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CALIFORNIA ENERGY COMMISSION

TRANSCRIPTION OF RECORDED STAFF WORKSHOP

JULY 11, 2018

SACRAMENTO, CALIFORNIA

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ALEX GALDAMEZ, Mechanical Engineer, CEC
TRINITY PERSFAL, Twin City Fan & Blower
JEFF KLEISS, Lochinvar
MICHAEL IVANOVICH, AMCA International
JOANNA MAUER, Appliance Standards Awareness Project
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TRANSCRIBED RECORDED STAFF WORKSHOP

July 11, 2018

MS. MOHNEY: Good morning. Welcome to the Commercial Industrial Fan and Blowers Workshop.

I have a few housekeeping items to go over before we get started. My name's Leah Mohney. I'm the supervisor of the mechanical appliances unit. And we are working on this rulemaking.

There are bathrooms outside the doors to the right, and more to the left, underneath the stairs. There's also a drinking fountain to the right. Up on the second floor under the canopy there are vending machines. We do not have a snack bar or anything like that; vending machines is it.

We have provided some maps outside for lunch. I anticipate that this will probably go at least that long, so there are a number of places that you can go for lunch that are nearby.

If you notice on the desks, as in front of Shawn, these are microphones. So when we get to the public discussion part, if somebody would just push the button, so that the light is green, the people at the table will be heard. I have this microphone; I'll bring it around if we need additional mic'd conversation.

A business meeting is going on right now, and there

is an item that I know several people have expressed an interest in. We will be taking a break probably around 10:20 to go across the atrium to the business meeting, so people can participate that. I imagine probably a fifteen- to twenty-minute break so that people can participate, and then we will resume the workshop.

In the event of an emergency, please file out the doors. You can either leave the exit through the entrance doors, which you came, or there are doors to the right, follow the staff out. There's a park cattycorner; we will assemble in the park. This is during an emergency. Just follow staff and we'll reassemble over there. I believe those are all of our emergency messages.

Again, if you are making a comment, please make sure you introduce yourselves and identify the company or organization that you are representing, and we will remind you about this. We do have a number of presentations, so bear with us. Hopefully we can plan the break so that it's not in the middle of somebody's presentation, but we'll keep our fingers crossed on that one.

With that, I would like to introduce Alex Galdamez. He is our mechanical engineer that's working on the commercial industrial fans and blowers rulemaking.

MR. GALDAMEZ: Well, hello. My name is Alejandro Galdamez. I go by Alex, just because a lot of people don't know how to pronounce the J, you know; kind of embarrassing sometimes.

Welcome to the Commercial and Industrial Fans and Blowers Workshop. We're going to be discussing the draft staff report at this awesome meeting now, maybe, yeah? Okay. All right. So let's get started. Oh, that's not moving. Okay. Here we go.

So today we are going to be discussing the following: the rulemaking process, the background, the staff proposal, the technical feasibility, the methodology that we use to calculate the savings, at least the bigger picture of it, the cost-effectiveness of the proposed regulation, the energy savings that the proposed regulation will have statewide, then I'm going to close with the conclusion of what we came up for the staff report.

After that, we are going to move on to the scheduled presentations, the presentations I received yesterday.

And after that, we're going to go to the public and discussion section of the meeting; short and sweet.

So where are we? We are right here at the meeting; the red arrow points to that; the public workshop to discuss the draft staff analysis.

The comment period will end on July 31st at 5 p.m., but we have received some extensions needed, so we're going to review that and then probably will go for further than that. I mean, they won't end at the 31st.

So let's start with background. So background, the U.S. Department of Energy started a process to regulate commercial and industrial fans back in the day when I was young and not -- no, sorry. Back when they issued three notices of data availability, and used data provided by manufacturers for its analysis. They've also used, I guess, embedded fans to analyze the shipments of such. We use the same analysis to come up with a color point in numbers for this regulation.

So we are proposing to focus on standalone fans, as well as embedded fans in nonregulated equipment. On the left we have an example of a standalone fan. That's an actual inline fan. And on the right, we have an example of axial panel fans that are embedded in the nonregulated unit.

The staff proposal can be found in the docket. This is the website, so in a couple years, I'm not going to verbalize it, although, kind of fun to do it. We are seeking comments and supporting data for the proposal standard, either if you're for it, or against it.

So staff is proposing the scope to include

standalone fans and embedded fans in nonregulated equipment that upgrade from one break horsepower, which is around one kilowatt, to a maximum of 150 air horsepower. These are the fans that are going to be covered. You can read the slide. I'm not going to be telling you all the little fans. I'll give you some time for that.

So as far as the metric, we are proposing the Fan Energy Index, or FEI, the value of one, and that was calculated used in what DOE used, which is efficiency level 3 for the proposal. The FEI basically is equal to the referenced fan of electrical input power compared to an actual Fan Electrical Input Power, or FEIP, referenced over FEIP actual.

As far as the test procedure, we are proposing to use ANSI/AMCA 208-18 calculation of the Fan Energy Index. This test procedure, however, requires AMCA 210 and AMCA 207 to carry out the calculations of 208. So it's a conjunction of three standards.

Staff, we are not basically taking fans out of the market, but rather defining the upgrading points where the fan is FEI compliant. Here are two different fans: A high efficiency fan on the left and a low efficiency fan on the right. The red area represents the area where the fans are compliant, a different sized pressures and

air flow. The one on the left will have a bigger compliant map if you want to see it that way. While the one on the right will be specific to specific airflow and pressures that can operate and be compliant to FEI, making it technically feasible.

This graph basically represents the efficiency of fans for centrifugal roof vents. The fans that were picked on the X-axis would have basically the percentile efficiency. On the Y-axis we have the load and cfm. Most other fans that were picked for the different jobs were, as you can see here, are forty-three percent or less. This only shows that there are currently more efficient fans in the market available for this type of application, pointing out that if this proposal is technically feasible.

This is another example of we've got 295 fans that were above one horsepower. Each blue dot represents the fan and the red lines here are the percentile efficiency levels. As you can see, there are fans that are way above forty percent that are available for the same job as those that were picked for -- that were less efficient. So this graph is just representing, again, that there are available fans in the market.

So I had -- this is not working for some reason, so it has all the data. So we -- further, for better fans,

we got information that the only way to achieve FEI of one was just to increase the size. We gathered some information and, as you can see here, if you increase it to a forty-two-inch square inline fan, for example, you'd be FEI compliant. And we understand there is a weight increase that's where the housing increase and a budget cost of the fan. However, if they were to take a twenty-seven-inch mixed flow fan, yes, it is the higher cost, but it'll give the house width lower, plus it'll be FEI compliant.

There's new technology, like the EQB-27, which will keep the budget costs low. The house and width will be lower, actually, that the original and the operation costs will be lower than even the forty-two square inch increase by just putting a bigger fan. It'll be also FEI complaint, so you're killing two birds with one stone. It might be a higher cost in engineering, but there's technology out there available.

Yeah?

MR. WOLF: Al, it's Mike Wolf of Greenheck. Can we ask questions? Do we go here? How do you want it?

MR. GALDAMEZ: Yeah, by all means.

MR. WOLF: So --

UNIDENTIFIED SPEAKER: (Indiscernible)?

MR. WOLF: Yes, I've got it.

So the thing I want to point out on this, as it is something that originated with my company, is I think we got to be cautious when we're -- we're making broad statements about what can and can't be done.

This example here was strictly on inline fans, and, while I think that the concept carries through, I don't know that carries through on -- on all product types. So I just want to caution the --

MR. GALDAMEZ: Again, and we got the couple of the comments that we need basically --

MR. WOLF: Okay.

MR. GALDAMEZ: -- for this coming period --

MR. WOLF: Okay.

MR. GALDAMEZ: -- on how this can be implemented, how it cannot be, why, and so I can take that into consideration. Yeah.

MR. IVANOVICH: This is Mike Ivanovich from AMCA International. I have a question for Mike Wolf, who he just identified his company as the source for this data, somebody had asked me if the weight included the motors drive, can you clarify that?

MR. WOLF: No.

MR. IVANOVICH: Did not include the motors?

MR. WOLF: No, I can't clarify that.

MR. IVANOVICH: Oh, okay. Thank you.

MR. WOLF: My guess is that it probably does not, and this slide is pretty dated too, so this is -- this is probably pre, where we were incorporating the motor into the some of the FEI calculations. Again, it was more for kind of a general reference. It's not probably as detailed as you'd want, but I think the -- the point is correct, the analysis, you know, what it's telling us is correct, but to the extent that it includes every last detail that would be required on a regulation, I guess it's probably not.

MR. IVANOVICH: Thank you.

MR. WOLF: On embedded fans, this is not a very good representative example. You really need to look at centrifugal fans which are the vast majority of embedded fans, and you won't find the opportunity to suggest to substitute a better class of fans than those. So again, you're looking at again, centrifugal fans being predominantly what's being used, and then separate class. There isn't any way to substitute a better class of fans.

MR. GALDAMEZ: Again, that's a great comment, and those are the type of comments and information that we need for (indiscernible) embedded fans. Right? Right now the data that we have received is limited, and this is the best response that we can come up with.

By all means, if you got to have examples and why is

it that we cannot use an inline fan instead of centrifugal fan and so forth, by all means, please resend that data for the embedded fans issue. Okay.

Any more questions, or -- we're good? Okay.

So let's -- so the two figures, 11 and 12, which are the graphs, basically just represent that the standalone fans are technically feasible. And the same can be said for embedded fans, standalone fans since once you take that embedded fan out and test it, it will upgrade in the same way a standalone fan would.

So that's our assumption that we can test the embedded fan in the outside of the unit, and it'll perform the same way as a standalone fan of the same type. You might want to unmute the mic.

MR. WAGNER: This is Greg Wagner. I'd just say that that statement is not correct. In fact, that last slide with the inline fan kind of illustrates why that's not true. And that is, you can take perfectly good fans, put them in those boxes, they don't perform very well in those boxes like that.

MR. GALDAMEZ: In some cases, also for a better fan, the system is designed around the fans such as chillers, which is just saying that those are actually technically feasible since we define the unit after choosing the fan, so you just choose an FEI compliant fan, and then design

the unit around it.

In regards to -- oh, sorry.

So we also receive additional information on FEI compliance and unitary rooftop units. And for the EL level that we're suggesting most of the fans for this specific unit are FEI compliant as is. This graph only represents some unitary unit from a company which are at EL level, and they're all FEI complaint, all the fans used.

So our favorite methodology, basically we use the same assumptions the DOE did in their latest NODA and use that twelve percent population rate to calculate the shipments in California.

And we calculated the cost effectiveness for the proposed regulation using those numbers. All calculations are based on using DOE's efficiency level 3 assumptions, and it's a comparison between a fan that upgrades at a noncompliant level, and I wanted that upgrade at EL3 or our compliant level, using the FEI equation and calculations.

So I came back to a cost effectiveness, as you can see here for standalone fans. We -- for example, on axial cylindrical house fans, we calculated a per unit electricity savings of about 1,100 kilowatt hours per year.

There's a question on the lines. Go ahead.

MR. NICHOLAS TIMOTHY: Hi, John Bade, you are unmuted.

MR. BADE: Hi, can you hear me?

MR. GALDAMEZ: Yes.

