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BEFORE THE

CALIFORNIA ENERGY COMMISSION

In the matter of,	)
	) Docket No.19-DECARB-01
Decarbonization	)

STAFF WORKSHOP ON

ASSEMBLY BILL 3232 BUILDING DECARBONIZATION ASSESSMENT:

PROJECT SCOPE, BASELINE RECOMMENDATION,

AND GHG ACCOUNTING ASSUMPTIONS

WARREN-ALQUIST STATE ENERGY BUILDING

1516 NINTH STREET

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SACRAMENTO, CALIFORNIA 95814

WEDNESDAY, DECEMBER 4, 2019

9:13 A.M.

Reported By:
Peter Petty

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Staff Present

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Other Presenters

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Nick Zanjani, California Public Utilities Commission (CPUC)

Delphine Hou, California Independent Systems Operator (CAISO)

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Cathy Higgins, New Buildings Institute

Pierre Delforge, Natural Resources Defense Council (NRDC)

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Lauren Cullum, Sierra Club California

Farhad Farahmand, TRC Companies, Inc.

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P R O C E E D I N G S

DECEMBER 4, 2019 9:13 A.M.

MS. BIRD: After that, staff will present the AB 3232 Assessment Scope. And you can find that in the docket under TN230838. And then, we'll have a separate staff presentation on the recommended baseline. And you can find that in the docket.

Good morning, Commissioner. I'm just kind of doing an overview.

So, the recommended baseline document is in the docket under TN230833.

After each staff presentation there will be a short Q&A session. And then, towards the end of the workshop there will be an opportunity for public comment and discussion. At that time we'll display eight scoping questions that were listed in the scoping document. We'll display them on the board to kind of stimulate conversation. And we are asking parties to limit their comments to three minutes.

For those in the room who'd like to make comments, please come up to the center podium and speak into the microphone. Please state your name and affiliation. And it's also helpful if you would give our court reporter your business card.

Okay. If we end up with a long line of

commenters, we will have our Public Adviser, Lindsay Russell, who's sitting back in the corner by the door, has blue cards. We'll ask you to fill them out and then we'll call you up one by one.

For WebEx participants, if you'd like to make a comment you can use the raised hand feature on WebEx and we'll call on you during the public comment period. And then, using this same feature, you can lower your hand if someone has already asked your question, or you would like to withdraw your comment.

And following comments and discussion, we'll wrap up and adjourn. Please note that we have a hard stop at 12:20 due to another workshop starting in this room at one o'clock.

Following the meeting, we'd like to -- we really would like to hear your comments. We'd like to see them. You can submit them to the docket. Let's see, I've got the docket slide. So, we'll flash this up at the end as well.

But let's see, you can find materials for this meeting on the website and hardcopies are on the tables out by the door.

There's also a sign-in sheet. We'd like to know who's here in the room. And we've got a load of people on the WebEx, as well.

Written comments on today's topics are due on Friday, December 19th, by 5:00 p.m. And the workshop notice explains the process for submitting written comments.

And, finally, I'd like to thank our participants for being here today and ask that you identify yourselves before speaking. This is helpful for everyone in the room and also for those -- for the court reporter, and also for those participating remotely.

And so, without further ado, I'm going to turn the mic over to Commissioner Andrew McAllister for opening remarks.

COMMISSIONER MCALLISTER: Great. Thank you, Heather. I'll be brief, I know we only have the morning and there's just a lot to cover. I want to certainly thank all of our presenters but, in particular, those from our sister agencies. So, thanks to you guys, I really appreciate it.

This topic is -- I mean, it's super interesting. All of you are here because you really care about this. And I think we're all trying to put our heads together. Part of the -- well, I was not going to make excused for being late but, you know, you have to anticipate the rain and people don't know how to drive in the rain.

But, actually, I was just on a call with the

organizer of a topic on decarbonization, of a decarbonization panel next week, at the COP, in Madrid. And, you know, we are, I think, all in a very similar position where the demand flexibility and hardcore energy efficiency, you know, the lights are going on in people's brains all over the world. Understanding now, in a much more deep way than before about how linked all of these issues are. And that we need, you know, wholesale action, and we need these aggregated resources, but that really a lot of our barriers are at the individual customer in the market.

And we've got to figure out how to get technology deployed properly in our buildings both on the energy efficiency front and the flexibility front, and really merge those two in a way that's optimal in order to get to our decarbonization goals. Like that's just a fundamental requirement. Otherwise, we're going to be spending too much money and we're not going to get the results that we want.

So, this is really the front lines of decarbonization at our buildings, I think. And there are a lot of pieces that have to kind of work together. And I think, you know, certainly these are issues we need to solve. People are looking to California to get this done. And we have a big enough economy where we

can move markets and get it done.

So, you know, I think the AB 3232 platform is a really fantastic one for this conversation. And so, that's why I'm looking forward to today.

I want to thank stakeholders for sort of -- for suggesting a more formal process to figure out how we're going to have this conversation because I think it's the right thing to do. So, having a formal discussion about the scope of this effort and, you know, I would invite all of you to submit your kind of aspirations about where this could end up, really where it ought to end up or where you think it ought to end up.

And, obviously, a lot of lifting. This interfaces with the Energy Efficiency Action Plan that is on the agenda for next week's business meeting. Unfortunately, I'm not going to be here, but I'm really happy with staff's work on that plan. I think, you know, it's a good basis for work going forward. And it's sort of the first incursion into this AB 3232 discussion, which will -- which is a separate discussion and will have its own plan. But the Efficiency Action Plan I think obviously has a lot of ties with decarbonization. And so, we tried to sort of kick it off with that plan and include those themes in there, but without finishing the discussion because we knew we

were having this discussion.

So, in any case, that's kind of the context. This is -- you know, energy efficiency and certainly buildings there's a lot of detail. And, certainly, existing buildings are all different. And marketplaces just have to figure this out and we have to understand and support the marketplaces in ways that make sense.

So, that's a lot of what this is about. We need big capital. Capital has to come to our existing buildings.

Our new construction also has challenges, but I think they're different and they're, honestly, a bit easier. You know, they're not easy, but they're easier.

And so, yeah, all of us with our thinking caps on, hopefully, we can come up with solutions and put them in place for California. And people, you know, I know here everyday people are looking to us to get this done and to really help solve these problems.

And this is a message I want to take to Madrid next week and see what's happening with a little more detail, in some really innovative places in Europe and elsewhere, and really share experiences and start to strengthen those relationships. We have a lot of relationships, but strengthen them. And keep those conversations going into Scotland next year, and all the

international collaborations in years after that.

So, anyway, not to imbue this with, you know, so much gravitas that it scares people, but it kind of ought to scare us because this is the front line of how we're going to solve the climate crisis. And so, it's really important that we figure it out.

So, with that, you know, let's have a light and fresh discussion today. And I want to thank Heather and team for putting this together and everybody for presenting. And, hopefully, this is the start of a really good, productive and results-oriented conversation. So, thanks everybody.

MS. BIRD: Thank you, Commissioner. And Aida Escala's team, as well. So, this is a collaboration of two divisions that are doing a good job of working together.

So, let's see. So, now, we're going to have representatives from each of the agencies and organizations that we're working with. And that's not the slide I want. Anyway, I'll put up a slide.

And Dana is representing the Air Resources Board and she's going to start off with her presentation.

MS. WATERS: Thanks.

MS. BIRD: Thanks, Dana.

MS. WATERS: Okay. Good morning Commissioner

McAllister. I don't know if you can see me. I'm kind of short here. I'll move to the side.

COMMISSIONER MCALLISTER: Hey, Dana.

MS. WATERS: Thanks for the opportunity to provide an update on CARB's programs related to building decarbonization. Before I get started, I just wanted to say thank you to CEC staff for working so closely with us on this initial proposal to really reduce building related emissions as much as possible.

I'm going to touch on six topics today related to HFC mitigation, what we're doing in the upstream oil and gas sector, SB 1371 to reduce methane leaks from natural gas transmission and distribution. I'm going to touch on a commercial cooking model rule that we're going to work on. And an update on our zero carbon buildings research and the climate neutrality effort underway.

So, HFCs are synthetic gases. They're mainly used in aerosols, foams, air conditioning and refrigeration systems. They are thousands of times more potent than carbon dioxide. HFC emissions are the fastest growing greenhouse gas emissions globally, including in California. They currently are about 4 percent of our greenhouse gas emissions inventory, but they're expected to more than double by 2030 under a

business as usual scenario.

The main reason why they're increasing so rapidly is because HFCs are used as a substitute for ozone depleting substances that were banned under the Montreal Protocol. There's also a greater demand for air conditioning and refrigeration systems with global warming causing this increase in emissions.

You can see the red line is business as usual. The dotted line is emissions projections with our current HFC regulations. And to counter this trend, we do have an SB 1383 target of 10 million metric tons, and that's a 40 percent reduction below 2013 levels by 2030.

And as you can see, in 1990 -- I don't know why this slide's looking a little funny. But in 1990, emissions from HFCs were basically negligible. And so, CARB is actually recommending a 2013 baseline for HFCs for the purpose of AB 3232 implementation.

So, HFC emissions from buildings represent about 70 percent of those total emissions. The top two red lines are the same lines that we saw on the last graph and the blue lines are those HFC emissions relating to buildings in the context of the SB 1383 target.

Our current proposed HFC regulations are going to help us get down on the way to that SB 1383 target, but we're going to need all the help that we can get.

And even once we get to that SB 1383 target, we're going to need to reduce emissions even further if we want to get on track for our 2045 climate neutrality goals.

So, there is a challenge in, first of all, meeting that SB 1383 target, but also avoiding the increase in HFC emissions over the long runs. But there are a few policy ideas that we're recommending to help avoid those challenges.

And the first is that with the increased use of heat pumps in building electrification, we'd like to see innovation and incentivizing heat pump technologies that actually use lower global warming potential refrigerants, or even HFC free technologies, such as CO2 based heat pump water heaters.

Building codes have also been a barrier and we need to update building codes so that we can have some climate friendly alternatives for refrigerants more widely available.

Another step that needs to be taken is the proper installation of refrigerants used by trained technicians, so that we know that these systems are operating efficiently.

And lastly, most smaller equipment vent these refrigerants into the atmosphere during their repair and end of life. So, there's a need to improve programs for

recovery reclamation and destruction of refrigerants.

So, like I mentioned, the use of heat pumps for space conditioning, clothes drying and water heating is expected to increase dramatically with building electrification. And we're concerned that there might be an unintended consequence of increase HFC emissions.

Our business as usual emissions projections that we showed in those prior graphs don't actually include any increased emissions from large scale adoption of heat pumps. So, that's something that we do still need to look at. And HFC emissions could increase even more if they're left unchecked.

So, CARB definitely supports CEC's inclusion of HFC emissions in the AB 3232 baseline.

So, the next topic is related to upstream oil and gas. So, fugitive leaks of natural gas are composed mostly of methane. Methane is 25 to 72 times more potent at trapping heat in the atmosphere than carbon dioxide, when looking at it from a 100 year or 20 year timeframe. However, it's important to note that leak rates vary widely. And most of the large scale studies are inventories that consider the full lifecycle of natural gas, actually show leak rates in the range of about 1 to 3 percent.

One of the key drivers for this major variation

is the fact that there are large leaks in a small percentage of sites that are responsible for the majority of emissions.

And you can see, as shown in this figure on the right, this example where the top 5 percent of sites are actually responsible for about 50 percent of emissions.

So, the Air Resources Board is funding an expansion of an oil production, greenhouse emissions estimator through a contract with Stanford. It is a software tool that's going to include an innovative fugitive model to help better estimate these fugitive emission rates in the future.

So, the third topic I want to touch on is related to reducing methane leaks from natural gas transmission and distribution. SB 1371 does mandate the CPUC, in consultation with CARB, to adopt rules and procedures to reduce methane emissions from regulated pipelines by 40 percent below 2015 levels by 2030.

In June, CPUC approved their first phase decision for natural gas corporations to implement 26 best practices and develop biannual compliance plans. Their second phase decision was passed just this last August. That requires by 2025, if the gas utilities failed to reduce their methane emissions by at least 20 percent, which is half of the target, by that point then

they will not be able to get rate recovery from their gas customers.

This slide shows the emissions changing over time between 2015 and 2018. You can see that there is some variation with the downward trend and the emissions in 2018 were nearly 10 percent lower than the 2015 baseline.

We are -- we did also fund a study to establish more California specific emission factors related to T&D distribution, and particularly for customer gas meters, which represent about 25 percent of these total T&D emissions that are regulated under 1371, and we are expecting the report to be available sometime later, by the end of this year.

So, the fourth topic that I wanted to touch on is a commercial cooking model rule. This is actually one of the statewide actions under AB 617, and the Community Air Protection Blueprint to help reduce air pollution in heavily impacted communities.

While this measure is focused mainly on localized pollutants, such as particulate matter and ozone precursors, commercial cooking is also a source of black carbon, which is a short lived climate pollutant. So, there are impacts or climate impacts related to natural gas cooking.

So, the phase one part of this project is going to include a technical assessment. And the phase two is going to include the development of the actual suggested control measure. We're going to kick this off in 2020. But the idea here is that air districts would be able to adopt this commercial cooking model rule to help them reduce their criteria pollutants and it could also have a GHG benefit, depending upon what technologies they implement.

So, the fifth item I wanted to touch on is our Zero Carbon Buildings research project. WE do have some very preliminary results from the first phase and focused more on time of use and the energy wedge. And it does look like when certain measures are implemented at the building scale, zero carbon building performance is technically feasible for single family, multi family, warehouses. It is definitely more challenging for large offices.

We do have a community scale part to this study as well that's still wrapping up. And we hope to have a report on this project available no later than second quarter 2020.

So, we are also working on the climate neutrality effort for deep decarbonization by 2045. On this, I just want to point out that we are, in the very

preliminary stages, evaluating options on how we can reduce emissions from all the various sectors, but also increase carbon syncs. It's going to be part of our next scoping plan update. And building decarbonization is definitely part of the solution, but we are going to need early action and very aggressive action to set us on track to meet this target.

So, in closing, I just wanted to reemphasize a few of the points that I covered. First of all, we definitely support CEC's initial proposal. We do believe that the direct emissions accounting approach is going to require maximum action to decarbonize buildings. In particular, when we're looking at HFC emissions we do support the inclusion of those emissions.

We are -- we want to make sure that we manage that potential impact with lower GWP option. And I think by including it in AB 3232 scope, it will help us to keep that in sight.

The second point, under oil and gas, is that there are these major inventories and studies that show leak rates vary widely, which could affect the magnitude and the scale of upstream fugitive emissions from natural gas. But there are a few large leaks, in a

small percentage of sites that are contributing to the majority of emissions. And since there's already legislation to reduce fugitive emissions by 40 percent below 2015 levels, we support excluding both the upstream natural gas, as well as the T&D fugitive emissions from the scope of AB 3232.

We do look forward to partnering with you as we're moving forward on our commercial cooking rule, and as we're thinking about whether or not it's possible to achieve some of these aggressive targets. We think that some of our preliminary research does show that it is technically feasible to achieve zero carbon performance, and we need to take this early aggressive action to really help us achieve our 2045 climate neutrality goals.

So, thank you.

COMMISSIONER MCALLISTER: Thanks very much, Dana. And, really, looking forward to working with you on the commercial cooking stuff and the --

MS. WATERS: Yeah.

COMMISSIONER MCALLISTER: -- zero carbon buildings. And it's good to have, at least show technical feasibility.

MS. WATERS: Yeah.

COMMISSIONER MCALLISTER: I think that's clear

and, you know, hopefully, we can work with the markets to get the cost down --

MS. WATERS: Right.

COMMISSIONER MCALLISTER: -- and make it something we can include largely in the code, actually.

MS. WATERS: Okay.

COMMISSIONER MCALLISTER: Thanks.

MS. WATERS: Sounds good. Thanks.

MS. BIRD: Thanks Dana.

And now, we're going to have Nick Zanjani from the Public Utilities Commission.

MR. ZANJANI: All right. I'm quite a bit taller than Dana. I don't think you'll have a problem seeing me. All right, wonderful.

Good morning Commissioner and audience members, it's a pleasure to be here. I do want to echo what Dana said and that we really appreciate the close coordination with the CEC and other partner agencies. And Nick and Heriberto have been doing a great job. So, thank you very much and we're happy to be part of this process.

I've been asked to provide a brief overview, first, of where things stand in regards to RPS progress and energy sector emissions before going into some of the specific things that the PUC is doing to help on the

building decarbonization front more specifically.

So, I'll start off with that and then go into some of the various different programs that have an impact on the wider building decarbonization effort.

So, in regards to electric generation and RPS progress, everybody in this room is probably well aware we have a Renewables Portfolio Standard. And under SB 100 there's a requirement that the load serving entities procure at least 60 percent of their resources from renewable generation by 2030. So, you can see the graph right there and the periods in which there is compliance required.

How are we doing in terms of compliance? With the three largest IOUs, you can see they're over on the side, this is 2017 for actual figures, and you can see that PG&E at that point was at 33 percent, SCE 32 percent, and SDG&E 44 percent. So, incremental progress is being made.

And the great news is that of course, you know, whereas some of the contracts that were signed earlier on in the progress would make us blush today, we've seen a rapid decrease in the price of RPS contracts. And so, that will help us, you know, achieve our goals at the least cost possible.

I don't want to steal the CAISO's thunder too

much, since this is also in the CAISO's slide deck, but what does this all mean in terms of renewables procurement for the larger GHG picture? And what it means is what the graph shows right there. Each year we are seeing steady decreases in the amount of CO2 emissions associated with the grid. And so, that's a wonderful thing.

Why is that? Obviously, a large reason for that is that renewables re displacing natural gas generation and other fossil generation, and that is a significant reason. You can see natural gas generation is down 30 percent from 2001. But I think something that's lost when having this conversation about GHG emissions intensity of the grid is that it's not just RPS displacing fossil, it's also that the natural gas, itself, is getting less carbon intensive and more efficient.

And so, you can see on this graph right here that the natural gas emissions associated with just the natural gasoline itself is down 40 percent. And you're seeing that the more -- the steam turbines are largely being displaced by CCGGs and other things. They're just much more efficient, which helps us achieve our GHG goals, which is a great thing.

So, that's kind of where things stand in regards

to the electricity situation. And that's significant because when we talk about building decarbonization we so often talk about electrification, and electrification is obviously not the only means by which we achieve building decarbonization, but it's a significant and very prominent means right now. So, obviously, when we switch to more electrified buildings we want to make sure that we're taking advantage of everything that electrification accomplishes in terms of GHG reductions.

So, what are we doing more specifically at the PUC in regards to building decarbonization? We do have a proceeding, our 1901-011, and we are currently in the first of four phases in that proceeding that will help us get on a path towards, you know, more steadily and rapidly decarbonizing California's building stock.

Phase one of the proceeding is simply implementation of a bill from 2018, by Senator Stern, SB 1477. And it authorizes the PUC to implement two new pilot programs, BUILD and TECH. BUILD is targeting new construction and is primarily focused on new low income construction.

TECH is designed mostly to provide upstream and midstream incentives to not necessarily transform the market, but help develop the market and get it ready, and in a place for more genuine market transformation in

the near future.

So, we have had workshops on SB 1477 implementation. We have released a staff proposal per the scoping memo. There is a commitment, or at least an aspiration to release the proposed decision by the end of this year. So, with any luck we'll be successful in that endeavor, but no promises.

For phase two, this is targeting the wildfire rebuild. We have kind of ad hoc efforts underway that have come from utility proposals and in conjunction with local CCAs, like Sonoma Clean Power, to provide incentives in areas that have been devastated by wildfires and other natural disasters for people to rebuild, and to rebuild in a way that the homes are less carbon intensive.

So, as we move forward, we want to have a regime in place, essentially, so that we don't have to rely on advice loader filings, and scrambling at the last minute whenever we're responding to a wildfire. When we want to help people rebuild and rebuild with a less carbon intensive home, we want to just have a framework in place by which if something tragic happens and, hopefully, this happens less often moving forward, but if something tragic happens all of the IOUs already know what they need to do. And we hope that we can design

those guidelines and rules in place so that moving forward we actually have more subscription to these services, rather than the fairly low uptake that we've seen so far, particularly in Sonoma.

Phase three of the building decarbonization proceeding will deal with the things that are not necessarily incentive specific and how we can, you know, consider specific program policies and rules to incent builders to choose Title 24 compliance pathways that maximize greenhouse gas emissions reductions.

Phase four is kind of the catchall in our proceeding, where we've identified some few specific things, such as rates and what we can do to change the way that rates work to better incentivize less carbon intensive buildings. But, also, other things, permanent structure in place, perhaps, that we can implement, so that rather than just relying on the initial four years of the pilot programs that we'd be introducing, we'd have a permanent regime in place that we could rely on to accomplish our goals.

So, that is the building decarbonization proceeding. I wanted to touch on a few other efforts. Some of you might be familiar with our San Joaquin Valley Disadvantaged Communities pilot, which came out of a bill from 2014, by Assembly Member Henry Perea.

The intention behind this proceeding was not actually decarbonization itself. It was more social justice and providing accessible energy, clean energy and less reliance on wood burning stoves and propane in communities that don't have the natural gas infrastructure built out to them in the San Joaquin Valley.

Nevertheless, as we've moved forward through this proceeding, the outcome has largely been one that has involved electrification. And so, we have a decision in place and we are working with the investor owned utilities to start rolling out these incentives, and covering these communities. The proceeding initially identified 170 relevant communities. But for the purpose of the pilots that we're rolling out, it applies to only 11 pilot communities initially. And then, we'll see how those programs go and then build off of that.

But what we learned from the electrification effort will be really, really helpful to us as we explore other electrification options not necessarily specific to the San Joaquin Valley or to disadvantaged communities, but it's something for us to learn from and to look out for.

I wanted to note briefly that, you know, there

was a decision that passed this September that made some modifications to the Self-Generation Incentive Program. And while we typically think of that today as more in terms of storage, I wanted to note for people that the recent decision also applies to thermal hot water storage as well. And this is significant because it applies to the heat pump technologies that are coming on the market. And some of them that are grid enabled are able to manage load more effectively. And I think the graph is demonstrative of some of the potential we can see if we have those grid enabled storage devices incorporated into our heat pump hot water heaters. So, that's something just to keep an eye out, and incentives that are available that are relevant to the electrification effort more broadly.

Of course, as I mentioned earlier, decarbonization is not just about electrification. It's also about, you know, decarbonizing the gas supply as well. And we wouldn't preclude things such as, you know, hydrogen, and fuel cells, and other things that have the potential to help is the effort of decarbonizing buildings.

But I wanted to make a quick note about renewable natural gas and where things stand in regards to what the PUC is doing to help further the viability

of renewable natural gas.

SB 1383, through that process we did approve six pilot programs to kind of prove the viability of dairy biomethane interconnection injection. So, that will help in the broader effort to decarbonize the gas supply. But there is nothing about the gas that ultimately gets fed into the pipe through that process that is going to be attributable for building decarbonization. All of that gas is for off take agreements for the use in transportation. So, it's not building decarbonization specific, it just has applications that could apply down the road.

SB 1440 could very well lead to a gas supply that's decarbonized and attributable to buildings. So, that's something that's kind of in the process. And the language from SB 1440 was recently incorporated into phase four of our 1302008 literally verbatim, and it's quoted right there.

Furthermore, SoCalGas and SDG&E have filed for an opt-in green gas tariff, which is also something that the Commission is exploring. So, we hope to kind of be fighting this fight for building decarbonization on all fronts, not just electrification.

Dana already talked about refrigerants quite a bit, but it's so significant that I just want to

reiterate it one more time. If you look at the documentation that was prepared by CEC staff for this workshop, it's very clear that refrigerants are growing exponentially. And if you think electrification in and of itself is going to accomplish our decarbonization objectives, it's not. We need to switch to low GWP refrigerants and we need to switch as soon as possible.

There as a bill in 2018 that had requirements for a variety of different agencies. But insofar as the PUC is implicated, it has us developing a strategy for including low GWP refrigerants and equipment that's funded through the Energy Efficiency Program.

This summer, we did bring a staffer on board who has expertise in this area and then, we expect action to begin on this topic in earnest in early 2020, in the efficiency proceeding. But nevertheless, we are doing several things currently in regards to promoting low GWP refrigerants.

I would note that a very recent staff proposal in the IDER proceeding would propose factoring in refrigerant GWP into the avoided cost calculator. That hasn't been approved yet, but it's something that staff has proposed.

And then, in the staff proposal for SB 1477 there is a kicker incentive for low GWP refrigerant

equipment in the BUILD Program. So, it's something that's small in the staff proposal, but it's a significant component of it.

This next slide is just an overview of the various different refrigerants in common use today. And if you can see that, it's very clear three tiers here in regards to refrigerant and common use. You can see that the very low GWP, kind of the 0 to 4, CEC defines low GWP as 150 and below. Then, you can see the middle tier, that kind of 583 to 733, if you will. And I would classify that as kind of middle tier, medium, moderate GWP because the recent ARB proposal that's on the table would essentially say nothing above 750 will be permitted after 2023. So, and then everything over 750 is what we really classify as high.