MR. BADE: Okay. So I apologize, I had raised my hand back when you were on the -- on the rooftop slide, but you don't need to go back.

The question I have here, and I'm sure the answer is yes, is that this fan that you were looking at for the rooftop units were supply fans, correct?

MR. GALDAMEZ: Yes.

MR. BADE: Okay. So I will be submitting some very extended comments, but one of them will be that for rooftop units that have returned and exhaust fans embedded in them, you will not find that to be the case.

And one of the biggest areas where we're going to run into issues are going to be on the low pressure -- you know, low pressure relative to their flow fans, so that -- it's down in that range. The right side of the curve where you're going to run into the yes, you've got to go to a physically larger fan.

When you're up near the -- when you're working up at the peak and you're looking at three to four inches, and you're trying to find, you know, a different fan that

works, yeah, I don't doubt that in many cases, or the majority of the cases, you can find a fan that works. It's where we're going to have to look really hard are the exhaust and returns like applications where we've got the low pressures. And neither the DOE, nor a lot of analyses that I've looked at have addressed this issue.

MR. GALDAMEZ: Okay. If you have some data on that, I would appreciate it if you could submit it as well.

MR. BADE: Yes. Oh, yeah, you know, I'll be submitting you a whole lot of data.

MR. GALDAMEZ: Okay. Thank you. I was saying -- any more questions online? Sorry. No? Okay.

As I was saying, we calculated a per unit calculated savings of about 1,100 for this axial cylindrical house fan, with an incremental cost of 400 dollars. The average lifetime for this fan is about twenty-nine years. We calculated our per unit average annual savings of 169 bucks a year, with a lifecycle net benefit of 2,800 dollars with a three percent discount rate. Their mic -- there it is.

UNIDENTIFIED SPEAKER: Alex, would you clarify the per unit -- the hour used for the per unit electrical savings?

MR. GALDAMEZ: The per hour, we're dependent on the average lifetime that were calculated. I could go

through the specifics with you later. I'll send you that data. I mean, how I calculated the spreadsheet. I don't have it with me at this time.

UNIDENTIFIED SPEAKER: Okay.

MR. GALDAMEZ: But I'll send it to you. I think it's on (indiscernible) industrial, we calculated a full year, operating seven days a week and for commercial we did -- I'll send you the numbers; I haven't done that. I have no idea.

So then we ran calculations for the embedded fans and here's an example for axial cylindrical house fan. The per unit electricity, the savings was about 300 kilowatt hours per year, with an incremental cost of $187, yet that was just for the fan design and installation, with an average lifetime of eighteen years, the per unit average annual savings of 51 bucks a year, with a lifecycle net benefit of 650 bucks, round.

Yeah, go ahead.

UNIDENTIFIED SPEAKER: Hey, Alex. Just a question on cost effectiveness of embedded fans in the previous table.

So you said fan design and implementation of that fan, right? That's what the cost of that is?

MR. GALDAMEZ: Yeah, that's the data that we had.

UNIDENTIFIED SPEAKER: Okay.

MR. GALDAMEZ: It was only at the time of a new fan, for example --

UNIDENTIFIED SPEAKER: Okay.

MR. GALDAMEZ: -- and putting it into the (indiscernible).

UNIDENTIFIED SPEAKER: Right.

MR. GALDAMEZ: We didn't get any more data in regards to how much it would increase in size.

UNIDENTIFIED SPEAKER: That's okay.

MR. GALDAMEZ: The (indiscernible) later.

UNIDENTIFIED SPEAKER: Okay. Thank you.

MS. MOHNEY: I just want to remind people to identify yourself before you speak, so we know who is making comments.

MR. GALDAMEZ: So what does this mean? It basically means a savings for standalone fans of about 50 gigawatt hours per year, with 1,400 gigawatt hours per year after full stock turnover. So sorry, the 15 gigawatt hours is for the first year of implementation.

The full stock turnover for standalone fans is around twenty-seven to thirty years, so that'll be the same.

Go ahead. Of course, you're online.

MR. TIMOTHY: John Bade, you're unmuted.

MR. BADE: Thank you, this is John Bade from Johnson

Controls. What I'm not clear on is what is the base that we are saving from -- and the reason I ask that is you had shown in a previous slide, an example of a rooftop unit that was already at FEI of one. I have run -- I represent a company that -- that sells -- has a large share of the air handler market, and almost every air handler that we've sold on SPY fan side have already had an FEI higher than one, so one thing I'm concerned about is what is the assumption about where fans in the market are being sold today? At least from what I've seen, at least in the embedded fan market, most of them are pretty much over one as it is.

MR. GALDAMEZ: We use the data from DOE that they gathered from different manufacturers, and so we compared a nonefficient EL1 up rating at zero basically, and then compared the cost of usage of that to the one that uprights at EL3. So if you have an axial fan, it was data that will compare -- you could compare a noncompliant axial inline fan to that of an axial inline fan that upgraded at EL level 3. And we gathered -- I mean DOE is the one that got us that data, and that's the data that we used. That's the assumption. I don't know if I'm -- did I answer your question, or?

MR. BADE: You did, so I'll repeat my comment and, again, this will be some of the data that I'll share

the -- I believe (break in audio) fans already that are used for supply are already over one today.

MR. GALDAMEZ: Okay.

MR. BADE: The other thing I'll mention, and I have a good relationship with the both at ANSI. I know the folks here that are there. I will say I suspect that a lot of the AMCA data, are is -- it's heavily skewed toward the low pressure, high airflow fan, so in very many systems that we participate in selling, like doing air conditioning and ventilating for a large building, the air handler comes with a supply fan, and the exhaust and return fans that are low pressure are very often standalone fans where the AMCA folks would have the data, but the same fan that, you know -- but we buy fans from them, put them in our air handlers, they don't have the performance data for those, because we're just buying fans in bulk. We don't share the performance data with them.

MR. GALDAMEZ: Okay. If you can, by all means, share that data and your comment, that would be great.

MR. BADE: Sure.

MR. GALDAMEZ: Thank you.

MR. STARR: This is Louis Starr with Northwest Energy of CLI, and one thing I would kind of point out here is mentioning that -- John mentioned that he's

looking at equipment and that fans regular getting FEI1. I would kind of, you know, not in the context of this, but I would say that sort of gives an indication that some of these FEI levels and embedded equipment are possible, and that's one of the things.

It also brings up another issue. If the other return fans aren't meeting at FEI level of FEI1, then that's problematic. It means they're not apprising of this fan, and there's no way to capture that in the metric.

So it sort of gives you the idea that maybe you need to be going after these fans and in particular, they're not regulated. I mean, the EI measure the CPEX (ph.) 2012 indicates that energy is fifty percent -- or cooling energy and the fan energy are about fifty percent split nationally. And so you have California goals that are around trying to drive efficiency, you need to be going after where the opportunities exist, so I just wanted to provide that kind of perspective. Thank you.

MR. GALDAMEZ: Thank you.

MR. ERNST: Just responding. This is Skip Ernst with Daikin. Just responding to, I think Louis' comment. The exhaust fans and return fans that's not an issue of what speculated and what isn't. It's the application of the fan and the fact that return fan, exhaust fan, and

supply fan all go in the same units, supply fan is used at a higher static pressure so it's the (indiscernible) efficiency fan is a smaller diameter than the return fan/exhaust fan. And you end up on space -- on all equipment is space-constrained, and you end up with exhaust fans and return fans that a more efficient fan doesn't fit right.

When we presented that data to DOE, and I -- you know, it appears we need to present it again to California. The DOE didn't address these comments. These were comments sent to them after their last NODA, and we pointed out many of the flaws in their analysis, and they've -- they've never corrected it.

MR. GALDAMEZ: (Break in audio) over there, then here. Okay.

UNIDENTIFIED SPEAKER: So this is (indiscernible). You know, one of the things I would say is the casing side of the equipment, so when you buy a piece of equipment, you have a fan that's inside of it, depending on where that ends up. That fan could be just right there, and it won't fit into a larger case. In other words, you need a larger casing size. But most of the time, that's not the case. And so the ability to shift to a bigger fan, I think exists in a lot of equipment, and that's what DOE did do in their analysis.

But the other thought about this is, let's just say what he's saying is correct? It means basically our box is too small to put in a more efficient fan, and we can't put in more -- we can't go get a more efficiency, because we have to find a bigger box for it. So there will never ever be a reason. I mean, if you think about it, why is it that essentially the fan is optimized in the current RTs, but it has part of a regulation associated with it. So there's a reason to drive -- to drive it more on the (indiscernible) fan. On the return side, there is not. And so how do you drive those -- or how do you drive manufacturers to make a fan that is slightly bigger or whatever it needs to be -- to be more efficient. And so my thought is that do that through fan regulations.

MR. GALDAMEZ: Thank you.

UNIDENTIFIED SPEAKER: And (indiscernible).

MR. LESSANS: Mark Lessans with Ingersoll Rand. I'll build on this a little bit in my presentation, especially if it relates to fans that are embedded in rooftop units, but one thing that I also want to make sure that we clear up is that we're not mixing up any kind of data sources on the amount of energy that's consumed by the rooftop unit, and in some of the other air source, or airside products that are out there. I'm not sure where the fifty/fifty split from the cooling to

ventilation comes from, but I can tell you that inside of a rooftop unit itself, the cooling function of that product accounts for -- the compressor itself accounts for over seventy percent of the electricity consumption of that unit.

So yes, there are other airside products that are not covered by that rooftop unit that are also providing ventilation of that building, perhaps. But inside of an embedded rooftop unit that's designed specifically to provide cooling and ventilation, the actual cooling function is by far the majority of that electricity consumption.

MR. GALDAMEZ: Two more and then we'll continue the presentation, because we're going to have a time to discuss and go through all this process. And do the workshop.

MR. STARR: So this is Louis Starr with NEEA. So what that doesn't represent is that a natural energy model, the metric doesn't represent the annual energy usage, it represents a way to basically identify how efficient another product is based upon a test procedure. But when you actually run energy models in climate zone 4, half of the energy in a cooling application is coming from the fan energy. So this is when you use economizer. This is when you're doing ventilation. This is when the

air compressor's not on. And that's a number of hours a year, and it's very much the same case in California, which has a lot of climate zone 4. So same as the test procedure has seventy percent, you know, the actual energy use when you go in the models, and then you know, it obviously depends on the climate zone 4. I mean, for instance, how much compressor energy is used in Alaska? Do we think it's seventy percent there? So it does depend on the climate zone. And so thing in the test procedure that, you know, it's a metric that's averaged over the whole United States. I think we can all see that Alaska does not have a lot of cooling energy, and it certainly is at seventy percent there. And so I was looking to what the climate zones here are, and make that decision. But I think regardless, we know that the test procedure does not reflect the actual energy used to the fan.

And in the 90. -- in our ASRAC meeting, we're supposed to start renegotiating that test procedure in the -- with a January 1st, 2016 completing on 2019. So we got about six months to finish that renegotiation of the test procedure. So I don't think that's going to happen anytime soon. And I just -- you know, I kind of looked at the fans, and to me that looked like you need to think about reaching in and getting regulations,

energy-efficiency -- or energy savings through looking at the fan metric.

MR. GALDAMEZ: Thank you. And there was more -- Okay, go ahead.