And the downside, as Dana already pointed out, is that the high GWP refrigerant is, unfortunately, the refrigerant in most common use. And so, as you can see, you know, R410A that is the standard for space heating heat pumps. R134A is the standard for heat pump hot water heaters. And so, if we can transition to those lower GWP refrigerants, we're going to be in a much better position to achieve our GHG goals.

And then, very quickly, I have two slides on the recent fuel substitution decision. This is not

necessarily specific to building decarbonization but, nevertheless, the three-prong test that the fuel substitution test replaced was identified by many in the environmental community and beyond as a major obstacle towards achieving our GHG goals.

And so, with this recent decision that was passed this August, we'll be in a better position to allow people, who want to, to transition from natural gas appliances to highly efficient, low GHG electrical appliances and take advantage of all that that has to offer.

So, this is a major change in the way our operations are going to be working. And we look forward to seeing how it all plays out.

And this second slide is simply kind of more of an overview as to what fuel substitution is all about, what it is, what it's not.

So, thank you very much that is the end of my presentation.

COMMISSIONER MCALLISTER: Thanks very much, Nick.

MS. BIRD: Thanks Nick. And so, now, we have Delphine Hou from the California Independent System Operator. Is she in the room?

Okay. Okay, so, we'll go to Martha Brook from

the California Energy Commission. And if Delphine arrives, she'll go after Martha.

COMMISSIONER MCALLISTER: Are we in touch with Delphine, by the way?

MS. BIRD: I don't think we've heard from her.

COMMISSIONER MCALLISTER: Great.

MS. BROOK: Good morning, everyone. I've been asked to give a summary of the Energy Commission's efforts on building decarbonization.

Many of you have been with us in this room for IEPR discussions on building decarbonization. So, this presentation is going to quickly just cover all the related activities, just like the other agencies did, to give the context for all things related to building decarbonization that we're working on.

And that doesn't work. Which one of these things makes the -- okay, so I'm going to cover updates that we either have already done, planning to do, intend to do on our long standing regulations that will impact building decarbonization, implementation of new legislation, some of which you've heard bits and pieces of already from our sister agencies. The key assumptions that we're using right now for our current electricity emission intensities, and this is a result of ongoing analysis here at the Energy Commission, along

with collaborative discussions with our sister agencies in a Fuel Substitution Working Group that was launched out of our SB 350 doubling of energy efficiency efforts.

And then, ongoing research and development because we have a well-funded program here in California, and we're lucky to have it, and it's really in tune with our policy needs. And so, of course, they're funding many relevant activities that will help us in our journey on building decarbonization.

So first, our regulations, Building Energy Efficiency Standards. We're working towards in our current standards a performance compliance path for all electric systems. We mostly have this in place. We have a couple wrinkles to work out in multi-family buildings that want to use large, central heat pump water heating systems. A few things like that that we're working on right now.

And then, in the future standards, we're proposing for 2022 an going forward from there, a new source energy metric that will really align nicely with emission reductions, we think. And so, that will be a big step forward in terms of really focusing on the energy that's used in buildings and how it relates to emission reductions, and other environmental impacts.

Our Appliance Energy Efficiency Standards is

ongoing and we have just recently been blessed with recent legislation from Senator Skinner, AB 49, which adds demand flexibility to the scope of our future appliance standards. So, now, we'll begin to think about which -- how appliances sold into the State of California can help us with our demand flexible goals. And this as Andrew -- or, Commissioner McAllister has pointed out, a big emphasis on successful building decarbonization will be our ability to shift loads.

And to that point, we have just recently opened and adopted an order instituting rulemaking in November, on our Load Management Standards Update. The focus here will be on strategies and technologies to shift electric loads for emission reductions and cost savings. These regulations apply to all load serving entities in California. So, you could imagine a future when these regulations are updated where all utilities in California will be required to find technologies and employ strategies that we deem to be more cost effective than a traditional generation resource.

So, Commissioner McAllister is leading that effort and we're excited to integrate the potential impacts of those standards in our AB 3232 analysis.

New legislation, SB 350 in 2015 asked us to -- the Energy Commission to assess the potential to double

energy efficiency by 2030. It also increases the Renewable Portfolio Standard, which we heard about, to 60 percent by 2030.

1477, which we also heard about from the PUC, provides $200 million over four years for low emission residential new construction and existing residential heating. And I think that because we're collaborating so well with our sister agencies that we'll be able to actually influence how 1477 rolls out, based at least partly on the analysis that we'll be doing for 3232.

So, for example, we anticipate that building system efficiency and envelope performance will play a big role in successfully rolling out clean heating technologies. And so, if we get that analysis in front of the PUC early, then they'll be able to influence the rollout of the existing building portion, the TECH program of 1477.

SB 100 -- oh, then, 3232, obviously is what we're talking about today. And SB 100 is a hundred percent zero-carbon resources for electricity retail sales by 2045. And I'll demonstrate how that's connected to building decarbonization in the coming slides.

So, this is something that I put together, the next two slides, as a way to sort of figure out what all

these different moving parts, how they fit together and how they apply to our clean energy policy goals.

So, this chart is meant to describe the sector scope of our policy instrument. So, SB 100 at the top, it covers all of our demand sectors. Because one of the things we have to do in SB 100 is to reach the clean energy goals we have to do as much as we can on the demand side, and show how low carbon technologies and systems influencing transportation, commercial, residential and our industries in the state are going to change the demand that will need to be met with zero-carbon resources. So, SB 100 covers all sectors.

3232, what we're talking about today, just covers residential and commercial buildings. There are obviously buildings in some industries, in agricultural processes, and to the extent they're related to our commercial building efforts they will also be covered.

SB 1477 is only a residential program, but that's strategic. Because as we've talked about in previous workshops, huge amounts of building decarbonization will need to be met by the residential sector. So, that's a great place to start in our incentive program mechanisms.

SB 350, doubling energy efficiency, applies to residential, commercial, industry and AG. Our Load

Management Standards, again, can address all demand sectors and ways to shift load to reduce the cost of generation in the state.

Our Building Standards traditionally cover residential and commercial buildings. We have dipped our toes into covered processes, so processed energy that are used in commercial buildings are covered in the Building Standards.

Appliance Standards typically cover residential and commercial buildings. We're also doing things in larger, you know, large fan systems that apply to industry and, of course, our water pumping for our water efficiency. We can potentially stretch into transportation in the Appliance Standards, but we have yet to do that.

And then, research development, for obvious reasons covers all sectors. And we're glad it's doing that because there's lots of R&D that's going on in the state that's helping our clean energy goals across all those demand sectors.

Another important way to look at the policy framework here in the state is to look at the planning horizon of each of the policy instruments. And I didn't include the regulations on this slide on purpose because in my opinion, and I think it's true, they're all

relatively short term. Because to successfully implement regulations, at least in the State of California, you have to prove they're going to be cost effective and to have little to no impact on, negative impact on businesses in the state. And the only way to do that is to actually have real, current information about costs and impacts.

So, in our Building Standards, for example, we can't assume that something is going to be cost effective in ten years and to set a building standard it has to be cost effective at the time that the building standard takes effect.

But the good part is regulations are updated routinely, especially our Building and Appliance Standards. And I think going forward our Load Management Standards will also be updated more routinely.

But for these pieces of legislation, we also have an obligation to update the planning that goes into these periodically, and one way or another, mostly through our Integrated Energy Policy reporting process.

So, just as a summary, 1477 is a relatively short term project. The funding is only for four years. We don't expect -- we expect the program will run longer than four years because it will take time to roll out

and engage the market in ways that are successful. But in terms of planning, it's relatively short term.

And what's shocking to me is that SB 350 and AB 3232 are also relatively short term. So, even though 2030 -- it used to sound like it was a long ways away, it doesn't sound like it's a long ways away anymore. It's ten years. So, those goals become really important and really, really challenging, especially in comparison to SB 100, which has got a very, obviously a much more aggressive goal, but we have 15 extra years to accomplish it. And so, that we're looking at that zero-carbon resources for electricity target in SB 100 is 2045.

So, the next two slides are meant to introduce you to the newest version of our electricity emission intensities. We'll be using these assumptions in our 322 analysis. We've introduced these emission intensities in previous building decarbonization settings. We'll continue to update these. And they've been, like I said, a point of discussion in our collaborative efforts with our sister agencies.

So, first, just for our most recent work, the assumptions that we're making on the demand side is that it's a -- it was introduced on Monday as a pseudo or a quasi AB 322 demand scenario. So, it doesn't -- it's

not an emissions based assumption. It's basically saying, well, close enough would be if we reduced our natural gas consumption in 2030 to 40 percent below 1990. So, that's what we've modeled for our demand is that we've reduced gas consumption and replaced it with electricity at those levels.

We've also assumed that electric heat pumps replace gas, space and water heating. So, that means that the relative efficiency of those electric technologies are potentially, probably, at least 3X better than the gas equipment efficiencies that they're replacing.

But we haven't assumed any building envelope efficiency improvements and we haven't assumed any load shifting. So, it's in some ways a worst case scenario, because we know we're going to do better than that in our 3232 analysis. But it also kind of just says -- it also says what could happen to the grid, to the impact on the grid if we shifted that, you know, huge amounts of gas consumption to electricity. With reasonable estimates of what we would expect for efficiency, without additional, you know, efforts by us and others to actually do things that we know are smart, but would be harder to do, and will take more market transformational efforts besides just equipment

replacements.

On the supply side, we're assuming that we're meeting the SB 350 goal of 60 percent RPS by 2030. For the docket, I'll add an additional assumption that I should have added to this slide and that is that in the production cost modeling there's 1,200 megawatts of batteries assumed, so that we can keep the same levels of the reserve margin that we typically use for our planning purposes.

We are recommending a long term marginal emission intensity framework for our 3232 analysis. And this is important because it reflects the changes in generation resources needed to meet, you know, significant demand changes that we anticipate will be needed for 3232.

And then, a final assumption is that our out-of-state renewables is 80 percent emission free and 20 percent is the ARB default stated there.

And this is one version of the data. Another version that I'll stakeholders love is this one I shared with Commissioner McAllister. This will be in the docket. I asked the tableau expert too late to get an indoor slide deck. But we want you to grab this and use it because it's great eye candy and it's a very powerful image.

So, this is the same data. And I think what's important in this perspective of the emission intensity visualization is how it compares to the straight blue line, which is the gas reference. So, many months everything is -- and as you can see in this thing, many months all of -- everything's blue. Blue is below gas and orange is above gas on this heat map.

So, but then winter and spring months there are shoulder hours that are significantly, at least 2X above that gas reference. And this super important for our building decarbonization work because those are largely the hours that we use space heating and also water heating, which are our two biggest fuel substitution measures that we'll be considering for 3232.

So, in other words, it's not a slam dunk that our grid renewable. We still, as we've heard, need to think about efficiency, demand flexibility, and then this, obviously, doesn't include the impacts of refrigerants.

So, I'm not going to be able to go through all of our great research, but I've included, I think, six slides from both the Building Energy Efficiency Research Group and our Energy Related Environmental Research Group. So, I wanted you to have them in your -- they'll be in your docket and they're in your slide presentation

that you can grab, if you haven't already.

I'd say that everything that we've talked about already, low HFC, low GHG -- you know, global warming potential refrigerant research is included in our building research group. Both gas and electric, both 3 to 5X efficiency improvements on space and water heating slide. So, there are such things as gas heat pumps, and they do a great job reducing gas consumption, so they're also included in our buildings research program.

On the environmental research side we are focusing on leakage. And most of the great work -- this, actually this image actually comes from work that EPIC funded to really -- to the point that Dana was making about the point sources. You know, a limited number of point sources have the -- you know, 80 percent of the methane leaks was identified through one of our research projects here in the state.

And we also have expanded kind of the control volume around the gas system to include both the meter leakage and the wellhead leakage. So, we're doing our best to assess all of that and collaborating with CARB to the extent possible, so that once we have peer-reviewed, really foundational research, then they can start to include those leaks in their inventory assessments.

And that is all I have. Again, lots of research I'm not going to go through now. I think I covered it at the level that I need to right now, and that's all.

MS. BIRD: Thank you, Martha.

So, Delphine has arrived. So, come up, Delphine. Delphine Hou from the California Independent System Operator.

MS. HOU: All right, good morning. This is Delphine from the California Independent System Operator. I'm the Director of California Regulatory Affairs. And appreciate the staff here for being flexible on my timing.

So, I'm here to talk a little bit about AB 3232 in context of grid operations. And I want to start off, maybe, with an introduction about what the California Independent System Operator is because we're unlike the other folks, who have presented before me, in important ways, but we also are very close collaborators in much of what we do. And much of what we do is derivative of what the regulatory agencies do. So, it's a very important feedback that we have.

So, I'll start off with what we are. So, first and foremost, we're a balancing authority. And that's simply just to balance supply and demand to make sure everyone's lights are staying on and to ensure system

reliability and security.

But beyond that, we also are a regional transmission planner. So, that includes transmission planning across the major investor owned utilities in the state, as well as municipal utilities, and independent transmission owners. So, we do have that very large scale overview. In fact, we do cover, for our balancing authority area, which includes our regional planning we do cover 80 percent of the state. So, it's a significant amount to have that ability for a wide range overview. And as I'll get to my later slides, you'll kind of see why that feedback is important to get that snapshot of the state and for most of the footprint.

In addition to that, we're a market operator. That's also another very important function that I'll talk about later on and how this relates to AB 3232, and what kind of feedback that could provide. But we do operate a wholesale electricity market. It includes ancillary service functions as well. But we're the only one in the Western United States. And we also operate, now, the Western Energy Imbalance Market, which extends beyond the State of California borders into many footprints in the rest of the West. But that's also another important factor to consider and I'll mention

that a little bit later on in my slide deck.

Okay, just adjusting that. At least someone's video didn't come up. And last, but not least, we recently became a reliability coordinator for the majority of California, and we also do cover 87 percent of the load in the Western United States. So, again, reliability from a different perspective, but this time around beyond the balancing area footprint into a wider, a larger view of the rest of the West. And that, increasingly so, will have some impact.

And as Martha was talking before, we are a net importer. And so, what happens in other states does impact what we do here.

So, that's a tee up what we are. But also, very importantly, I do want to tee up what we are not. We are not a load serving entity. We don't procure resources. We don't have load. We don't meet resource adequacy requirements, though we do work very closely with the CPUC in the resource adequacy program. There is an explicit handoff between their program and the resources that operate in our market. That tie between us is called a must offer obligation. So, resources that are in the RA program, importantly, have to be offered into the CAISO market. So, we have visibility and we can use the resources that the state has spent

money to procure for.

In terms of transmission or generation, even though we do a lot of the planning and we look at how the flows are on the system, we don't own any of those resources. So, that is a very important factor in the "I", in the California Independent System Operator name. We are independent because we don't own generation or transmission. And not responsible for performing physical switching or maintenance.

Similarly, on the distribution side there is a differentiation there where we also don't plan on the distribution side. Whereas on the transmission side we do regional planning, even though we don't own the assets, on the distribution side we don't own nor do we do planning. So, that's also very important because much of what we're talking about here will happen on the distribution side and kind of bubble up to the transmission level.

And then, we are -- unlike the other agencies, we are not a regulator. We don't regulate utilities or any of our participants in our market.

So, those are important differentiations because I think a lot of the issues that we're talking about here, especially the programs for example that Martha was mentioning, those are things that the California ISO

won't necessarily directly have visibility to. But I think because of the collective impact, we definitely will feel that at the grid level.

And just for a status check in of where we are right now, we are working very closely with the CEC and the PUC, and increasingly so with the Air Resources Board. So, the first step is really the demand forecast.

So, what Martha has mentioned is that there is this, now, look there's a framework, and kind of a what would fuel substitution look like in the future? What would the impacts of, you know, really policies? All of that really is embedded in the core managed scenarios, as well as sensitivities within the demand forecast.

So, the California ISO relies on the CEC to provide that demand forecast. And as such, it flows into the CAISO. And so, at the CAISO, we do a lot of planning for local capacity, for flexible capacity, as well as overall transmission planning for the 80 percent of the state that we oversee. As well as, on the CPUC side, the same forecast is flowing into their assessment for resource needs.

And we do iterate and work with the PUC back and forth between that. So, at minimum, we'll all

consistent in our foundational assumptions of what the forecast is so that if we are, for example, talking about a future where there is going to be a lot of fuel substitution, a lot of switching from gas to electric and we want to understand, well, what does that scenario look like and how does it impact, at minimum and working with the CEC we can use the same foundational demand forecast and put that through all of our separate processes.

Beyond that, we also now have the Integrated Resource and Procurement Plans at the Public Utilities Commission. That's another important factor. And that also flows back into the CAISO planning structure and everything feeds back together, again, to the demand forecast for the demand side impacts.

So, that's just how we work with the state agencies. And then, obviously, as we're walking through the Integrated Resource Plan, for example, there's a big role for Air Resources Board in establishing the GHG targets.

And those are just highlighting some of the reliability based analyses that the CAISO performs.

So, over the years we obviously not only are living within the context of the state policies, but we're actively supporting them. How do we integrate

more renewables onto the grid? How do we take state policies and make sure they flow well with reliability, and how they work in concert?

And this is just a summary of some of the progress that we've made. But definitely, the graphic at the bottom, you know, since 2014 we've seen year over year, month over month decreases in GHG emissions associated with the load that the CAISO is serving within the 80 percent of our footprint. And that's really a testament to the state's GHG reduction policies.

As well as, you know, at the same time what's somewhat invisible is that through it all we've kept, we've maintained reliability. And you can see the latest data point that we have is the line at the very bottom, which is 2019 data. And you can see that trending fairly nicely.

The only hiccup that we had there was in 2018, in July, we had a particularly high demand load and so we were back to relying much more on natural gas resources. And you can see very clearly that when that happens the GHG does increase.

But another point I want to kind of link back together between CAISO's markets are operations, reliability, and how this all feeds into what could be a

good feedback loop for AB 3232, and other, potentially other state policies is looking at our CAISO operations.

So, this is, I think as CAISO folks have often noted that we never leave home without our duck. So, this is our infamous duck curve. And what you can see is in the blue behind is that's the load that the CAISO can perceive net of behind the meter, solar typically. So, that there's that little bit of a dip in the middle of the day. But the very low line, which is the net demand, is all of the in front of the meter solar, the high voltage connected solar and wind, and other renewables that is helping to serve load, especially in that middle part of the day. But obviously, as the sun sets at the end of the day, you do see that pretty aggressive ramp up.

And these two snapshots are taken from April 21st, and there's a reason why I pulled that very specific day. But there's April 21st, sort of a spring snapshot and that aligns pretty well with the graphics that Martha was showing you about the different emissions intensities changes across the month, across seasons. And then, below that is the summer.

So, you can see that that duck shape isn't necessarily there in summertime because our energy use is very different and a little bit of our resource is

slightly different.

But what's interesting is that if I'm looking at these two graphs, I can talk a lot about what the CAISO needs operationally. We need more ramping resources at the end of the day, when the sun sets we need to ramp up. And then, we need some resources to serve load when it's actually net peaking, which is more later in the evening, around the 7:00, 8:00 p.m. timeframe.

Interestingly enough, when we pull the emissions that go with that, we're looking at pretty much the same curve. And we think that is very important because what we're trying to message is that the grid needs aligns really well with where the emissions reductions can occur.

And if I were to put pricing along this, where we're operating the market, the pricing will also align where the highest prices are on those peaks in the early morning and the late evening. So, that the incentives are aligned. If we have technology, we have programs that are really trying to target reduction in emissions they're also able to help us operationally with ramping.

So, in our selfish CAISO needs that's great for us operationally. But also, pricing wise that's also the highest prices during our market. So, all of that, between the pricing, the emissions, the operations

aligns really well.

And you can see that similarly in the graphic in the summertime. Again, it tracks more so that net demand shape. And so, that's another nuance we want to put in there is that as we're looking at programs or, you know, incentives or what consumers are adopting, we also need to be aware that this graph, this shape changes with time, with season. So, that's just another factor. And I think Martha touched upon that as well, in her presentation.

So, we're engaged with this. Obviously, we aren't at the front lines of much of what's going on. But I think in having this data, in ensuring reliability we provide a good feedback to what's going on more so at the retail distribution side, and then feeding that back into the wholesale, and having that information back out to the public.

COMMISSIONER MCALLISTER: Hey, Delphine let me just jump in.

MS. HOU: Sure.

COMMISSIONER MCALLISTER: So, just to be really clear. So, thanks for all this data. I mean, I think, you know, the ISO is just an extremely, just great collaborator in all of this just because you have such insight into trends and, you know, have a very data rich

toolbox, which is great.

I guess, just to be clear, you're talking about price aligning at the wholesale level, right?

MS. HOU: That is correct.

COMMISSIONER MCALLISTER: So, that's a conversation, if we want load shift at the retail level, then we need to kind of have the conversation about how we align up and down the chain, right, all the way through the consumer?

MS. HOU: That's absolutely right. I think we've taken some initial steps with time of use rates. So, the new time of use rates, at least on the IOU side, but also it aligns fairly well with SMUD for example, that 5 to 8 for SMUD or the 4 to 9 for most of the Investor Owned Utilities, aligns fairly well with what we're seeing here as the big ramping need overnight.

I think what we're maybe less aware of is that morning ramp. That's going to be probably, potentially more prevalent in the wintertime, as we're talking about, you know, taking -- maybe transferring space heating from gas to electric. So, that's something, maybe, we'll have to think about further down the road.

But at minimum, you know, we understand that there might be that disconnect between retail consumers, the prices they see on the wholesale side. But at

minimum, there will always be that wholesale signal that can help inform whatever retail structure occurs later.

And the one thing I wanted to note is the reason why I pulled April 21st is because that was one of the few days, it's few but we might be increasing that in the future, where not only the line has touched zero there -- I don't know if folks can see the line down here. That's the zero line. So, really, it actually dipped below it. So, really, that's a moment where that's a real opportunity there.

So, you can see that, you know, with loads not necessarily very high in California, but with all the renewable production that we have, we're actually exporting it out. And so, we think that that could be a great opportunity for whatever programs to think about what those opportunities might be in future.

All right, with that, thank you so much for your time.

COMMISSIONER MCALLISTER: Thanks Delphine.

MS. HOU: Sure, thank you.

MS. BIRD: Thanks Delphine.

So, we're going to take a five-minute stretch break and really, literally five minutes.

COMMISSIONER MCALLISTER: We don't have a lot of time, so if we can come back quickly, that would be

great.

MS. BIRD: Yeah. Great, thank you.

(Off the record at 10:26 a.m.)

(On the record at 10:45 a.m.)

MS. BIRD: So, our first staff presentation is Heriberto Rosales and he's going to talk about the scoping document.

MR. ROSALES: Thank you.

MS. BIRD: And we have made a decision to use blue cards today. So, when we get to the last section of comments -- so, we're going to have two staff presentations. Each presentation will have a short comment period or question period directly associated with those presentations. And then, after those presentations and comment periods, we're going to have a public, kind of open Q&A discussion period.

During that last final section, we'll have blue cards. So, in order to get a blue card, there's a Public Adviser sitting back here, Lindsay. And you can get a blue card from her, fill it out, and give it back to her, please. Thank you.

MR. ROSALES: Thank you, Heather.

Good morning. Good morning everyone. Commissioner, good morning. Wow, a big crowd.

So, my name's Heri Rosales, Heriberto Rosales.

I think I've met a lot of the folks in the room, either in person, in meetings, or in a phone call. So, thanks for coming out today. I'm going to walk everyone through our proposed scoping plan for this project. I'm going to go over the main framing points.

I want to remind everyone that the assessment work is we're assessing the potential to reduce carbon emissions from the building sector. So, this is not a hard requirement. We will develop suggestions and strategies to how to reach that 40 percent reduction by 2030. So, I wanted to make sure we had the right mindset when we think about this in those terms.

I also want to remind folks that this is a proposed scoping document. So, we're leaving the door open for your comments, and your feedback, and your input on any one of many items that we're suggesting. By no means do we think that, obviously, this is set in stone yet. Your feedback is definitely appreciated.

So, with that, let me get started with where we're at. Let me start with the policy framework for the work here. So, AB 3232 was signed last year, passed in the Assembly, and signed by Governor Brown, actually, last year. So, the bill directs CEC to assess the potential to reduce GHG emissions from the building sector.

So, we're collaborating with our sister agencies, CPUC and ARB, on emission data and also some of our framing assumptions. So, I want to thank them for helping us out because they've actually been instrumental in helping us get to this point. And they will continue working with us as we work through this study.

So, the final assessment report is actually due to the State Legislature by January 1st, 2021. So, we have the balance of next year to work through this report, developing a draft, work with everyone here in the room and our stakeholders to get input, and then try to finalize it by the end of the year.

So, it's regarding building decarbonization, which is going to be essential for California, to help California meet its 2030 decarb goals, as well as 2045 carbon neutral goals.

The assessment will report on all associated GHG buildings in the building sector, and that's the main focus here on demand side, demand side energy. We are tracking GHG emissions associated with also the supply side energy, and I'll get to that in a minute, for both residential and commercial buildings. So, we're doing that by fuel type and those requirements will be part of future reporting requirements under this bill.

So, we're using the 40 percent emissions reduction as your benchmark for 2030. Nothing necessarily prohibiting us from going above that. But again, we're assessing the potential to be able to reach that by 2030.