MR. WAGNER: I was going to say, if you go -- this is Greg Wagner. If you go back to slide 12, you can see that just looking at efficiency of fans doesn't necessarily drive energy savings, and that slide showed that you have a lot of fans that were lower efficiency level at the bottom right-hand corner, but a lot of those are also using way less energy than the ones that are in the higher efficiency levels, so just saying efficiency isn't driving energy saving.

MR. GALDAMEZ: Go ahead.

MR. LESSANS: Just, maybe a -- length that I'll expand -- I'm sorry, Mark Lessans with Ingersoll Rand. I'll get a bit on the energy consumption of roof topping in itself again in my comments, but one other, I guess, observation that I'd like to add is that the test procedure for these rooftop units is actually in the process of being revised, and that did come out of the negotiated rulemaking for -- at the DOE level for these products.

And I guess I'm still having some -- to me it seems like there's a -- we're talking about all the fan that's

supposedly isn't being -- or all this energy that certainly isn't being captured by the test procedure, but I still don't see how revising the test procedure to more adequately capture the energy consumption that fan is inferior to addressing the fan for some separate regulation that -- to me, understanding the better performance of that product is always going to have a much better -- paint a much better picture of the total consumption than trying to look at the individual fans in isolation.

MR. GALDAMEZ: Can we continue, or is it urgent?

UNIDENTIFIED SPEAKER: Yeah, no, I was just -- just needed (indiscernible).

MR. GALDAMEZ: Yeah, we'll have a discussion that's set to really work through it, and look at the issues and further this custom, and see what data I said that we actually need, and how we can make it work for everybody.

So for a better fan on the other hand, is the first-year savings that we calculated was about 24 gigawatt hours for that first year, and after full stock turnover, which is around seventeen to twenty-one years, it'll be 430 gigawatt hours per year on savings.

Conclusion-wise, we concluded, basically, that calculating savings discount rate of three percent, it is cost effective -- the regulation is cost-effective. It

is technically feasible because there are fans available on the market as it is, that perform at the FEI level that we are suggesting.

The first-year energy savings will be around seventy gigawatt hours for both embedded and standalone fans, and after full stock turnover will be around 1,800 gigawatt hours per year. So when we compare that to previous regulations we have passed, it's between the battery chargers and the state-regulated LEDs.

UNIDENTIFIED SPEAKER: (Indiscernible) the transfer because of the (indiscernible)?

MR. GALDAMEZ: Yes.

So what did that mean for California? It's about 183 million in savings for the first year. Savings after stock turnover, 529 million per year. If you want to look at it at a cumulative savings will be about $4.8 billion for California in thirty years.

So with that --

UNIDENTIFIED SPEAKER: Quick question.

MR. GALDAMEZ: Yes, go ahead.

UNIDENTIFIED SPEAKER: That thirty-year time period include any ratcheting upwards in the string (indiscernible)?

MR. GALDAMEZ: No, it's a flat, no growth.

UNIDENTIFIED SPEAKER: Flat, no growth. Okay.

Thank you.

MR. GALDAMEZ: Yeah, question on the line.

MR. TIMOTHY: John Bade, you are unmuted.

MR. BADE: Yeah, so I just want to clarify. Those numbers you just quoted are based on the assumption that every fan in California today is operating at some level below FEI of one, correct?

MR. GALDAMEZ: No, it's based on the shipments that we received from DOE. So basically, we look at the shipment information the DOE calculated for both standalone and embedded fans. And we based those numbers on those shipment.

MR. BADE: Okay. So there is some, you know -- so you got some significant number of fans already above FEI of one and therefore not showing any savings in your calculations, correct?

MR. GALDAMEZ: Yeah, unfortunately we don't have actual numbers on how many fans are out there that are efficient or already operating at FEI. That data hasn't come by.

MR. BADE: Okay. Thank you.

MS. MAUER: This is Joanna Mauer from ACEEE Staff. I just wanted to clarify that I think -- and I think the CEC analysis is based on the DOE analysis from NODA 3. And I think the information from DOE at each efficiency

level was really -- so their analysis for the impact of the EL3 was really relative to the base paced distribution of fan efficiency, so not relative to an EL0 fan, but rather relative to the distribution of -- of fans that are -- that are being pulled today. So I think in that way it's taking into account what you're saying, John, about, you know, lots of -- lot of fans are being purchased at -- at FEI1 today.

MR. GALDAMEZ: Okay. Can you (indiscernible) mic over there in the back? Sorry.

MR. ERNST: Now, there were quite a few people in the room here that were involved in the ASRAC, and just see if -- this is Skip Ernst with Daikin -- if we have the same recollection, the EL3 was what DOE considered would require thirty percent of the market to be redesigned. Isn't that what everyone -- everyone's recollection? The EL10 or EL1 was ten percent of the fans, and this was based on data that AMCA gave them, and is not reflective of embedded fans. It's entirely based on data that AMCA provided to DOE. This is my recollection, but, you know, defer to some of these people that are more involved than me.

MR. GALDAMEZ: Yeah, we did the -- we used this -- DOE had to do a lot of assumptions, because there were no -- there was no data provided for embedded fans,

that's correct. So yes, the data is for several fans and we can now (indiscernible).

Go ahead.

MS. MAUER: This is Joanna Mauer from ACEEE Staff. So my recollection is that EL3 may be roughly twenty-five -- I think that twenty-five percent of the market or so would need to be, yeah, recollected, redesigned something similar to what you said.

I also think that for NODA 3, one of the things that DOE went back and did, kind of after -- after realizing that the data from AMCA, maybe, wasn't, you know, reflective of embedded fan shipment, because I think they at least attempted to better reflect, in particular, shipments of (indiscernible) fans. I don't know that they, you know, got it exactly right, but I think they did in the NODA 3, at least attempt to account for the fact that the AMCA data really focusing on (indiscernible).

MR. GALDAMEZ: We have -- right there, then you can go ahead.

MR. ERNST: Again, DOE -- this is Skip Ernst with Daikin. DOE did go out and talk to embedded manufacturers. The data -- they never updated based on the data we gave them. And we have information to support that.

MR. GALDAMEZ: That be, you can provide a data to us, so we can take a look at it.

MS. PETRILLO-GROH: Laura Petrillo-Groh, AHRI. Yeah, so from this conversation is jogging that summer, and into the -- into the fall, and into the winter, negotiations. And my memory on the topic, but the NODA 3 was the first NODA that used FEI as the metrics. I think the previous two used different metrics entirely.

MR. GALDAMEZ: Correct.

MS. PETRILLO-GROH: And was -- I think, Joanna is correct the first time you attempted to make corrections for the embedded fan market. It's my understanding that Skip and Daikin, and many other companies did supply the Department of Energy with more information on embedded fans, since we finally understood what was captured in that original AMCA database by that point in the negotiation; however, the NODA 3 was published prior to the conclusion of the negotiation. It was just meant to give us -- give the working group information on what that metric would look like in -- in a regulation.

So a lot of information was provided to the Department of Energy on embedded fans after that NODA was published. And at that point, where we've stalled. So you know, clearly we would have to provide that same information to California, to be able to update their

analysis, but I would like a little bit more information on how that entire analysis would get updated and reflect -- and more reflective of the actual market and what the, you know, development cost technical feasibility is for the embedded fans which we care about so much.

Because our work with the spreadsheets that were issued by Department are the draft. They're not final. They're not in particularly user-friendly format at this point. They're not the complete package that gets issued with the final rulemaking. So maybe CEC or ASBS (ph.) Utility Partners, or could concede more to that process, we might be able to provide better information in a way that you guys could use it in your analyses, as opposed to what we would have provided the Department of Energy for use in their analysis.

UNIDENTIFIED SPEAKER: This is Mary Ann (indiscernible). We're going to be giving a presentation shortly, or later this afternoon/morning-ish on some of that information. So more to come, but we've already started to look through that.

MR. GALDAMEZ: There's one more coming in --

MS. PETRILLO-GROH: Can I follow-up please?

MR. GALDAMEZ: Yeah, go ahead.

MS. PETRILLO-GROH: This is Laura again. Yeah, I

think a lot of what has been said here, I think mischaracterizes the participation of -- of embedded equipment. Only in the process, you know, that the information was, in fact, provided on -- on many different sources on many different occasions, and it was just in the process of being revised, so this is just --

MR. GALDAMEZ: Yeah, I understand that DOE had a problem and they did continue the main administration, so, I mean, that could be a reason why. I don't know. I'm just making an assumption here.

MS. PETRILLO-GROH: Yeah.

MR. GALDAMEZ: (Indiscernible) can provide any information when, you know, we give you what we need and how we need it and all that.

MS. PETRILLO-GROH: Yeah. We also did try to do that after the -- the last step in the process, where we provided a proposal for a regulation, and tried to follow-up with, you know, who we were told would be the consultants working on this on the CEC side, and received no response. Not the emails, phone calls, so I'm -- I'm very pleased to hear that we will -- will have a contact now that we can provide this information to and leave authoritative being able to, finally, time to adequately provide that.

MR. GALDAMEZ: (Indiscernible) sending you

information, but I'll go ahead and send it to you again.

MS. PETRILLO-GROH: Yeah.

MR. GALDAMEZ: Yeah.

MR. STARR: So this is Louis with NEEA. So what I understand, Lisa -- Laura, that you basically information you submitted to DOE, you -- you have or are going to resubmit that same information to CEC as well? I seen that in NDA and all that information was that --

MS. PETRILLO-GROH: So a lot of the information that I'm -- I'm talking about was actually submitted by individual manufacturers directly to Department of Energy consultants under NDA.

MR. STARR: And can that be carried over? This means, I bet (indiscernible).

MS. PETRILLO-GROH: I think as long as an NDA can be completed, I mean, that would be required to be -- to maintain confidentiality in terms of cost of equipment redesign specific models. I mean, this business information that, you know, we were able to, you know, that many companies were able to provide the DOE's consultants under NDA. You know, one of my member companies who did provide that can -- can maybe provide more clarification on what would be needed, but --

MR. STARR: Sure.

MS. PETRILLO-GROH: But that same --

MR. STARR: Sounds like it's your -- it's that same mechanism exists with DOE that you had with the (indiscernible) NDA agreement saying that you're okay with that as well, right?

MS. PETRILLO-GROH: That would be part -- that'll be part of it, but then I think there's some additional analysis that we are requesting as well. So I would like to wait until we hear from the consultants on what they need and what they've been looking at.

MR. STARR: And then the other thing I would point out, the ASRAC's meeting is around September 5th or something like that, and a lot of this data that was submitted on the record by AHRI and member companies was after that date, which generally when you're trying to negotiate things, it's helpful to have that information during the negotiations, so it needs, just from my perspective, what sees that the data was held on until the very end, and then it's like well, we better give data, or we're going to get regulated. So that's my perspective. It may be incorrect, but that's how I kind of look at it.

UNIDENTIFIED SPEAKER: (Indiscernible) a lot of data three -- I know I submitted data three years before.

MS. ANDERSON: And just to clarify the da -- this is Mary Anderson with PG&E. The analysis we're doing, we

are not a consultant to the CEC. I have consultants that I'm with the investor on utilities, which is separate. We are also a party similar to AHRI.

MS. MOHNEY: And the Energy Commission does have a process for submitting confidential information. We'll get that information to you.

MR. GALDAMEZ: So going back. So what we're looking for standalone fans is basically we appreciate comments on all definitions that we propose, including the fans that are not covered to be exempt, such as circulating fans.