So, the reduction target is also embedded in SB 32 that was passed in 2016 as a reduction limit for statewide emissions for all sectors.

So, again, that's just some of the policy framework.

Okay, so how does CEC view the potential to reduce these emissions? So, the building sector, as you know, is very large and very complex. It's interconnected with both the natural gas and the electric supply grids.

So, beginning in 2018, the CEC IEPR, in our IEPR report we estimated that the building sector was responsible for about 26 percent of statewide greenhouse gas emissions, when you take the wider context into account, when you take both the supply and the demand side into account.

We followed up a chapter this year, a building decarbonization and energy efficiency chapter in this year's draft IEPR. And we're proposing a multi-faceted solution for achieving optimal building decarbonization.

So, it's the graph you see up on the chart up there.

So, in the near future we're going to definitely see net increases and most of that's being driven by clean energy supply for the state, and that's good news. Again, the focus that's going to be here is how do we clean up the demand side from the building sector.

So, decarbonization, as we proposed in this -- we talked about in this year's draft IEPR is best optimized when we're alongside clean energy policy, as well as flexible equipment. And I want to thank the presenters before because they were touching on some very key points, policy points and movement in terms of creating flexibility in some of our buildings and also some of the appliances.

So, one, offsite starts with clean energy. It's the first bubble you see up there, the clean supply bubble. So, renewable sources are generating cleaner electricity, as well as we're also including renewable natural gas sources to meet building loads. For us, this helps address decarbonization from the fuel side. So, again, we're open to ideas and suggestions on the clean supply side.

Onsite, so we're also look at deep efficiency. There's been some reports on this, speaking about the fact that we're still relying on energy, deep energy

efficiency to help us reach a lot of our decarbonization goals for the building sector. So, we continue to believe that energy efficiency is going to be key in helping us solve decarbonization. So, we're leveraging energy efficiency through state standards and policy goals. And I think Martha did a good job of touching on some of the work that we're doing on that side. As well as, you know, some requirements from SB 350 to double the energy efficiency savings for both natural gas and electric appliances. Especially in the light that in the next ten years obviously building loads for both these fuels will continue to increase.

On the technology side, demand flexibility's going to play a greater role, and we're relying on that to help us meet our decarbonization goals. So, it will help us aggregate load so equipment can be flexible, and it can be virtually dispatched to respond to grid conditions, which achieve multiple goals. It helps us match demand and supply in a much smarter way. It will help us optimize energy usage on an hourly basis, on top of efficiency alone. And for sure, it's going to help us reduce carbon emissions both on the system side and also at the building location.

So, decarbonization for us is an overarching goal. It leaves the door open for different strategies

to be able to achieve carbon reductions. So, CEC is open to, again, ideas and recommendations on decarbonization solutions from all stakeholders here, and also joining us on the WebEx seminar today.

Okay. So, let me get into the framing points for the report. So, again, the AB 32 asked us to specify and focus on the residential and commercial building stock for the assessment.

So, for GHG emissions measurement CEC is relying on a lot of the data that's coming from our sister agency, the Air Resource Board's inventory datasets.

On the residential building side, the unit information that they also use is actually supplied by California's Department of Finance on data for residential housing. And in the recent estimate, just to give everyone here an idea, there's an estimate, the 2018 estimate is there's 14.1 million housing units statewide. Just to give you an idea of how wide the context here is on the residential building side.

Residential units are inclusive of single family units, multi-family units, and in addition include mobile homes, as well as long-term housing occupancies. For example, hotel and motel, for the hotel and motel segments. So, it's a wide sector that we are accounting for.

On the commercial building side, we are using the North American Industry Classification System, the NAICS data system. And we're using just their commercial building code. So, for those of you who are familiar with it, it's the ones that are inventoried under the 400 Code. And so, that's important to know because that doesn't account for a lot of the industry, heavy industry buildings. Those are in a different code and so those are not going to be part of this report.

I'm going to touch on the emissions baseline briefly, because we have a separate presentation on this. My colleague, Nick Janusch is going to walk us through this.

But again, this is another important framing point to the report. So, the proposed assessment is going to be using a tailored 1990 emissions baseline. That will estimate 40 percent of the building sector reductions by 2030.

The graph up here is just illustrative. Again, Nick will go through a more detailed analysis, we've already started with. But again, these are the two building segments that we will be assessing.

The graphic -- anyways, and Nick will -- well, I'll leave the rest to Nick because he'll go through the methodology and GHG emissions in detail, how we're

counting that.

So, the other -- another framing point is we're going to be doing emissions and modeling. Again, some of the earlier presentations were kind of touching on some of the data and information from the system side. And we are going to be keeping track of this. It's going to be -- and Nick will walk through this as well, but it will be different from the baseline.

But some of the considerations here for future years are going to vary under different energy scenarios. For example, CEC will utilize different emission models to estimate reductions at scale, will input for fuel substitution scenarios in the building sector, for both residential and commercial as segments, and also the building sector as a whole.

It will view the differences to the system emissions as fuel substitution impacts. You know, shift load away from some of the natural gas load over to the electric load in future years. And we're calling this the incremental electric increase.

And then, we'll also continue reporting on the hourly emission intensities from the system as a whole for the building, again just for the building sector as decarbonization at the building level is going to trigger upstream changes.

We'll also be reporting on impacts and strategies. Again, and this is going to be what a lot of folks look for in terms of, you know, proposed solutions. But a lot of this is taken straight from the bill, as well, the direction within AB 3232. So, we'll be utilizing first the baseline model to project different scenarios for building emission reductions. We're going to incorporate low shifting impacts for both residential and commercial sector to the extent possible.

So, some of the important -- some of those, we're trying to keep these very localized because some of the impacts are going to be very direct on different stakeholders. So, for building owners, for example.

We'll be doing analysis for different building types, new versus existing, to understand deep decarbonization barriers a little bit better.

As part of this analysis we'll consider appropriate cost effectiveness test across different building types and also how they impact building owners.

Ratepayers are also very important here. We'll be measuring potential cost impacts of building decarbonization strategies on ratepayers, natural gas and energy customers alike because fuel substitution between fuels is expected to bring a lot of future rate

changes, so we're going to try and estimate for that.

Another important group, the low income, the folks, residents of low income housing, and also residents who live in disadvantaged communities. So, low income housing tenants and residents are vulnerable to fast changes because they don't have the final say in changes to the actual building. So, that's why they're going to be very important to understand, even though they are utility customers.

So, the multi-family housing market is diverse in itself. For example, restricted rental housing is publicly subsidized and provides an easy outreach audience for us.

Private multi-family housing in DAC communities are totally different. They're managed by a different set of incentives. So, the market barriers and policy barriers that impact them are going to be much higher at the onset for clean energy programs, so we're going to try and jump into that and understand what those barriers are and the level of sensitivity there.

Another important segment that's come up recently, at least this year is the workforce segment. So, we're going to be studying possible risks to impacted workforce groups, in particular the natural gas pipeline workers that might be vulnerable as a result of

large shifts in fuel substitution.

We'll also be looking to understand grid reliability a lot better. So, CEC will estimate expected shifts to hourly loads under different decarbonization scenarios. This is the area where we'll consider the potential for load flexibility that's going to be very important here to help accommodate load growth and decarbonize demand.

CEC is going to be utilizing lots of different information, both with respect to emissions data and some decarbonization information and reports that have already been published in the last 18 months or so.

So, in general, we can bucket the information into either A, the emissions data or, B, studies on building decarbonization that already contain proposed policy or mitigation measures.

So, let me speak on the emissions data first. As you all know, we're relying heavily on the CARB emission data to -- with respect to fuel and GHG emissions by sector. So, we call that out in the scoping document that we docketed. And a lot of that, we're using the most current GHG emission data in there from the 2017 Emissions Data and Trends Report.

But we're also open if, again, stakeholders feel that we might be undercounting, or we're missing GHG

data that's out there in the world, by all means, again, we are open to consider additional data and see how they work together.

Under decarbonization studies, we're using -- there's been a lot of really good work on this and I want to give credit to all the folks out there who've done a lot of hard work, like I said in the last 18 months to publish reports under this topic.

One of the first important references for us was the 2018 IEPR that first published, you know, some of the work, some of the framing work for building decarbonization. So, I want to mention that. So, we're building off of some of the work that was done there and we're continuing it under this bill direction.

So, some of the stuff that we're going to consider under the policy framework for the report information is we're going to be looking at increased renewable energy supply, and we're also going to be accounting for doubling the energy efficiency under our SB 350 mandates. So, we've even been looking at, you know, support for natural carbon sequestration programs that have been found in some of the recent publications.

One other very important report that was out there that's, again, serving as an important reference point for us is the CEC E3 Pathways Report that was

published last year, and it developed different scenarios for carbon reductions, and it takes into account different mixes of energy efficiency, renewable power and building technology in order to meet building decarbonization reduction goals.

And for those folks -- in this presentation, I don't got the full list of all the studies, but in the scoping document that we docketed, we do got the list that we're using there. And so, again, for those who are interested there, I would reference you back to the scoping document.

Here's an overview of our schedule for activities for starting now and continuing through next year. So, starting with this workshop, we hope to have additional workshops from the first two quarters of next year on different issues. Some of the impacts and strategies that I mentioned in the previous slide are potential workshops that we gather more input from some of the stakeholders here.

We hope to, we're looking at drafting the report, the first assessment somewhere around the middle of next year, early, maybe the early part of the quarter next year. I might be being hopeful, but if we do that, we'll be on track to complete the report.

And then, we'll definitely have a workshop on

that draft report, again to be able to collect more comments and then report some of our findings, and discuss some of our strategies for reaching the decarbonization goals. And then, we hope to wrap up the assessment by the fourth quarter of next year.

So, this is going to be -- definitely it's going to be a public process through this whole project. We've got a docket dedicated just for this report now. So, for those who might not know it's open, this is the assignment number for the docket. It's 19-DECARB-01. That's the proceeding docket.

And here are the associated Listservs, so that way you can get email notifications on the docket. It's the Existing Buildings Listserv, the Climate Change Listserv, and the Natural Gas Listserv.

The public stakeholders are always welcome to submit comments on the docket, whether it's questions or ideas to the docket. Everyone has the ability to use the docket for those purposes.

For this workshop, though, we're closing the comment period, both on December 19th. So, it's possible we can extend that, depending on the amount of comments we get back. But for the comment period for this workshop, for us to be able to just -- both the baseline and the scoping document, we are proposing

closing it on December 19th. Keep that in mind. And if there's an extension, by all means reach out to us.

So, there's two staff lead right now on this work. Myself, my name's on the left right there, and that's my office number. And then, Nick Janusch is going to follow with his presentation right now, he's there on the right, his office number and his email.

So, we welcome, again, public input on the project. We're striving to keep everybody informed on progress of this report. Please visit, you know, please visit our proceeding webpage to find the docket. And, you know, again, it's a 15-day comment period which closes on the 19th and extensions are definitely possible.

We're interested in receiving any responses to any or all of the following scoping questions. I think we're going to post those scoping questions at the end. So, that is it for my overview on the scoping.

MS. BIRD: Yeah, so we can do some quick clarification questions, probably until about 11:05, you know, if we have those questions. At this point, we're just going to ask you to come up to the podium. And if there's multiple comments, you can kind of queue up in that aisle. But we'll keep this kind of brief. And then, after Nick's presentation and short comment

period, we'll have a more open and public comment period that will operate through the Public Adviser blue cards. Thanks.

MS. HIGGINS: I can do that. Cathy Higgins, Research Director, New Buildings Institute. Thank you, Mr. Rosales.

I'm just interested particularly around your description of optimizing decarbonization and the three bubbles you have, for two reasons. I'm wondering if you're going to be modeling the building location as an attribute of the building, in terms of its impact on decarbonizing, or if that's a merge later with your transportation section.

And on the same topic of transportation, I think you need to be more forward facing about technology interruption and the presence of EV charging versus just deep efficiency, because of the factor that buildings are now going to have this completely new technology that increases energy use that isn't a decrease of an existing technology. So, I wonder about the factors of the EV impact. Thank you.

MR. ROSALES: Yeah, real quickly on those two points. So, we've had discussions and I think we're planning to use some regional approach to understand the differences. Obviously, in California, not all

buildings across the state are built and designed the same.

So, we haven't gotten into that level of sensitivity and analysis yet, but we definitely got the discussion. I think we're probably preparing ourselves to understand what decarbonization means. Obviously, you know, coastal areas versus some of the inland areas. So, I would expect us to be -- to study that.

On the transportation EV charging you're correct, that's actually part of some of the language in the bill as well. So, to the extent that that's infrastructure inside the buildings, even connected to some of the commercial building meters, I think we're going to be taking a look at that for future years to understand, especially understand the load shift.