Let's take a look at the definitions so they make sense to you. And please submit some comments on those. Or standalone fans with this procedure, we are proposing to use the basic model that we have done for other regulations; however, we received a suggestion to use fan laws to lower the amount of testing that needs to be done; however, we need examples how to implement it, since there's something different that DOE has done in the past.

The test procedure, we're proposing -- sorry, did I miss my spot? No. I'm sorry, I went back -- I went forward one slide. I didn't go forward, right?

Okay. So for embedded fans, we're looking at the -- we're asking for comments on the definition. How to

define it? Our main concern is basically to prevent a loophole to the wall, so that if a consumer is not -- if an embedded fan were to be exempt, for example, how can we define it to take it out of the regulation? Or how can we define it better? All right, since an actual fan inside or embedded upright and looks the same, how can you define it?

In regards to a scope for embedded fans, we're accepting substantiated comments to define the scope of the embedded fans. What should the scope be if we include embedded fans or not?

MR. WOLF: Mike Wolf from Greenheck. I'm not sure this is the right place to bring this up, but going back to a previous slide, I guess, I'm curious when you're asking about definitions. A lot of the stuff related to fans is kind of application-related. I know I've had discussions of you and others as to how a Title 20 relates to Title 24, because a lot of times it's not until you actually see the fan in the field installed that you know whether, you know, whether it's a standalone fan or embedded fan.

So I guess my question is, and if it's the right time or not, how -- how does title, what we're doing in Title 20 ultimately tie into 24, because that seems like that's where a good part of the enforcement will need to

come from.

MR. GALDAMEZ: Well, the implementation -- unfortunately, Title 20 and 24 are independent from each other. Right? So it's not like I can say you need to implement this fan this way in Title 20. Right? That's Title 24's job, right? What Title 24 does do is point to the FEI requirement that we are needing for embedded or standalone fans.

So if we decide to go FEI1, at EL3, right? Then in the future, when either what is the negotiation? The ASRAC negotiation, not the ASRAC, the ASHRAE 490.1 goes through, or that we do -- we do the fans requirements for rooftop units and all that, then they'll point to Title 20 requirements. All right? So that's how I understand it works.

And yes, it's a difficult subject, and that's what I'm doing. So I need more information than -- the definitions that we propose are very clear enough, or they're good enough, or they need to be worked on more. And I need basically any help and suggestions on how to improve them.

In regards to the test procedure -- oh, go ahead, there's a person online.

MR. TIMOTHY: Hi, John Bade, you're unmuted.

MR. BADE: This is John Bade from Johnson Controls.

One very specific comment that I will make is that the fan definition -- the proposed fan definition does not match the fan definition that's in 208, and that only talks about the physical fan itself, and does not include transmission, rotors, or controllers and something that has been very unclear to me as I've been reviewing the report is -- is how you are applying those other pieces to this process, because all of the database stuff is all about standalone fan with a (indiscernible) part number on there, but a very, very big flaw is the definition of the fans, because if you're going to use FEI, it has to include the entire package, transmission, motor, and controller.

MR. GALDAMEZ: Okay. Can you submit a comment and a suggestion on how to define it better?

MR. BADE: Oh, I will, but it's essentially going to be -- use the definition that's in AMCA 208.

MR. GALDAMEZ: And there's a comment in the back.

MR. STARR: Hi, this is Louis with NEEA. Actually, maybe, I don't know, would be helpful maybe to AMCA someone has some -- just to comment on that to see. I've -- unfortunately, I don't have that off the top of mind; I don't work on fans every day. What John's kind of expressing is that a legitimate concern, or can you comment?

MR. IVANOVICH: Well, definition, this is Michael Ivanovich from AMCA. The definitions are always a legitimate concern so I've been making notes as we go along here, and we'll provide a more detailed analysis in our written comments with the definitions. It's not just the definition of fan, but all of the included and then excluded fans. Definitions need to be checked against AMCA standards and publications.

UNIDENTIFIED SPEAKER: Just off the top head, you should know whether the definition of fan's right or not, right?

UNIDENTIFIED SPEAKER: (Indiscernible)?

UNIDENTIFIED SPEAKER: I mean, he's basically saying the fan definition is not inclusive enough of all the things it concludes.

MR. GALDAMEZ: We'll take a look at that.

MR. PERCIVAL: This is Trinity Persfal, Twin City Fan, to address Louis' comment.

In general, we look at -- we're going away from just the fan equipment. The piece that rotates to move air, to a fan system which includes the motor and drive, and so most of the definitions in most of what you'll see in 208, and from hence, it will be inclusive of the fan motor drive, so we look at the fan. We're being a little bit more expansive in our definition of a fan system and

the motor and drive is inclusive of that.

MR. GALDAMEZ: It is my understanding of the problem that maybe we're just referring 208, maybe we need to make reference at 207 and 210 as well, as part of all three test procedures needed for the standard, rather than just 208. I think that will cover that drive and all that.

One comment over in the back.

MR. WAGNER: Yeah, a slide or -- this is Greg Wagner. A slide or two ago, you had a thing about the fan laws and one of the issues with using those similarity equations is that they are to a bare shafted fan. They don't include the motor and drive, because you can't use those same similarity equations to do that.

So some of these assumptions that are building to just in the slide deck in comparison to what that definition might be are relevant, and that's why the question is, what is the definition of a fan. And people do have a lot of questions about where does it start, where does it stop?

MR. GALDAMEZ: Okay. Thank you. So again, all of the comments in regards to how to improve the definitions are welcome. By all means, submit them.

In regards to the test procedure, we're seeking engineering data. Any information in regards to how

representative it is for embedded fans, or how is it not? So specifically to rooftop units. We're looking at if we should lower the FEI for embedded fans or not, so that will be something to look at.

In regards to energy savings, preliminary calculations received show significant savings for California. We are accepting data and analysis to support a different conclusion for better fans. We have received some information on shipments, and we are going to be running those numbers in this new iteration as well. But if you have more data, by all means, please submit them.

UNIDENTIFIED SPEAKER: Is there a deadline by which that this should be submitted?

MR. GALDAMEZ: Right now we have July 31st, but we are probably going to extend it due to two different extension requests. Going to be publishing that really soon, the extension of it.

Cost effectiveness-wise, Energy Commission staff has received comments on the costs associated with embedded fans; however, we need tabulated information on why I said that for embedded fans that cost explodes, right?

We need, like, for example, for a fan that is in the cabinet well, if it's increasing in this diameter, how much is the weight and the only other fan going to

increase by the entire unit, how much it'll be for installation, how much for engineering, reengineering the fan, and so forth. Each is a different kind of logic for the unit, how much would that cost engineering-wise? So we need that tabulated calculation to reassess the cost of embedded fans.

MR. LESSANS: Mark Lessans with Ingersoll Rand. I know that we, at least, attempted to provide that information to you over the course of the past year, so it would be helpful if that information was not useful, or if it needs to be built on. It would be helpful to get some additional clarification on --

MR. GALDAMEZ: Can you do a summary of the cost -- total cost. What I needed was a breakdown of why do they got that fee here. Right?

MR. LESSANS: Okay. So they'll --

MR. GALDAMEZ: So for example is this, like, say 500 dollars, right? Just even tumble. Well, 200 is for engineering, 300 for materials, blah, blah, blah, blah. Kind of like a bill to, like, kind of explain the worst case scenario cost.

MR. LESSANS: Sure.

MR. GALDAMEZ: I'm not asking for information -- like preferred information that you cannot provide. I'm more of, like, the reason why that cost is so high.

MR. LESSANS: So that there's -- I guess there's a little bit of an issue, because that information that you just described, you needed would essentially be competitive information, so I think that we'll have to, at least from our company's perspective, we couldn't provide that in a comfortable way, knowing that our competitors could also see it.

When we originally presented it to you was under the offices of this is going to be public information, so we can follow-up on the best way to get that information to you on our end, and, yeah, I just want to make sure that I get that out there, because we'd like to get you that information just in a way that CEC can use it here.

MR. GALDAMEZ: So again, the comments are due by 5 p.m. on July 31st. That might change; we're analyzing the two requests and we'll make a decision soon on that.

To submit electronically, of course, just go straight to the docket and submit your comments. If you need to send a hard copy, here's the address on the slide of this presentation. It's available on the docket. Just look for this address.

If you need to send a digital copy, you can email it to docket@energy.ca.gov, just make sure to include the docket number 17-AAER-06, and indicate Commercial and Industrial Fans and Blowers on the subject line, so that

it can be docketed correctly.

So with that, I end my presentation in regards to what we are proposing. And we are going to move to presentations, and I think right now the first one we got Trinity -- oh, yeah, one comment. Sorry.

UNIDENTIFIED SPEAKER: My name is Dwight Goodman (ph.). Alex, just wanted to find out a little bit on slide 11, you know, the technical feasibility on that slide actually points to centrifugal roof vents. Was that the only certified that you will --

MR. GALDAMEZ: Yeah, that was one time. I did use it for presentation because we had a graph. And the (indiscernible) them mostly, rather than what's available on the market.

UNIDENTIFIED SPEAKER: Okay, so the Commission has reviewed the other fans and the results were --

MR. GALDAMEZ: Yeah, exactly. Some of them -- I mean there was limited data that we had received.

UNIDENTIFIED SPEAKER: Right. And then on the tables, right, on the cost-effectiveness, just like DOE would, I guess, the spreadsheet that we used to use, will those be made available?

MR. GALDAMEZ: We used the sheets (indiscernible) from DOE and then we arrive at our own calculate -- we had to do our own calculations because it's California

specific --

UNIDENTIFIED SPEAKER: Right.

MR. GALDAMEZ: Right. Those are in the report. If you need help on how it was calculated, via pending because most of the equations that were used and we came out to those numbers.

UNIDENTIFIED SPEAKER: Okay.

MR. GALDAMEZ: However, if you need help, please contact me and I'll walk you through it -- go through it. If you need the spreadsheet, itself, I can send it to you and, so you can play with it, or, yeah.

UNIDENTIFIED SPEAKER: Okay. Thank you, Alex.

MR. GALDAMEZ: No problem.

MR. STARR: So this is Louis with NEEA. I just want to -- this is probably maybe a question for you. So I seem -- I noticed in DOE's analysis the NODA 3 inch nearing of 2016 dated 10/9/13, version three, they've got the cost of the fans on a dollar per ton, I believe, it's 250 dollars per cooling ton, and then they've got the size fans. That's what you currently have, and are you trying to get different information on that, or is it more information?

MR. GALDAMEZ: I just need more information.

MR. STARR: So the other piece is in other words, right?

MR. GALDAMEZ: Yes.

MR. STARR: So in the case of reengineering, if you just go to a larger fan, that's not really reengineering, you're just making a larger fan, right? So the question is, is there space to go in there, which is done in another analysis. So to me it seems like DOE -- the information that is there is already the right information, it's just a -- in other words, they've taken account, the other things they're worried about in another part of the analysis. So to me it just seems like it's cost of the fan that was kind of the basis or analysis, and then they do it in another part of the analysis to figure out the effect. So help me understand that.

MR. GALDAMEZ: That's correct, yes. So we're going to have Trinity, right?

So to control inches, you can go here on the right, or if you want, can you move this slide? You can? Okay. All right. Let me know and I'll help you, but --

MR. PERSFAL: All right, thanks Alex. Appreciate the chance to talk, and like Skip, I'm getting memories of being in DC and the ASRAC process, but I think they will probably be better characterizes as a flashback, instead of a memory.

So again, I appreciate seeing a lot of the same

people. What I'm going to do for the next nine and a half minutes that I have, there's really three things that I want to talk about.

I want to just give a quick intro to what AMCA is, who AMCA is, where we're at, what we do. Just a brief intro to the FEI piece. Many of us who know it. I'll just give some examples that we've put together of how it's better to capture the energy than the previous metrics. How there's been accommodation for some of the low flow/low pressure applications, and how some of the bigger size impacts some of the efficiency pieces. And then finally, how this is becoming more of a mainstream type of metric.

So with that being said, my name's Trinity Persfal. I'm a member of AMCA, along with some of my other compatriots here from New York Blower and Greenheck. And I'm with Twin City Fan. We're based out of Minneapolis, and we play, and Arman (ph.). Sorry Arman. We play in the industrial, commercial, and OEM market.

And so AMCA, as you may know, is Manufacturer's Association, and really its mission is promote the health, growth, and integrity of the market. Worldwide, we have about 380 members, half of them exist outside of the U.S. We have 18 ANSI accredited standards and more than 4,000 AMCA certified products, with 150 plus

companies participating in various regions around the world.

There's multiple -- there's many, many AMCA fan committees, and many of them pertain to this rulemaking. And really what we try to do in our association is come up with consistent positions and we try to drive the regulation. It's beneficial that helps us accomplish our mission up integrity health of our members and the association. As alluded to from Alex, some of the pertinent committees that pertain to this rulemaking is 207, 208, and 210, and those are ANSI-guided standards as well.

What we'll see and what many people already know about, but we want to start to compare, whenever you do anything new, you want to compare it to what's old, and so the FEI is really, it's an energy index instead of an efficiency index. So the old, what we refer to as FEG, the Fan Efficiency Grade, not necessarily wire-to-air metric, doesn't include the motors and drives. And so back in 2013, we started to project and future cast what a new metric would look like that went from an efficiency, more to an energy type of metric.

And so coming up with this was tricky and difficult to say the least. And you can see here's why, and one of the things that becomes pretty obvious pretty quickly is

that efficiency and power, and fan RPM and size, they all start to play with each other. And so we try to come up with a regulation that'll address that electrical input power.

And we knew that, unlike a lot of energy codes, the product regulation can't regulate the fan application. They could regulate how the fan is presented to the public. And so we tried to determine a way to present what is the best-case piece of equipment for that application. And so many people have seen this, but just as a background, really the FEI is an index, and we're comparing a baseline input power to the actual. And so there's an accommodation that's made for low-flow applications low-pressure applications that takes into effect the energy impact that's consumed in the efficiency consume. So you see that with the Q-Knot and the P-Knot energy coefficient. And there was a lot of ringing of hands three or four summers ago about what those coefficient to be, but this was the consensus position that we determined. And so to kind of reference what Louis was discussing a little bit earlier about the definition of a fan and a fan system, here you can see this W coefficient is really reflective of the fan equipment, the belt loss, and the motor loss. So we're starting to look at this more holistically instead of

just a singular piece of equipment.

So we compared the old system of FEG to FEI. You can see that FEG is the efficiency grade of an eighty-five was selected. All of these fans have an FEG of eighty-five. But it becomes pretty obvious that it doesn't reflect the actual power that is consumed. So we wanted an index that would reflect better the power consumed. And so you can see the last two columns on the right. You can see FEG compared to FEI. And if you look at the fan power column, you can see as the power goes down, the efficiency index goes up. So this is fairly typical, dependent of fan type. You see the same type of relationship.

And so to give a little background on some of the FEI bubbles that you see, this is how those bubbles tend to be constructed. You get -- very quickly you start to determine what is the compliant range of a fan if the FEI is at a one, you can start to see the part of the curve that becomes compliant. So that's what you see here in red.

And this is where the bubbles, for lack of a better word, start to take shape. And so on the left, you can see an efficient fan that has a much bigger compliant operating range with an FEI of greater than one, compared to one that is operating at an FEI -- it's operating at a

specific RPM at an FEI of one.

And for an axial fan -- axial fans don't get a lot of love many times, but I just wanted to put this axial fan curve in here, so we could all -- we'll see that too from my axial fan brother.

So to kind of wrap up, the FEI is starting to become popular with the kids, and starting to become mainstream. And so what we're starting to see is it's trending in all the right platforms. And so you can see AMCA 208 is now an ISO standard. You're starting to see -- it's being adopted into 210, and you're starting to see -- we're talking about it here today in California, but we're also talking about it in ASHRAE, and so EnergyPlus is starting to grab hold of this, and the new DOE Asset Tool will be inclusive using FEI. So it's starting to catch on.

And for us, as a proponent of the FEI, that's good news for us and the AMCA members. So at the end of this presentation, here's some of the resources that you used and there is no bonus slides, but I think that's it. I think I've allotted my ten minutes, so I appreciate the opportunity. Thank you.

MR. GALDAMEZ: So I don't want to kill this, but the next person, there will be [Lux-ni-var]? [Luch-in-var]?

MR. KLEISS: [Lock-in-var].

MR. GALDAMEZ: Lochinvar, sorry, man. I'm bad, my

apologies. I knew I was going to kill it. Here we go.

MR. KLEISS: Thank you. It's unfortunate following Trinity, because he was really entertaining. So I am Jeff Kleiss. I am representing Lochinvar. We are a manufacturer -- and I'll just get on to this. We are a leading manufacturer of commercial and residential water boilers, water heaters, pool heaters, storage tanks. We've been building water heaters since 1939, and we are currently a wholly-owned subsidiary of A.O. Smith.

Before I go on, I'll just say it's my opinion of CEC that they are a good organization that is legitimately interested in conserving energy and water, and they put their money where their mouth is as far as trying to verify and actually legitimately do that job. And I am hoping that this effort is related to conservation of energy, and not just conservation of electricity, or else I'm wasting your time with the rest of this presentation. Also, this is going to be probably kindergarten level from a bunch of Ph.D.s that are sitting at the table, but we'll see what we can do.

So what we are recommending and requesting is that embedded fans used to provide combustion air would be excluded from the CEC fan rule, to prevent increased energy consumption and other adverse effects. This would include boilers, water heaters, pool heaters, whether

there be gas-fired or oil-fired.

Fans in combustion appliances are used for moving air used for combustion with hydrocarbons. And they are an essential part of the combustion systems. Most of the combustion blowers that are used in high efficiency boilers and water heaters that would be affected by this rule are currently using fans with highly efficient ECM motors. And we use those because we do modulate our products, throttle them to meet load, and the ECM motors provide us the ability to smoothly, reliably, and stably adjust the speed, the RPM of our blowers, and match the air that we need for our combustion. And do that in a way that we'll provide for stable combustion.

I had some animation, but that's lost, but if you plot the resistance of air flow through our systems, then that would be depicted by these colored curves that are shown. The burner and heat exchanger, and ducting all create resistance to the airflow. As the efficiency of a heat exchanger increases, we tighten those passageways. We lengthen them. We do things to create more turbulence and increase the surface area that is making contact with products of combustion. And as you do that, you create drag or resistance to the flow, so you would move from the bar that is shown on the right towards the left, and have a greater differential pressure and a lower flow

rate with a given fan, or a high efficiency product.

Now, the point where the fan curve intersects the resistance curve, or the appliance, determines the airflow rate that we have. Now, for a given design of product, which would be depicted by that red line that is curving up to the right, we then adjust the RPM of the fan with the ECM motor control to modulate the airflow. And as you decrease the RPM on the blower, we're going to have a lower flow rate through our product. Again, kindergarten level for a bunch of Ph.D.s; I apologize.

Now, the one thing that maybe is different for the people in the room that are dealing with mostly moving air, as opposed to using the air to burn something, is the power consumption that's involved here.

So for most of our combustion appliances, the electrical power consumption of the fan is about .2 percent of the energy that is consumed in the process. The vast majority is used in the combustion of the fuel. That's where the vast majority of our energy consumption. The bar chart that is on the left of this slide, you'll see a bar showing the actual useful energy that we have in a 3,500,000 BTU boiler as an example.

And the orange part on top is the actual heat that goes into the water. The total tie to the bar would be how much energy is actually consumed in the system. And

the little blue bar on the bottom of that is our loss from the inefficiency of the appliance, which in this case, is about four percent of the total energy that's consumed.

Now, next to that is the fan power, which you can't see on this, because it is such a small contributor. So I took just the energy losses, the thermal efficiency losses, and moved those over on a plot on the right. So that's showing about four percent of the energy consumed. And then you can see how much of the fan power that's used there is useful power and potentially a waste, compared to the amount of energy that's consumed. It is a very small fraction of the energy used for combustion products.

Since it's unlikely that the fan rule will improve fan energy consumption by more than fifty percent in combustion appliances, that means that the energy savings will be less than .1 percent of the thermal efficiency of boilers and water heaters. That is a rounding error for us when we're testing efficiency. Any loss of thermal efficiency caused by the fan rule, would have to be less than .1 percent, or the fan rule would end up costing energy, rather than saving energy.

By limiting the allowable use of combustion fans to the highest efficiency window, some high efficiency

designs will be excluded or made less efficient. I'm going to look at two different examples, based on products that we manufacture. Our ARMOR condensing water heater which has a very, very restrictive air passageways and a high resistance to airflow of our combustion gases; and then another unit that we have, which is a commercial boiler, our Crest, which has high turndown rate, and has actually sort of two different stages of operation.

Now, these examples are Lochinvar models, but these concerns are not unique to Lochinvar. We are just representatives of the combustion products that have chosen to be here and speak before you. And also, I don't want to limit these concerns to the products that we're building today. This is also going to affect what we can possibly do in the future.

So the examples, as I mentioned, that we're looking at, there's a ninety-eight percent thermal efficiency commercial water heater that we have. This currently goes up to four million BTUs per hour input. And then the Crest boiler, which is a 96.2 percent thermo-efficiency product.

These products go up to six million BTUs per hour. The fans that you're regulating with one horsepower and more for these appliances, start at about a 1 million, 1.2 million BTUs per hour and going up, that would affect

our product if they're embedded fans in combustion appliances it's still applied.

So as an example, I want to start with looking at the loss of turndown, and this is using the example of our Crest boiler. The peak efficiency for fans may stop before the maximum RPM is reached. And there are many combustion systems that use the full range of RPMs, maximize and modulation the turndown ratio of the products. Now, I've been speaking with Arman about this. There could be some confusion between the data that I have for our products, and the data that he has, so we've been working on it. From the time that we were given the notice of this meeting, I think we had thirty/thirty-one days, and it was really not enough time for us to pull together really good data, so this is the best I can do at this point.

So what the Crest does, we can modulate down to a certain range, but as for any combustion appliance, we have to run tests and certify our products to show that they will not shut down if you have a forty mile an hour wind blowing against the exhaust. And then you also have to prove that they will shut off before they produce too much carbon monoxide if you block the inlet, or if you block the outlet, or if you block the inlet and the outlet, and to certain degrees. So we have to put in

safeties, pressure switches, things like that that will shut the unit off before it becomes unsafe, while still allowing operation over a wide range of installations. That creates some limitations as far as how much we can modulate and turndown without -- and still have proper safeties.