And then, as we also continue to track the system overall in context, I think we're going to definitely be looking at to see where shifting, not only energy loads, but also shifting emissions back onto the system and away from the buildings.

So, I don't know if that fully answers your question, but yeah.

COMMISSIONER MCALLISTER: So, I guess what I would encourage everyone to do is try to -- including staff, is to try to be precise about -- well, backing

up. You know, we don't have to have -- we don't have to solve all of these problems, you know, in the same time frame. So, I think, you know, it may be that a recommendation about how we do locational analysis may be a part of this initial -- you know, it's data intensive. There are some tools out there, there's some, you know, data requirements that we would need to do it in this building or maybe there are, you know, entities, third parties that can do it outside of this building.

But I think that's a key issue. And, you know, I guess the overarching issue really is the value of flexibility, what is it? And so, in order to really make solid recommendations, we're going to need to do that work. And so, what's the level of the recommendation? I don't know. It kind of depends on where we are today, and where we think we need to go, and what tools we need in the meantime. It's a really good question in terms of, you know, how we frame this particular study for the particular timeline that we have.

Any other clarifying questions about the scope that Heri has presented? Okay, so, I guess we'll go ahead with Nick. I think some of these boundary questions Nick might actually talk about as well, so

we'll see.

MR. ROSALES: Thank you.

COMMISSIONER MCALLISTER: Thanks, Heri.

MS. BIRD: Thanks Heri.

So, now, Nick Janusch is going to present the baseline recommendations.

MR. JANUSCH: All right, good morning Commissioner McAllister. Good morning everyone. Thank you all for being here, including those on WebEx.

My name is Nicholas Janusch. I'm in the Analysis Office. And today I'm going to present the full scope of the emissions we considered for the baseline, and our decision, as well as a discussion of each emission, why we chose them, and a discussion of what the cost curve is. And then, have some time for questions and answers.

And so, before I begin, I want to thank staff from ARB and CPUC in the development of this baseline recommendation. It was a very much iterative process and so, their feedback was very productive for me in doing this, in creating this document. And this document is online. It's more technical than my presentation, so please refer to it regarding the methodology for how we estimated these emissions.

So, to take a step back. So, the legislation

asks us to assess the potential to reduce GHG emissions in the state's residential and commercial building stock by at least 40 percent below 1990 levels by 2030. That's easier said than done. There is, when it comes to ARB inventory, it's not clean of here's residential, here's the commercial sector, including all the GHG emissions there. They're all kind of spread out in the categorizations.

So, here I have the categories of the emissions we considered. And as you can see, some are reported for residential and commercial buildings in the ARB inventory. And one of the complications with looking at the inventory, there are two. There is a 1990 to 2004 series and there is a 2000 to 2017 series, and they are not continuous. So, we had to make assumptions of going back from what we have today to establishing 1990 levels.

So, with this, it was a bit of a garden of forking paths, where it was a very contentious, difficult decision with our baseline recommendation. And for better or worse I've created three categories. I have core building emissions, and so fuel combustion and refrigerants. Another category of methane emissions, so looking at different levels of production, transmission distribution at the meter and then the

leakage behind the meter. And then, what to do with the electricity emissions.

So, on the very far right you see what we actually included in there. And to be clear, this baseline recommendation will likely evolve by the time of completion. And we know this for sure when it comes to current research being conducted right now. By early spring we should have more information about behind-the-meter leakage, leaks in commercial buildings.

So, with our decision, this is more of an illustrative view of the baseline, and here are the emissions that we are including. So, the blue is the fuel combustion emissions, orange is the refrigerants, and green is the behind-the-meter leaks, and the purple is the electricity emissions.

And what you're seeing here on the far left is the 1990 baseline, 2017 is the most recent reported emissions from ARB, and then the 2030 target. So, doing the math, the target for 2030 is 27.5 million metric tons of carbon dioxide emissions.

So, four observations to make here, looking at this figure is, one, that total emissions, at least what we're accounting for in the baseline have increased since 1990. And the other observation, the second one is that as was mentioned in earlier presentations that

HFCs, these refrigerant emissions have increased significantly since 1990. And looking at the 2030 target, I have it a bit ambiguous here but, really, when we're looking at the target is the suite, the aggregate amount of each of these categories must be below 27.5.

And this bottom box here, this is, as Heri mentioned, these incremental electric loads from fuel substitution activities.

COMMISSIONER MCALLISTER: Nick, just a quick question. So, on the 1990 baseline, I mean there were -- let's see, I guess there's no data about the refrigerants from 1990 or is there some fundamental change between then and now?

MR. JANUSCH: I will get into that.

COMMISSIONER MCALLISTER: Okay.

MR. JANUSCH: I did not report the number. But for 1990 the amount of emissions was .01 million metric tons, so it's very much negligible. It's almost zero for 1990.

COMMISSIONER MCALLISTER: Let's see, is that -- let's see, maybe I'm missing something here. But I mean there were lots of air conditioning units in 1990.

MR. JANUSCH: But those were CFCs.

COMMISSIONER MCALLISTER: Oh, right.

MR. JANUSCH: But this was based on --

COMMISSIONER MCALLISTER: Gotcha.

MR. JANUSCH: So, there's some accounting when it comes to ARB's inventory, CFCs are not included.

COMMISSIONER MCALLISTER: But you'll get into that.

MR. JANUSCH: Yeah.

COMMISSIONER MCALLISTER: Thanks.

MR. JANUSCH: All right. So, going back to kind of these categories of core buildings, the methane emissions and electricity emissions, it kind of gets to the good, the bad, the ugly when it comes to the decision process and the comfort that it was when making this final recommendation.

So, starting with the good, where there was no contention is fuel combustion. So, across the inventories it was continuous. And what's actually nice to see is that total emissions have decreased since 1990 levels. But according to our preliminary IEPR forecast, when we're looking at both the residential and commercial natural gas end us that we are forecasting, compared to 2017, an increase in consumption of natural gas. And that's mostly due to the commercial sector.

And looking at fuel combustion, so natural gas use, so about 90 percent of these total fuel combustion is due to natural gas, that this really is the target

emissions that we're trying to reduce for AB 3232. They're going to be the core focus when looking at activities.

So, still on the, I guess, good side, so we are including refrigerants and other high global warming potential gases, but there is a bit of some hand waving here, since ARB does not account for ozone depleting substances. And those are CFCs, since the Montreal Protocol banned them.

And because of that we have -- they included ODF substitutes. And so, because of including those two, we have basically negligible value of emissions at 1990 levels.

And another thing that was complex was in the 1990 through 2004 series, the emissions were not called out for the specific sectors, so we had to estimate for those sectors.

And as was really highlighted earlier, that with our friends from CPUC and ARB is that the HFCs emissions are forecasted to increase substantially. This is really, almost a penalty doing fuel substitution efforts, but we need to account for them. And this is going to really be a driving, be a focus of our analysis as well.

And to look at what's happening here on the

right, so this is from ARB's latest report looking at trends in emissions. So, here in the red that's what's actually included in the GHG inventory. And the yellow are those CFCs that were banned from the Montreal Protocol, that are not included in the inventory. So, total emissions have decreased, but it's really the red that's increasing there.

So, getting to the, I guess on the bad side, so methane emissions. And the issue here is the data availability. And as you saw on my original slide with the table, that ARB does not report specifically for buildings for production leakage, transmission distribution and at the meter. It's only for, and it's only recently that for residential buildings it's the behind-the-meter leaks are the ones that are being reported.

And here, and I forgot to mention, so with the HFCs there's already ongoing work, legislation. SB 1383 is handling HFC emissions. And then, on the production side looking at this upstream, natural gas leaks there's SB 1371 that was touched on. And so, that's being managed on that side.

So, there is contention here of whether we should exclude these emissions or whether we should have some non-zero attribution, but we feel comfortable

leaving those out. And if you go further upstream and really focus on the building sector.

But, obviously, staff is open to updating the baseline and we'll want some consultation from our sister agencies as well. And if we're going to change the baseline recommendation, we'll discuss it at a staff workshop. But when you're providing us comments and feedback from this presentation, and my document, and this workshop please provide like a very data-driven, you know, construction recommendation of why we should include a certain emission.

This gets to what I kind of characterize as the ugly. This was a very complex and contentious issue. I know staff have been on both sides of this, but how to handle electricity emissions. And I would summarize, this is me summarizing, how this issue kind of came up is first of all it was a question of how do we handling electricity loads from fuel substituting activities? So, should they be included?

Two is the, all right, what's going to be the impact of SB 100 and how that's going to affect the study and the feasibility of attaining the 2030 target.

And then the last part is, so if we are, you know, maybe limiting the amount of electricity emissions how do we capture those deep decarbonization efforts in

looking at demand flexibility and other demand side management strategies to make sure they're captured, and being assessed, and included in the study.

So, let me walk you through. Well, that didn't come up the way I wanted it to. So, looking at the first, so obviously we want to include electricity emissions in our assessment, and that's because we don't want these emissions to shift to some other sector and not be accounted for. So, we are looking at these incremental emissions from the increased electrical loads from fuel substitution activities.

My colleague, Mike Jaske, spoke at the workshop this Monday, December 2nd, to discuss the tool where we're going to be looking at these incremental electric loads.

So, the next point is looking at this SB 100 issue and seeing, all right, what is going to be the impact of the cleaning of the grid? And with our own analysis we found that -- you know, with the assumption of a cleaner grid, more aggressive RPS that there will be probably less abatement needed at the building sector, the buildings themselves. And that they might be relying on just getting to the target on efforts going on in different sectors. So, we feel comfortable leaving electricity emissions out of the 1990 value.

And then lastly, looking at the abatement cost analysis. And so, if we are just looking at the incremental electricity emissions then that's leaving out, you know, the potential of just doing traditional energy efficiency at those homes that are not participating in fuel substitution activities. We are going to, with our abatement cost analysis capture those. So, we're going to be looking at the holistic approach of the full potential of GHG reductions from the building sector. And I'll get more into that later.

All right. So, this is a graphical view of if we were to include electricity emissions in the 1990 baseline, so that's the purple. And one thing to note, compared to that original simplified figure I showed earlier is that when we include these emissions in 1990 that we are below the 1990 level. Unlike if we had our more aggressive -- our aggressive recommendation we are above.

And with our own analysis, looking at our IEPR forecast and the GHG intensities there that we saw that just within -- so, here's the gap to get to what will be the target if we use electricity emissions in 1990, it's 28.5, and that there will be a 17 -- roughly, a 17 million metric tons reduction just by SB 100's efforts. And so, with that there will be just this gap of about

11 million metric tons remaining.

Therefore, we feel comfortable recommending that, you know, it's a bigger target and a bigger pie to chew and we want to focus on the building sector level and not get into the nuances that's happening at the electric generation sector.

And so, comparatively, here is the baseline, here's the complete time series looking at the emissions that we're including in the baseline. And as I mentioned before, we're above the 1990 levels. And so, this is the amount of emissions that we want to achieve to reach the 27.5 target.

And note that, well, it might be a bit confusing, when we're looking at the suite, the stack of emissions that we will be including those incremental electricity loads that we have modeled due to fuel substitution activities.

COMMISSIONER MCALLISTER: So, Nick, just a quick question on that. So, those incremental loads, the carbon content of those additional loads that wouldn't have otherwise been there without fuel substitution, those are tracking over time where we would expect to be in whatever respective year?

MR. JANUSCH: Yes.

COMMISSIONER MCALLISTER: So, the carbon content

of a substituted unit of electricity would be sort of compliantly low in 2030?

MR. JANUSCH: Yes, yes.

COMMISSIONER MCALLISTER: Okay, thanks.

MR. JANUSCH: Yeah. All right, so here is the graph again showing here's the aggressive target and that there is, compared to 2017, a need to reduce emissions by 25.7 million metric tons. And as was highlighted by earlier presentations that we have that one we just discussed, these incremental electricity loads, the purple. So, fuel substitution that's going to increase.

And then, this other issue of with more heat pumps out there, and more refrigerants, and HFCs that that's also going to be a penalty. So, it's going to be looking at this holistic effort of reducing those penalty emissions and trying to reduce those to achieve the 27 point -- to reduce emissions to achieve the 2030 target.

So, kind of getting back to this margin abatement cost curve, and with this recommendation we're not -- since we're not including 1990 electricity emissions, we're not capturing all the emissions of activities and trying to -- for the AB 3232 baseline assessment. But with the marginal abatement cost curve

it maps out the incremental cost of reducing each emission and the cumulative effect of all these activities.