So what we did on this particular product is we added in an air shutter, an air damper, that closes and creates greater resistance in a second stage of operation, and still allows all of our safeties to function. Now, when we do that, that second curve for the lower input rate, falls outside of the FEI range for the blower that's used here, and would likely be out of other alternatives. So what that does is that limits our ability to modulate in match load. So you can see on the bar, where we would lose both the top end and the bottom end of our turndown. Now modulation and turndown of heating products is used to match load. To resist -- prevent off-cycle losses, so if we can just modulate up and down, and meet the demand for heat, we can stay on, percolate, say when there's a very low demand for heat, and then ramp up, as demand for heat increases. Matching load, high turndown ratio is something that is recognized by ASHRAE, by the consortium for energy efficiency in ACEEE as a valuable energy efficiency conservation

method.

The standby losses for heating system account for just .2 percent of the system input, then load matching saves more energy than the combustion fan consumes. Even if the limitations apply by the fan rule, say thirty percent of the possible fan energy, its --

Am I going on overtime?

MR. GALDAMEZ: Yea, but we're not going to interrupt you.

MR. KLEISS: Okay.

MR. GALDAMEZ: There's a business meeting across the room, and there's the subject that most people are interested here, so we're going to take a break, and then we're going to continue with your presentation, if that's okay? And we'll come back. So we're going to take a break right now, so people can attend the business meeting across the way. Thank you.

For those online, come back in ten to fifteen minutes the most.

(Whereupon, a recess was taken)

MR. GALDAMEZ: Okay, so we're going to get back at it. I think everybody's back, so go ahead and take it away.

MR. KLEISS: Okay. So Jeff Kleiss again, Lochinvar, and I was informed that I was going overtime, so I'm

going to try and speed things up. I also think there may be some questions that I'll -- we can hold those and come back to them.

So at any rate, I kind of covered the loss of turndown ratio.

The next thing that relates to loss of turndown ratio is this type of graph is fairly popular in modulating boiler literature, and it shows how, as you modulate, or have higher turndown ratio, you tend to get greater and greater performance efficiency out of appliances. Now, we only actually test and rate products at one hundred percent of input, but as you get turned down and go to lower and lower input rates, your heat input has a ratio of the surface area that you have to absorb that heat changes, and you tend to get better efficiency.

So putting that together, if you lose your ability to prevent off-cycle losses, and you've got an efficiency loss there, but in addition to that, if you lose the bottom end of your modulation, you could lose another one percent easily in thermal efficiency, which is greater than the total amount of energy that goes into your fan.

The other thing that we deal with, and this is more related to that ARMOR that I showed you, is about how restricted airflow can affect us. The ARMOR is our

latest and greatest heat exchanger. It is very, very restricted to flow, has a very high pressure drop as you get the airflow going through it, and it's the most efficient heat exchanger that we've ever manufactured. So the curve actually goes -- it's motor system goes outside of the allowable FEI range for the blower that we looked at. And we want to make sure that we don't end up getting into a situation where we're not allowed to build the most efficient products and can only supply lower efficiency products because we're falling outside of the allowable fan range for California.

In this case, we have a ninety-eight percent thermal efficiency product that we could potentially not supply in California, because we're not in the proper operating zone for the fan. However, we could sell an eight-five percent efficient product in its place with a fan where we would be operating in the proper zone. At best, the difference in the electrical power consumption of the fan would be about .1 percent of this efficiency. So you would have potentially a loss of 12.9 percent efficiency because of this.

So it's our request, our recommendation, that embedded fans used for combustion air for products, including water heaters, water boilers, pool heaters, that they be excluded. That the potential losses could

be 10 to 200 times the electrical power consumption that you're going to be saving.

Thank you.

MR. GALDAMEZ: Actually, we can hold questions until the time later. I'm sorry, because we're running low on time, and we have, like, five more presentations.

We're going to have a presentation by Michael for AMCA International.

MR. IVANOVICH: Good morning. This is Michael Ivanovich. I'm with AMCA International. I'm going to be presenting jointly with Joanna Mauer from the Appliance Standards Awareness Project. And we're here, not to give a fairly technical presentation, with just a pretty much talk about the origins and status of the team that went into developing a joint proposal for standalone fans.

So just a quick outline. We'll talk about the joint proposal team, the joint proposal scope, and primary elements, and then Joanna will talk about the CEC staff proposal and support for the joint proposal going forward.

So as Trinity mentioned, AMCA International is a not-for-profit manufacturers association. We got more than 130 member companies with consensus through the Fan Regulation Committee that are involved with fans.

The proposal also includes work from the efficiency

advocates, which includes ACEEE Staff, Northwest Energy Efficiency Alliance (NEEA); Louis Starr is here from them, the National Resources Defense Council, ACEEE, and then also the California IOU, including PG&E, San Diego Gas and Electric, CE, and SoCalGas.

A lot of the joint work that we've been doing collaboratively started in 2012. There was initial private negotiations between AMCA and the Efficiency Advocacy Organizations, very early in the DOE rulemaking process. That team also began to work together as part of the ASRAC working group, and then also we've been working together, not in that kind of capacity, but just some loose affiliations with an ACEEE-led rebate program for motor-driven loads. And that would be covering fans, pumps, and air compressors.

So while DOE was actually regulating or developing regulations for all three of those product categories, those three categories respective teams manufacturers associations, advocates, and California IOUs were working together to do rebate programs around those. Matter of fact, the pump rebate program under EMPLI is already in effect now with PG&E.

And then also when California decided to pick up the rulemaking after DOE shelved theirs, the teams continued to work together on that, leading to the joint proposal

that was submitted for standalone fans.

During this time and since then, AMCA standard 90.1, the energy efficiency standard for commercial buildings, low-rise commercial buildings has been under development, and there's now a draft addendum out for peer review until the end of the month. It's using FEI. And so the advocate organizations work with AMCA on that.

We also have AMCA 208, as an ANSI standard. That committee, because it's under ANSI, can include non-AMCA members participating in that, and that certainly was the case.

Then also, AMCA certified ratings program is governed by publications that define how products covered by the program are actually certified. Publication 211 is the publication governing and performance ratings. And for the first time ever, we opened up participation in that committee to nonmembers, not in the committee meetings themselves, but to provide input to the committee, and then to review the draft work that came out of that for FEI certification.

So there's been a lot of teamwork involved, but AMCA and the efficiency advocate organizations on fan efficiency, fan efficiency regulation, and voluntary programs as well.

And the goal of the joint proposal through

representing that body of work, has been to develop a logical and forceful energy saving approach regulating commercial and industrial standalone fans. And a lot of this work was meant to leverage the work that was already completed during the rulemaking. And then since the rulemaking was shelved, we continue to work together and participated in the AMCA standards, as well.

So the goal of the joint proposal was to take that body of work that already existed and fold it into a joint proposal to the California Energy Commission. So in terms of that joint proposal scope, it included the fan categories that you see here. I'm not going to read them all off, but they're kind of represented in the draft staff report that came out.

Some of the key issues are that it was in terms of size, equal to one horsepower or one kilowatt, and that the fan air power is less than or equal to 150 horsepower in terms of scope. And then these are really essential elements that the fans are tested in accordance with AMCA standard 210, which, by the way, is copublished with ASHRAE, as ASHRAE standard 51. Fans are rated for FEI in accordance with AMCA standard 208. And that the fans are manufactured on or after a date which is two years after the date of adoption, et cetera, et cetera, et cetera. So the FEI equals one for all types of fans that are

covered in the joint proposal.

Then we also mentioned, or worked in that in terms of compliance and testing that the proposal kind of ingested elements of AMCA 211, the certification publication. And then our proposed requirements reporting in marketing selection/software and labeling. So that the labeling things are in the joint proposal as well.

So what's going to happen now is, Joanne is now going to cover the proposal.

MS. MAUER: Shifting to the CEC staff proposal, we're pleased that the staff group will go first, standalone fans largely reflects our joint proposal and in particular, we're pleased that staff is proposing to adopt the FEI metric for the provided an introduction to the FEI metric, and we believe that really the significant advantage of the FEI approach is that it encourages not just improved fan designs, but better fan selections, which we know can result in very large energy savings.

The CEC analysis shows that the proposed standards for standalone fans would achieve very large energy savings for California and also electricity bill savings for California businesses. Staff estimates that the proposal for standalone fans would provide about 1,400

gigawatt hours of electricity savings annually after stock turnover, and about 230 million dollars a year in bill savings. And the staff analysis also shows that the proposed standards for standalone fans are very cost-effective, with benefit cost ratios of between 4:1 and 37:1, depending on the fan category.

For going forward, we continue to support CEC moving forward to establish standards for standalone fans. At this point, we're still reviewing the details of the draft staff report, but we look forward to continuing to work with CEC to advance this rulemaking. Thank you.

MR. GALDAMEZ: So just to let you know we're going to try to go to lunch at 11:30, to give everybody time to hit the restaurants before the rush, and then come back at 12:30, so we can continue the discussion. With that, okay, well, we have here, there'll be -- okay.

MS. MAUER: All right. So I just wanted to provide some brief comments from the efficiency advocates regarding embedded fans.

So the efficiency advocate submitted a proposal to CEC last September proposing standards for embedded fans. And in that proposal, we reflected the ASRAC term sheet from the working group, including the scope of coverage, the test method approach, and labeling.

In our proposal, we proposed the same exemptions as

those that were in the term sheet for fans that are embedded in equipment that's subject to a DOE standard, for which the efficiency metric captures the fan energy used at least to some extent.

We also proposed additional exemptions that are also consistent with the term sheet for additional equipment types. For example, fans embedded in transport refrigeration equipment, heat rejection equipment, and air current.

Our proposal for the test method approach aligned with the working group recommendations to test embedded fans, add standalone fans outside of the equipment, and then we also proposed labeling provisions that were also consistent with recommendations that were in the ASRAC term sheet.

In our proposal for embedded fans also aligned with our separate joint proposal of AMCA and standalone fans, including proposing the same standard levels.

Our proposal for embedded fans would provide a number of benefits, including capturing a significant energy savings opportunity for California, reducing burdens on OEMs in those cases where the energy use of the fan is already captured, at least to some extent, in the DOE efficiency metric, by exempting those fans from the scope of coverage. And then also, creating a level

playing field for fans in OEM equipment that would be part of the scope of coverage. So in these cases, the fan would be treated the same, subject to the same standards, regardless of whether the OEM was purchasing a fan from the fan manufacturer, or whether the OEM in effect was the fan manufacturer.

So the recently finalized AMCA 208 standard allows for applying the SEI metric equally to both standalone and embedded fans. Following the term sheet, AMCA 208 specifies that embedded fans can be tested as standalone fans, outside of the equipment, and then AMCA 208 also specifies that for embedded fans, the FEI is calculated based on the airflow and RPM of the fan, as embedded in the equipment. So for embedded fan applications where there are cabinet losses, the pressure provided by the fan when it's tested outside of the equipment is necessarily going to be higher than the pressure provided by the equipment when the fan is embedded due to those cabinet losses. But the approach and AMCA 208 means that you don't need to know what those cabinet losses are, and that's because any fan operating point can be described based on airflow and RPM. So FEI for any design point for an embedded fan can be calculated based on a design airflow and the RPM that's required to deliver that airflow. And similarly, embedded fans can be labeled,

based on the FEI at that design flow and RPM.

So we're pleased that the staff proposal for embedded fans largely reflects the efficiency advocate's proposal, as well as reflecting the ASRAC term sheet. CEC's analysis shows that the proposed standards for embedded fans would achieve significant cost-effective saving for California, about 430 gigawatt hours per year, and 300 million dollars per year in (indiscernible) savings after stock turnover, and benefit cost ratios are between 3:1 and 5:1.

Just in conclusion, we continue to strongly support establishing standards for embedded fans, and we look forward to continuing to work with CEC. Thank you.

MR. GALDAMEZ: Thank you so much. Let's see, who do we have next? Oh yeah, there's a comment -- go ahead.

MR. ERNST: This is Skip Ernst with Daikin.

So that was embedded fan discussion. Were any embedded fan manufacturers involved in your considerations?

MS. MAUER: The proposal that I was referring to was the proposal that was submitted by the efficiency advocates, but as I said, we really were trying to draw from the ASRAC term sheet, which, of course, did include the participation of many, many (indiscernible).

MR. ERNST: But almost all of those manufacturers

did not agree with the term sheet.

MS. MAUER: That's not my recollection. My recollection is that only one -- well, HRI and one manufacturer voted no, and everyone else voted yes.

MR. ERNST: Not on the energy savings and things like that.

MS. MAUER: I'm not sure it's worth getting into this, but at the end of the day, there are only two no votes on the entire term sheet.

MR. STARR: This is Louis Starr with NEEA.

One thing I'd like analysis, ASRAC meeting went on all summer long, and I can tell you there's lots of things on there that I really don't like. That's why it's called negotiation, and the idea that fan manufacturers weren't at this, I think the meeting I had with the fan and fan manufacturers back on July 11 when we went over this stuff. The stuff that ends up in the term sheet is negotiated rulemaking, and believe me, there's plenty of stuff that I don't like in there, and that's how -- that's why you have associated rulemaking. But the ideal is this is not what we agreed upon and, I asked Mark -- I can't remember the guy's name, but it is true, there are some manufactures that (indiscernible) they always get to, much to the way I was much against some of the things in there, too, but that being said, we

spent a lot of time and effort. We had a couple million dollars sent by DOE to come up with the stuff, and time and energy, and ample opportunities to put benefits in, or put information in, so to say that this was not consensus process -- I mean, I can understand that people would be not in favor of certain things, just as much same way I'm not in favor of certain things that are on the term sheet, but ultimately, the reason we stuck with the term sheet, and we had many discussions about it, too, is that it was a consensus of what negotiated rule of the manufacturers and advocate was. You know, our hope is is that manufacturers will stick to that agreement.

MR. GALDAMEZ: (Indiscernible). There's one online. Go ahead.

MR. WAGNER: This is Greg Wagner. A couple things. Regarding the ASRAC term sheet, there are a couple things that are different about that then what's proposed. One, which is the embedded part in that agreement was that if DOE could find legal cause or legal reason to cover those, they would, but they never found that. That was never defined for that.

The second thing is (indiscernible) is not the same as what's being proposed here by AMCA. AMCA (indiscernible) and does not -- is not consistent with

what the term sheet had, and finally, the (indiscernible) embedded equipment in order to get that second curve they need a test procedure for embedded equipment to be able to get the second curve in order to have something that is consistent with being able to label it.

MR. GALDAMEZ: We are going to go for that one line, and then we'll go to the next presentation.

MR. TIMOTHY: John Bade, you're unmuted.

MR. BADE: Yeah, this is John Bade of Johnson Controls. On the proposal for the marking of the embedded equipment, I do not believe that there was anything in the ASRAC that suggested that the embedded equipment would be marked with an FEI and then some kind of, and always have a total pressure, so, you know, embedded equipment probably, just so often has a fan that would fall under the static test, as they do on the total, yet the proposal really only - the only thing it talks about in the actual language, it just describes how the equipment should be tagged, and it specifically says that it should be based on total pressure. Boy, if that was in the ASRAC, I sure don't remember that. There are a lot of problems with that that I won't go into here, and I will put in my comments, but, you know, there are ways you can apply FEI to embedded equipment, but not what was written in the code.

MR. GALDAMEZ: Thank you. We just going to go to the next presenter Mark Lessans, Ingersoll Rand. Ingersoll Rand.

MR. LESSANS: (Indiscernible).

MR. GALDAMEZ: That's (indiscernible) man.

MR. LESSANS: Yeah. That's all right. Thanks Alex. For those of you that don't know, Ingersoll Rand is a diversified industrial company. We, through our brands Ingersoll Rand, Trane, Thermo King and Club Car, make a lot of different types of equipment that serve a lot of different industries. But the regulation on fans and blowers will actually have an impact on potentially a number of those different businesses that I'll get into.

But ultimately what I'd like to do today is walk through some of the practical impacts that what has been proposed would have on Ingersoll Rand as an original equipment manufacturer for a lot of these products, many of which are already required to meet an energy efficiency requirement and an energy efficiency regulation, and also I guess note that or recommend that really the -- a much more effective way to get the energy savings that are really being targeted would be to address the sole energy performance of that product through a rating rather than attempting to regulate the equipment that's embedded inside of it.

So as I indicated there's I suppose two key issues that we have with what's been proposed in the GEC staff report language, and really, I suppose in that regard too, recommendations that we would make in order to improve it.

The first would be to be more explicit in the exclusion of fans that are embedded in any product that has to meet an energy efficiency regulation. I suppose from our perspective, logically it doesn't make a lot of sense to only exclude products that have -- that are regulated by DOE appliance standards, but similarly, products that are regulated for energy performance by California Title 20 and California Title 24. The logical argument for why to exclude those embedded fans to us is essentially the same argument. And we would really note that instead of attempting to drive energy savings through regulating those fans, a much more effective alternative would be to address the energy efficiency requirements that are already in place or will be in place for a lot of those products, through a lot of the existing mechanisms that the CEC, and in some cases that was CARB, already have in order to set state policy for those products.

In addition to that, there's a few clarifications that have led to some internal confusion for us,

specifically around heat rejection equipment and how that's defined, as well as I suppose the way that language is being interpreted around transport refrigeration equipment that's led us to question whether some products are or are not intended to be in scope.

For us, the real issues with regulating embedded fans in a lot of this equipment is the fact that in many to most cases, the products that we're asking to be -- that we're recommending being excluded, you cannot improve the fan efficiency without increasing the fan diameter and ultimately leading to a redesign, re-optimization requirement for that product.

The CEC staff report cited one example that we already discussed a little bit today, which is that you could move from a square in-line fan to a mix flow fan to improve efficiency without increasing diameter. But those fans are only designed and rated for long duct runs and are not used in commercial unitary equipment. An attempt to put that fan in a commercial unitary air conditioner would significantly decrease its efficiency given the other components that are inside of that air conditioner and really just throw up the whole way that that product is optimized.

Instead, those products use centrifugal house or unhoused plenum fans and there are no commercially

available fans that we have been able to identify that can have the FEI improved without either increasing the footprint of that fan or dramatically reducing the operating point that that point is allowed to run in. In either case, that would force us to have to redesign those and reoptimize those products.

As a result, there will be a number of negative, unintended consequences if this language is put into effect in regulation. The first event would dramatically disrupt the way that we design and optimize our equipment in -- with the equipment that I've been discussing here, all these products are comprehensively designed and engineered to maximize efficiency and really achieve a efficiency rating that it must meet. If you instead force us to put a different fan in there and we have to redesign the entire product, it's still going to be redesigned around that efficiency rating that it has to meet, and it will nullify a significant, if not all, the energy savings that you would get.

Additionally, there are some energy efficiency features that can -- that would be degraded in a lot of these products, the best example that we could point to is in the economizing function in a commercially unitary air conditioner. If you restrict the operating mass of a release fan in a unitary air conditioner to the point

where it can no longer properly economize, the compressors will run longer and harder, and the unit will absolutely use more energy.

Finally, like every other company, we have to prioritize where we put our innovation dollars into improving our products. And if we have to redesign and reoptimize our entire portfolio around a new set of fans, that will eat into our ability to improve our product line for higher levels of efficiency as well as to accommodate alternative refrigerants, both of which we have existing plans for, but that would be significantly disrupted if we had to redesign our entire portfolio to meet a fan standard.

So we tried to, in the time that we had, do a product level analysis of what it actually meant to require a FEI of 1.0 in embedded fans in a large commercial unitary air conditioner; and this is one that is not regulated by DOE for IEER but is -- you can find the IEER requirements for this air conditioner in Title 24. It is regulated for its performance.

First we took that unitary air conditioner and put it on top of the ASHRAE headquarters building and placed that building in Sacramento, California, and ran an energy model. And the numbers that you see on the left are the total amount of electricity that's consumed by

each of those fans. And it's -- and so this is -- it's important to note that this is not based on AHRI 34360 to the extent that we made those types of assumptions. This is based on what we saw out of the model when it was run through an energy model.

We then made an assumption and without actually redesigning and reselecting the fans, we just held the allowable energy consumption of those fans to what it would be if they met and FEI 1.0 requirement and the theoretical maximum energy savings that we got, that is the energy that would be saved before we have to redesign the product around that IEER would be around 12,000 kilowatt hours per year. It's important to note that that is a theoretical maximum. Once we have to redesign that product, we will do so around that same IEER requirement, and so that will nullify almost all the energy savings that you get. The cost to do that though, the increase in cost that the consumer will see for that new product based on some analysis that we have conducted and submitted to the CEC -- we estimate that would be -- that would increase the cost of the seventy-ton rooftop unit by $17,000. That comes from an estimate of $246 per cooling ton, and that's an assessment that we'd done across our entire unitary portfolio for those products which have a fan in it that does not meet an FEI of 1.0.

We also had a brief discussion about this analysis presentation; the example that was shown was provided by Trane, that was one fan in one rooftop unit that happened to meet an FEI of 1.0 at all of its operating points. I can tell you that a majority of the fans that we're looking at do not and we're looking at substantial product redesign. It's also important to note, as I said before, that almost all these fans are captured by the IEER efficiency metric and so they're already regulated by -- their energy consumption, with the exception of the release fan is already captured by IEER.

Similarly, we did a -- we did this -- we tried to do this process to the greatest extent that we could for industrial air compressor, which does contain a heat rejection fan, which we are, I suppose, unclear right now whether or not that is intended to be in or out of scope of what the EC has proposed. These fans currently are not designed to any kind of FEI metric, so we did the best we could. And so for the sake of argument, we assume that the heat rejection fan in that compressor was improved by ten percent. Again, the theoretical maximum energy savings, you get are 800 kilowatt hours per year for that fan.

That said, like the unitary air conditioner, it would have to be completely redesigned and it would be

done in order to meet the isentropic efficiency rating for that product. But the product itself would have to have a larger product enclosure, like the unitary air conditioner, and be completely reoptimized for efficiency.

So as I indicated at the beginning of these comments, I'm not here to tell CC or anybody else that we're afraid of having our products regulated and that don't support energy efficiency regulations, even aggressive ones, for our products. That policy mechanism actually aligns quite well with what Ingersoll Rand has determined is going to make us successful long term and certainly aligns with what California has laid out as its higher level long term goals for carbon reduction energy efficiency.