So, with this, and I'm excited, when this report is actually finalized we will have different scopes of abatement cost curves. Where one is just looking at more of a nuanced look at just looking at the baseline, the activities to reduce those emissions. And also, we hope to in theory look at more of a locational aspect, and with the location we'll look at forecast zone. And with that, we're going to build out from that saying, okay, this is going to be the cost of reducing this amount of emissions. And then, bring out, okay, look at the entire source energy, the building sector itself. So, that's where we'll actually look at these deep decarbonization efforts of flexible loads, demand side management measures, and seeing how much they can contribute in reducing emissions.

And then, with that build up in further scope seeing how this analysis, how do the building sectors fit within this policy framework of reducing emissions compared to other sectors to see what is the value added of doing AB 3232 fuel substitution and deep decarbonization into reducing emissions. So, with that it will give us like, all right, we can see how much it

will cost for reducing emissions up to 40 percent, but also likely how much it will cost if you want to reduce it even further or less than that. It's going to give us a better policy framework on understanding what is the full scope of reducing these emissions.

So, to conclude, as I mentioned this baseline selection was very difficult and complex. I was on both sides of the issue when it came to electricity emissions. I'm fairly comfortable where we stand now.

To reiterate, we are flexible with how we are dealing with the baseline, so we're open to recommendations and with consultation with ARB and CPUC on making a revision. And we would like to -- if we make a revision, we'll discuss it at a future staff workshop.

And to summarize, it seems counterintuitive what we are recommending, since we are not including electricity emissions, but it does focus at the building level what is the value added of doing these efforts at the buildings, and to achieve the goals.

And again, to reiterate, that the story is looking at what's happening with refrigerants and these other high global warming potential gases, and the specific need for, you know, reducing those emissions.

And with that, so this was Heri's slide, and I'm

open for questions.

COMMISSIONER MCALLISTER: All right, thanks a lot Nick. So, certainly want to hear what everybody wants to say. I've also been on both sides of this. Early on I was on, oh, we ought to include it all. And then, I think over time, you know, I think we collectively realized, most of us kind of ended up agreeing that the -- it's wise to kind of draw the boundary around this analysis to include things that building -- that decisions around buildings can actually impact, which is not the whole electric grid outside of the building, beyond the meter.

And also, we have great policy that's aiming us in the right direction there. So, if we're really focusing on emissions at the building level, I think we ended up with a pretty pragmatic proposal here.

But, certainly, want to hear what everybody wants to say about that. And I don't have any further questions so maybe, Heather, we can move on to questions from other folks.

MS. BIRD: All right. So, anybody who wants to ask questions specific to Nick's presentation, please step up to the podium. And we'll see how it goes, but we could go until probably about 11:30. And then, before we do kind of the open forum.

MR. DELFORGE: Pierre Delforge, NRDC. Thank you for this presentation and great work.

I've got two questions and I'll have some more comments later on. The first one is on refrigerant emissions. So, my understanding is that the majority or large part of refrigerant emissions are from refrigeration and commercial refrigeration in particular. And the question is, is that in scope of -- did you include that in scope of AB 3232? Well, you know, fuel substitution does no impact on these emissions. So, are you planning to include policies that will address this large part of emissions or mostly focus on policies that will address HVAC emissions -- HFC emissions, which can be impacted by fuel substitution?

MR. JANUSCH: I believe so. So, yeah, looking at the broad, at the HFC emissions and looking at strategies to reduce those. So, whatever is in that baseline of that full category of emissions and trying to reduce those.

Did I answer your question?

MR. DELFORGE: Okay, so thank you for the clarification, but we'll comment on that.

COMMISSIONER MCALLISTER: Just trying to get

everything on the microphone, just so people can hear.

MS. WATERS: Just to clarify, this is Dana with CARB, the current proposal does include HFC emissions from both refrigeration systems and AC used in both residential and commercial buildings.

MR. DELFORGE: Great, thank you.

My second question is around the policy assessment of the cost curve, the marginal cost curve that you just showed, just the previous slide, which I think is a great way to show the options and the cost of the options that we have.

I was wondering if you're also planning to include an analysis of the scale and the timing of the policies that are needed? For example, you know, in terms of incentives to get the market to, you know, to get to market transformation. Do we need the CSI, like California Solar Initiative-like program to, you know, ramp up the market share? How much, when does it need to start to be able to meet these goals? I think that's going to be important to report to the Legislature saying, you know, these are the types of policies that we need to be able to affect this market. So, it probably goes beyond just the cost curve but, you know, recommendation in terms of timing and scale of the different policy levels that we have.

So, the question is, is that part of the scope?

MR. JANUSCH: So, the abatement cost curves are under development, obviously. And we're going to rely on CARB's AB 32 scoping memo. And as for the timing, the first best will be based on that scoping memo, which just looks at, you know, from 2020 to 2030 what is the average cost of reducing these emissions.

But the next stage, if we have the time, we will take a look at the timing because it is an intertemporal problem, yeah. We'll take a look, yeah.

MR. DELFORGE: Great, thank you.

COMMISSIONER MCALLISTER: I mean I would just say that our process is kind of -- I mean one of the real upsides of having a public process here is that advocates can sort of make the case for that and say, hey, here's -- you know, and different people can sharpen their pencils and come up with numbers of like, okay, Legislature, you know, how much would it take over what period of time.

I mean, at the end of the say SB 1 CSI funding was a political process and it freed up significant funds for market transformation that worked. And so, I think certainly, actually, we might even say that in the Efficiency Action Plan that those are the kinds of approaches that we need to transform the various

marketplaces for buildings and elsewhere. But, certainly, that's on the table for discussion.

I don't know that -- you know, we would take our cues from the Governor's office, obviously, and kind of figure out how to frame that conversation and come up with recommendations that had some support. So, it really does depend on the conversation.

MS. BROOK: This is Martha from staff at the Commission. I just wanted to chime in that I think we'll cover this more when we do our first technical workshop for 3232. But, certainly, our planned analysis includes a yearly, an annual, cumulative approach by climate zone. So, we are thinking about penetrations over time and by technology, and end use, and building sector. So, I think that will -- if we keep talking to you guys, we'll be able to address what your concerns are.

MR. DELFORGE: Thank you.

COMMISSIONER MCALLISTER: Thank you.

MS. HIGGINS: Cathy Higgins, New Buildings Institute. I want to say that I didn't have this on my radar before I came, but from what you've introduced in this short period of time, I just want to echo my support for your decision to keep the 1990 baseline free of electricity emissions because of the reason that

occurs to me, which I'm sure you've considered, that in light of the EPIC work and the trend in the market for manufacturers and private sector developers, they're going to see that as a very good signal for the continuation of their efforts, compared to if you had changed the baseline to make the delta less. So, I just wanted to say I noticed that in working towards technology improvements.

And then, in that regard you mentioned that the buildings are going to be looked at in terms of this emissions abatement model, the cost of emissions abatement, and then looking at what the building sector, singularly in a way can do about their emissions.

But our industry is struggling with how to value efficiency in a zero-carbon grid. And so, I'm wondering if in the end of your modeling, and the work by Mr. Rosales, also, on the model and this work, if you're going to keep that isolated or you're going to be looking at the tradeoffs of investments in generation versus buildings that could lead to abandoned building efficiency?

MR. JANUSCH: Yeah, the hope is to keep them isolated, see these independent activities and what is the cost. So, you see, you know, we rank them. We see what the lowest hanging fruit is and seeing, perhaps,

you know, energy efficiency, at least the -- I didn't describe it, but this McKinsey curve shows energy efficiency having a negative cost. And so, it's like one of those things of a policy framework that's something to aim for. It's what I hope to have as an outcome here is to see what is the density, the amount of, you know, reduction we can get from folks on that.

COMMISSIONER MCALLISTER: Yeah, I mean this McKinsey curve, you know, it was great in its time and it's still instructive, but it's ten years old and a lot has changed in those ten years. So, we would anticipate that that -- in the California context, that will have changed a lot. So, we're going to come up with a California specific kind of approach.

MR. JANUSCH: Uh-hum.

COMMISSIONER MCALLISTER: And, yeah, the valuation of grid flexibility is kind of the problem that we confront. And so, I think we may not solve that whole problem here. I mean I think there's a forecasting question. There's a lot of research that we're sponsoring and will continue to sponsor on that. But, you know, the shape, shed, shift, shimmy demand flexibility discussion has to continue to inform this work as well.

Any other clarifying comments or questions for

Nick? Anybody on the -- okay. All right, so should we open it up?

MS. BIRD: Okay. So, as I mentioned before, so I do have two blue cards and feel free to -- you know, if you want to comment or ask questions to see the Public Advocate, back here in the corner, against the window.

COMMISSIONER MCALLISTER: Yeah, so, Heather, actually just -- so, I don't want to over formalize this, but I thought it would be a good idea to get blue cards just because I thought a number of people would want to speak, not knowing how many. But, you know, if there needs to be some back and forth I think that's fine. So, you know, however it works best to get everybody's feedback. Don't feel intimidated from, you know, coming up to the podium.

MS. BIRD: Okay. Thank you, Commissioner.

Yeah, for those on WebEx use the hand raise function and then we'll unmute you when we get to you in the sequence of things.

So, please, reiterate to keep your comments to three minutes so everybody has a chance, and we have a chance to respond. Anybody who doesn't have a chance to speak, we can -- we highly encourage you, whether you speak or not, to submit your comments, questions to the

docket before 5:00 p.m. on December 19th.

And to kind of help stimulate the conversation, we're going to put the scoping questions up. You can find them in the back of the scoping document. There are a total of eight, so we'll put the first four up. We can kind of go through them.

But I think what I'd like to do is I have two blue cards and I'd like to hear those comments first, and then see how it goes. If we keep getting blue cards, we'll go that way. If we don't, we'll go through these questions and hopefully stimulate some conversation there.

So, our first commenter is Tim Carmichael from SoCalGas. So, come up.

MS. MORENO: Good morning, can you hear me? Good morning, my name's Edith Moreno and I work for Southern California Gas Company. I want to thank you for the opportunity to provide comments on this morning's workshop. I just want to say that SoCalGas does appreciate the state's attempts to address climate change concerns. We want to continue to be a key partner in helping the state lead the way to dramatic reductions in greenhouse gases.

SoCalGas believes that a portfolio approach, utilizing all energy sources and technologies to meet

our climate goals will best serve Californians.

And with that, I want to highlight some of the remarks that were made by the CPUC's Energy Division staff this morning. It was mentioned that electrification is not the only means of achieving decarbonization. We need to fight building decarbonization on all fronts. And decarbonization is also about decarbonizing the gas supply.

I also want to echo some of the remarks that were made by a panelist of energy experts that were convened at two workshops. The first one is the CEC's -- the first one is CARB's August workshop on carbon neutrality. And the second workshop was the CEC's IEPR workshop on Near-Zero Carbon Electricity.

All panelists generally concluded that a portfolio approach is the best approach that is required to meet our climate goals.

And with that in mind, I want -- SoCalGas asks that the CEC and other state agencies not conflate decarbonization with electrification. Renewable gas, whether it's biomethane, hydrogen, or synthetic gas must be part of the solution to not only decarbonize our buildings, but also to make buildings more resilient in light of the increased frequency of climate driven events, such as wildfires, via the use of fuel cells and

other distributed generation technologies.

Thank you.

COMMISSIONER MCALLISTER: Thanks for your comment. We have one more blue card?

MR. ROSALES: I just wanted to make a quick comment.

COMMISSIONER MCALLISTER: Do we have one more blue card?

MS. BIRD: Oh, we have three more.

COMMISSIONER MCALLISTER: Oh, three more. Let's just keep going with that.

MR. ROSALES: Okay.

MS. BIRD: Okay, fine. Thanks. So, next up is Pierre Delforge with NRDC.

MR. DELFORGE: Pierre Delforge, NRDC again. Shifting to comments. First, I wanted to say that we really appreciate the agencies working together to put together this working group and this effort, which is very comprehensive and I think commensurate with the scale of the challenge that we have.

We are nearing the end of the decade and already getting ready for the next one. And we all know, given what's happening with climate change, the IPC report last year, and all the new reports, that the next decade is going to be critical to slow down and mitigate the

worst impacts of climate change. And fixing our buildings is going to be critical for doing that, both for 2030 and also going to carbon neutrality. So, this is really timely and relevant, and we need to get it right. So, really appreciate the Commission's and the agencies' efforts.

In terms of, you know, I want to touch a few key points that we'll flesh out in our comments. The first one is around the baseline and freezing direct emissions. And we also agree, and we also in both places we, you know, discussed early on, but we do agree that it makes sense. The intent of the bill, AB 3232, is to decarbonize buildings. The bill says at least 40 percent by 2030. It doesn't say only 40 percent by 2030. So, I think we need to look at the long term, the 2045 timeline, carbon neutrality, and make sure that the plan that we identify and the feasibility we set is how to achieve that long term trajectory with 2030 as an intermediate milestone.

And the approach that has been taken with direct emissions is aligned with our long term trajectory, so I think it's really appropriate and, you know, aligned with the legislation.

The second point is around upstream emissions. So, I noted the proposal does not include upstream

emissions. So, we're talking about upstream fugitive methane emissions of natural gas that's delivered to buildings. And it didn't even discuss accounting for out-of-state emissions. California imports 90 percent of the gas we use and it's pretty clear that if we don't use gas in our buildings, we're not going to have as much upstream emissions from, you know, from producing, and processing, and distributing that gas. So, I think we should account for it. If we don't, we're underestimating the benefits of decarbonizing buildings.

And if we do that in multiple places we end up having, you know, a valuable position or a benefit that's, you know, clearly underestimated and not making the right policy decisions.

The Legislature, last year passed a bill, AB 2195, by Assemblymember Chau, that required CARB to assess out-of-state upstream emissions from methane. That clearly indicates that the Legislature agrees this is an issue. We already do it in the electricity sector, we account for out-of-state electricity emissions. And I think we need to have a level playing field and a fair process, and account for the same emissions, the same impacts from out-of-state gas production when we look at the California policies.

COMMISSIONER MCALLISTER: So, I'd like to get

other people's view on that, too, just to jump in real quick. We don't have your time up, so maybe we can put the clock up.

But I think the thinking, and staff can confirm this, was that, you know, if we reduce carbon emissions, you know, or carbon combustion, you know, carbon dioxide emissions from one building by making gas use more efficient, or substituting, that doesn't necessarily actually reduce emissions at all out on the grid.

And so, the question is where do you do the attribution of the actual emissions that we have and is it appropriate to do it at the building level. So, it's not that, you know, nobody's saying that those emissions aren't happening or that they don't need to be accounted for, but the question is whether we attribute them to the building and the efforts inside the building.

And so, we only reduce, at least the distribution grid we only reduce emissions if we don't use it at all, right. But if we only do haphazard building by building, then we don't really reduce the grid side of the meter emissions, right.

But that's a conversation we need to have and get to a robust place.

MR. DELFORGE: No, I appreciate the comment at this point. And I know it's not 100 percent

attribution, but there's more than zero. I mean we know emissions are linked to some extent to the volume produced and distributed to some extent. So, the question is, you know, what is a reasonable assumption for attribution. So, we can have that conversation, but I just wanted to mention it here.

And if I may just finish my comments, pretty quickly here. The last point I wanted to highlight is around assumptions for not including energy efficiency and load shifting in the baseline. I think it's unfortunate because, you know, trying to drive a worst case scenario is not going to inform the decisions we need to make to get to what -- you know, it's going to inform decisions to get to what we're trying to avoid, rather than what we want.

You know, I agree we shouldn't model best case, either, because that's not necessarily realistic, or sometimes we achieve or exceed best case. But at least we should try to model, assume, you know, a most likely scenario that we think we can achieve. Because that's going to drive us to make a decision that we want to, you know, to achieve rather than those we want to avoid.

MS. BROOK: Martha Brook. I'm confused. So, I don't know -- what assumptions are you talking about?

MR. DELFORGE: So, you presented -- maybe I

misunderstood the assumptions. But what I understood from the assumptions presented was that there was no -- we assume the electrification does not include any energy efficiency and any load shifting.

MS. BROOK: Are you talking -- okay, so, you're talking about my presentation when I was talking about the --

MR. DELFORGE: That's right.

MS. BROOK: -- assumptions in order to get the emission intensities.

MR. DELFORGE: That's.

MS. BROOK: So, absolutely, that's like a current version. It's like one, you know, step towards where we want to be. And with the idea of we know there's going to be increased demand for space and water heating if we choose to electrify as a major strategy of decarbonization.

Let's give the production cost model a demand profile that is at somewhere close to that future, so that we can understand how a highly renewable grid reacts to that increase in demand.

Absolutely, when we do our 3232 analysis and we say, okay, now here's all the strategies we've found, including as much, you know, cost effective efficiency and load shifting as possible we can do another version

of that. Throw it into a production cost model, get another version. So, it's iterative.

MR. DELFORGE: Okay. All right. Okay, thank you for clarifying. I was worried that it would just be used as the, you know, estimating assumptions.

MS. BROOK: No. And the question I have, this is Martha again, is I don't know, this is where I get really -- I just go into the wormhole of the production cost modeling framework. I have no idea like how much does it matter if you're changing demand? Is it, do you have to change a lot every hour to get a change in that marginal emission intensity or not? That's where I don't, I really don't know. But we'll go through it, we'll do some iterations and we'll see.

COMMISSIONER MCALLISTER: The baseline definition, actually enabled -- I mean, I would see it as the flip side, and maybe I'm confused, because it definitely is -- it's a little bit of a mind bender. But establishing the baseline as defined actually allows us to appreciate and quantify demand flexibility as a decarbonization strategy explicitly, right.

So, I think actually the way it's defined gives us more tools, not less. But anyway, I'm -- you know, we have to talk about this.

MR. DELFORGE: If it's just the baseline and not

the estimating process, yes. I wasn't clear about this. Thank you.

MS. BIRD: Okay, thank you.

So, next comment is from Lauren Cullum, Policy Advocate from the Sierra Club California.

And apologies, we don't have the clock. We're not sure how to use it.

COMMISSIONER MCALLISTER: Oh, no worries. It's like technical problems and it doesn't bode well for decarbonization, but it's okay. So, just try to keep concise is all.

MS. CULLUM: Will do. Thank you for the opportunity to comment. I'm Lauren Cullum with Sierra Club California, representing 13 local chapters in California and half a million members and supporters across the state.

Sierra Club supports the Energy Commission's baseline approach. We believe this method will lead to greater emission reductions in our building sector, which is a necessary and urgent need.

We also believe by focusing on on-site direct emissions is in line with the state's goal to achieve carbon neutrality by 2045, and it will also encourage the type of aggressive action we need in light of our climate crisis, and the speed at which we need to work

in order to reduce emissions from the building sector.

Any other approach or including the electricity emissions would either be -- would allow us to almost continue on a business as usual path and would hinder our ability to reach reduction targets that we need to reach by 2045. And it will also delay our efforts to electrify our homes and buildings.

That being said, we also have -- we have some concerns about not including the upstream methane emissions from natural gas infrastructure leaks, as we think that this is an issue that needs to be taken into consideration and addressed. But we'll provide more detailed recommendations and comments on this in the docket.

Thank you again for your leadership and attention to this important topic.

COMMISSIONER MCALLISTER: Thank you.

MS. BIRD: Okay, thanks Lauren.

So, next up we have Farhad Farahmand from TRC.

MR. FARAHMAND: Hi, this is Farhad Farahmand with TRC. Thank you very much.

So, I do a lot of work REACH work with local jurisdictions in the Bay Area, predominantly right now, focusing both on building electrification and electric vehicles.

Electric vehicles represents one of the largest new loads that our buildings are going to see. One of the REACH code elements that we've integrated is having the same access to electric vehicle charging infrastructure in multi-family buildings, as single family buildings currently have, which is one per dwelling unit.

Now, if you use that framework and extend it to what the current building standards require, which is that there's adequate panel capacity and transformer capacity allowed or, you know, accommodated for that leads to astronomical costs if you're trying to have all multi-family dwelling units have electric vehicle capacity.

So, what we have been stressing in our REACH codes is that there is load management built in and aligned with Part 11 standards. Because otherwise, we're going to see much higher costs in multi-family buildings.

And that's it.

COMMISSIONER MCALLISTER: Thanks very much.

MS. BIRD: Thanks, Farhad.

So, we don't have any further blue cards at the moment, so I've asked Heri to start going through these scoping questions one by one and see if that stimulates

some conversation. And there's another set of four questions after this. So, we'll go through those and we'll see where the conversation goes.

MR. ROSALES: Hi, this is Heri from CEC, again. We had listed eight questions in the scoping document that we had posted, so I'm going to run through them right now.

These questions we had formulated to help inform us and hear public comments and public ideas on these issues, but by no means are these prescriptive and by no means are you limited to providing information on anything beyond this.

But let me go through them real brief. So, question one, AB 3232 calls for a building decarbonization assessment through 2030. Should CEC staff also include a review of feasibility for California's 2045 zero-carbon goals?

Question two. Is the proposed baseline recommendation the best approach for the assessment? Why or why not?

Question three. Staff has identified sectors and topics that will be assessed for impacts, challenges and opportunities. Do you think this list is appropriate? What additional sectors or topics should be added to the scope of the assessment?

And question four. Building costs from substituting end-use appliances include direct and indirect costs. One example of indirect costs are fuel infrastructure costs, such as gas piping to and within buildings, and electric distribution systems. Which indirect costs should be included in this assessment and what are sources for this information?

I'm going to pause quick, if anyone wants to comment on any of those, the first set.

Anything on WebEx, Daniel? Nope.

Okay, I'm going to continue through the -- there we go. And continuing, question five, the total cost to reduce or eliminate emissions from energy usage are uncertain. However, reducing or eliminating emissions will have cost impacts at the individual and social level. Which cost effectiveness test should be included in this assessment?

Question six. What additional data analysis or study should be reviewed as part of this assessment? Please specify sources and include links or electronic copies, if possible. Also, include a brief rationale on the relevant to the building decarbonization assessment.

Question seven. What strategies or actions should be analyzed as options for reducing GHG emissions in the building sector?

And last, CEC is planning to hold workshops on the building decarbonization assessment in Q2 of 2020. Are there specific topics that you would like to have discussed at a workshop?

And those are the questions we included. So, again, definitely interested in hearing feedback on those. Thank you.

MS. BIRD: Okay, so I'm not hearing any questions. And so, Commissioner, would you like to make any closing remarks?

COMMISSIONER MCALLISTER: Yeah, I guess I would just certainly encourage people to participate. You know, I see some normally talkative people in the room and I wish they would get up to the podium, but I'm not looking at anybody in particular.

So, but I guess the point, really, of opening this public conversation is to create stakeholder engagement. You know, the solutions are -- so, we have great analysts. We have access to data. We have wonderful collaborations across our agencies. And so, that's a great, you know, set of tools that we have right here, cards that we have in our deck, you know, at the Commission.

But our deck is not big enough to solve this problem. It really has to -- the full suite of

solutions has to emerge from the broader marketplace, from stakeholders, from knowledgeable people in this sector, you know, the leaders of which are in this room and on the call, and beyond that.

And so, just cultivating that stakeholder, I think, engagement, levels of trust. You know, we are listening. You know, people make a good case for what they want to happen, we're going to listen.

And there are some tough questions. I certainly want to -- I'll highlight that one of the questions was about sort of nearish term versus longer term trajectories. And so, the issue of lock in. When we make near term investments to reduce carbon emissions what does that mean for the longer term goals, you know, to 2045 and beyond. We really want to understand the differences between various trajectories and investments that we might encourage with policy.

And, you know, to the extent that we, I think, need a broader, a more complete view of the carbon content, not only of electricity but of natural gas, that's something that I think that knowledge base needs to grow, but in a credible way. You know, like what is the future mix of the gas system?

You know, certainly, we want to acknowledge SoCalGas's presence and comment. You know, I think the

molecular accounting that we have to do going forward to 2045 can be pretty brutal. And so, you know, it's that light of day is something we have to just apply.

So, you know, we need scenarios that bring to life the possibilities that people believe are out there.

So, December 19th is the deadline. You know, this is going to be an ongoing conversation, so please submit your best thoughts when you have them. You know, if it's December 20th and you're taking a shower in the morning, and you have a brilliant idea, we want to hear it.

But this conversation is going to happen over the next six, eight months, and then at a draft and then the finalization of the report. And we want those recommendations to be, you know, fully fleshed out and something that's actionable. You know, they can go out into the world and actually have an impact. So, going to depend on all of you and the conversation going forward to make that happen.

So, those are my comments. I want to thank, again, the Efficiency Division staff and MEAD, as well, for all the contributions to this, and our agency counterparts who presented. So, thank you very much.

MS. BIRD: Great. Thank you, Commissioner.

So, yeah, I want to say thanks for coming out in the rain and thanks for your questions and comments. We'd love to hear from you. Please submit your comments to the docket, 19-DECARB-01. And the comments are due by 5:00 p.m., on December 19th.

I'd like to thank our partner agencies for being here and presenting.

And if you want to follow this proceeding, please sign up for one of these three Listservs. Climate change, natural gas, or existing bills, or all three if you're interested in all those topics.

And I just want to say thank you.

(Thereupon, the Workshop was adjourned at 11:52 a.m.)

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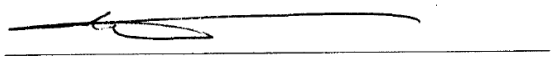

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