What I want -- my goal and really what I want to communicate to you today is that there is a much better way to get through actual guaranteed energy savings, and that is through addressing the energy efficiency ratings rather than the components for a lot of these products. For the two examples that I gave, CEC has the authority to do that today, and they are -- they could do that through Title 24 for air conditioners, and they are -- they've started -- they've opened up a rule-making docket to do that for air compressors. And for the majority of

the products that we have, that we're asking to be excluded, the California Energy Commission has the ability to do that today.

So that's everything that I have. I thank you for your time and I will certainly -- will go into much more detail on our comments and happy to answer any questions that I can at the appropriate time, to the extent that I can. Thank you.

MR. GALDAMEZ: So go ahead. One more comment. Just last comment because we're going to break for lunch after this.

MR. STARR: So this is Louis with NEEA. So I think an important thing here is I saw the total energy being five percent of an energy model, so in northwest we do a lot of energy modeling of our buildings. And I'm -- first of all, I guess it'd be helpful to see what your modeling is, but I don't think that five percent of the energy is the total energy used or HVAC is only five percent. I think it's more like fifty percent. So we've got a pretty disconnect on that number, but maybe you can help me understand that.

MR. LESSANS: Just to clarify it was about eighteen percent from the fans. The relief fan was, I believe, three, three and a half percent, the supply fan was five. We'd be happy to share that energy model that we've done

with you. But again, we're talking only about the energy that's being consumed specifically by that unitary air conditioner and not any of the other air side products that are -- that fall outside of that box.

MR. STARR: Okay. Well in the case -- the 760,000 stuff is not covered by any regulation now, right? (Indiscernible)

MR. LESSANS: That's not true. That -- Title 24 sets an IER requirement for that product.

MR. STARR: You're just looking at it as a general thing. Anyway, I mean my takeaway is so the supply fan and return fan --

MR. LESSANS: Do I need -- I'm sorry. Do I need to clarify what it means for Title 24 to set an IEER requirement for that product?

MR. STARR: Yeah, sure.

MR. LESSANS: So all -- you cannot put a product that does not have an IEER of really, I believe it's 11.2 -- you cannot sell an air conditioner that does not meet that requirement in the state of California because of Title 24. We --

MR. ERNST: Or eleven (indiscernible).

MR. LESSANS: Thanks Skip. We don't make any air conditioners that fall under that requirement because that's also what's in 90.1, and you can -- that's -- it

would be illegal based on Title 24 for anybody to put that product in on a building in the states.

MR. STARR: So I guess your point is that essentially you have a regulation that you need to meet on supply and condenser fans of 11.2 and then the remaining five percent on relief fans.

MR. LESSANS: 3.6 percent.

MR. STARR: Yeah, three six percent. So okay. Well, that's helpful. So in other words, in general in this centrifugal box, if you looked at everything, maybe more -- a higher number like fifty percent or something less -- I mean Sacramento, I think is five, so at a different climate, it's probably more standard -- But I look at this in general and say this is a product that's not regulated at all right now. I mean I know Title 24, but the Title 20 standards, there's no requirements on it, you went with the whole fan (indiscernible) so I get that part.

MR. LESSANS: I guess I'm having trouble why it really matters whether it's Title 20 or Title 24? We -- it's similar to -- just like with a DOE appliance standard for this product, it can't -- it would be illegal to sell this product in the state of California that doesn't meet an IEER rating of 11.2 or 11.0 depending on the heating element. That's not -- that's

the law in the state.

MR. STARR: Right. Well I'm just -- I'm trying to get (indiscernible) the opportunity is and --

MR. LESSANS: So I guess, I'm not sure. I mean we can talk about this online plenty, but all I'm saying is that the only portion of that electricity consumption that isn't already regulated by the IEER, is that relief fan. And the other issue that you run into, as I mentioned, is if you start limiting the operating map of that relief fan to the point where it's compliant with a FEI of 1.0, that product will not be able to operate in free cooling, which means it will use more electricity, not less.

MS. ANDERSON: And for Title 24, is that a new construction requirement? Or is that -- because it's --

MR. LESSANS: Not for replacement. If you're replacing a like to like product, it has to meet the new requirement in that efficiency table. You can't ignore those efficiency tables in -- for replacement equipment.

MR. ROY: Yeah, Mary , this is Aniruddh Roy with Goodman, just to comment on what Mark said, I think he's referring to table 110.

MR. LESSANS: I can --

MR. ROY: Which then in Title 24 would be -- so I think Mark is referring to table 110 which -- or tables

110, in section 110 A or B which sets the EER and IEER levels, which I think then get referenced on both new construction and additions and alterations.

MR. LESSANS: And additions and replacement of a rooftop unit, it's pretty clear that in the additions and alteration section of Title 24 and 90.1 that that applies to the energy, the IEER and the EER requirement for that rooftop unit.

MR. GALDAMEZ: Last comment because we got to break for lunch, otherwise we're going to be late. Do you want to do it or no?

UNIDENTIFIED SPEAKER 3: So just real quick, one thing I would say. Even just on return fan, if you think about it, how are you going to drive -- this is the release fan, return fan -- how is the efficiency going to be driven to more -- in other words, how is the market going to say hey, I want to -- the design engineer says I want a really efficient fan, and how would the manufacturers be encouraged to provide that? What's your -- is it just in picking up the IEER, you think that we'd catch it, since it doesn't catch the return fan? You're saying -- help me understand that.

MR. LESSANS: I guess we're rarely asked that question because the importance of that relief fan is to allow that system to do free cooling. If it's -- in its

normal operation, it actually generally will -- like in its operation, when that system's providing conditioned air, it's going to fall generally in a FEI of 1.0 operating range. The reason for that 3.6 energy -- well, the reason for its higher energy consumption is when it has to work harder to depressurize the building because it's providing a lot more ventilation air because the compressor operation is required less.

So I guess yes, we're always looking for ways to save energy in our products, but we -- that -- to redesign our product around an economizer fan is just -- it would be unheard of from a system's efficiency perspective.

MR. GALDAMEZ: Okay. So we're going to let this conversation go for later. We're going to break for lunch right now, and I'll see you guys in an hour. Thank you.

(Whereupon, a recess was taken)

So we're going to go ahead and start the second part of this incredible meeting. Woo-hoo. Yeah. So we're going to have PG&E, do a presentation right now. So if you can come to the podium and we can get this rolling.

All the people online, thank you for your patience. Sorry, we are starting a little late. Just getting the presenters back in the room.

So there's two ways you can use the page down, you just got to be a little firm with it. Or you can use the mouse and use the little arrow here on the right. Okay?

MS. ANDERSON: So I just wanted to start this out, and I'll introduce our team. My name is Mary Anderson from Pacific Gas and Electric. And this presentation is on behalf of PG&E, Southern California Edison, and SPG&E, as part of the codes and standards program. We are first of all, very grateful to the CEC for undergoing this rule-making. We think that there are significant savings through regulating fans both standalone and embedded. And the -- what we're about to present is some of our analysis that we think -- we'll look at embedded fans and some of the potential energy savings taking into account some of the -- the comments we've received up until this point, especially from AHRI.

And so I'm going to have Chad come up and go -- Chad Worth from Energy Solutions come up and give the overall presentation. If you have questions or would like to provide additional data to us to kind of edit what we put on the docket, we are happy to do that. Please either send any inquiries to myself or to Chad, and we are happy to sign NDAs. It's not the quickest process but no NDA is. And we are happy to change and learn more about what the concerns and the interests of the manufacturers are.

MR. WORTH: Thank you, Mary. And thanks all and the CEC for having us this morning and this afternoon. Again, my name's Chad Worth, I'm with Energy Solutions and a consultant on behalf of the statewide codes and -- IOU codes and standards team.

The IOUs have been fortunate enough to be involved in this process with many of you for a number of years back when, I think, it first kicked off in 2011. We participated in some of these voluntary private negotiations early on with AMCA and the rest of the efficiency advocates. We are also on the ASRAC negotiated working group, we commented on the NODA III, and in 2017 we responded to the CECs invitation to participate with some information, and then also worked with a number of stakeholders including the AMCA group, and we're signed onto the joint AMCA advocate proposal for standalone fans and signed on to the joint advocate proposal for embedded fans. And obviously in 2018, AMCA 208 is finalized. Good job, everyone, there, and we are continuing to work with efficiency advocates and the industry and working specifically on updating key data inputs to assist CEC in their analysis.

At a high level, this is kind of as I mentioned already, we broadly support what CEC -- the CEC staff proposal. It's going to lead to a lot of cost

effective -- well, energy savings statewide, all benefit the cost ratios, there's 3:1 or greater and the staff report covers the scope that was outlined roughly in the term sheet covering standalone and embedded fans.

This has been talked about already, and I'm sure we'll talk about it more -- the scope inclusion of embedded fans -- but for some of the reasons that have already been stated, we support the inclusion of them within the staff report as it helps level the playing field for fans and OEM equipment. So they're treated the same whether they're as a standalone fan that often ends up in embedded equipment, or if it's manufactured in-house. We think it'll help make the fan standard more enforceable to have to cover embedded fans as well. And of course, most importantly, it leads to additional energy savings.

We do have some recommendations to the fan shipments. So we looked at a lot of the information that came in on the docket last September and reviewed a lot of that very carefully and our -- it helped inform a lot of our recommendations we're going to be making to the energy commission. And the whole -- the intension of revising the number of these inputs is to give a more accurate estimate of what the impact of such a regulation will be in California. Our overall recommendation about

the standard levels has not changed, but we think this will give a more accurate portrayal, and we look forward to continuing to update this as the process goes.

We looked at some of the rooftop unit comments that came in and some of the suggestions of what the CEC should use. We, generally, due to some of the market conditions in California -- the Title 24 requirements at large --, they require economizers and we have some suggestions on the shipment assumptions California should use in their analysis, and we'll be docketing those. We also looked extensively at the air handler unit shipments and looked at that from a number of different angles and appreciate a lot of the information that was put on the docket, and we'll be suggesting some revised air handler unit shipments, similar with air cool chiller fan shipments and some of the suggestions that were put on the docket. And we've also added a few shipments that were not previously included in the NODA III analysis such as DOAS equipment and coil units, and ERV, HRV, fan units, that all fall within the scope of the staff report and the term sheet.

With -- what we'll be putting on the docket to -- again to help CEC with analysis are some updated unit energy consumption values. Here these are just shown at a high-level rule, embedded and standalone into one. We

will be providing these separately on the docket. These reflect some of the changes to AMCA 208 and just overall changes to the shipments that were previously described and how that impacts the representative sample. And similarly with the incremental measure costs, we'll be providing this broken out to CEC.

We'll -- as many others here we're learning a lot and continuing to review the staff report, and we'll likely be working with other fellow advocates and stakeholders to develop further recommendations and opportunities for improvement. So far, we've kind of been looking a lot at the labeling and reporting, and we look forward to putting some of those comments down in writing.

So in summary, the IOUs commend CEC on a strong and thorough staff report. We support the current scope as defined, we plan on docketing updated information that will assist CEC in giving an accurate portrayal of this regulation in California. And of course we look forward to the continued dialogue with everyone here and other stakeholders we've been working with. Thank you.

MR. GALDAMEZ: I think there's a question online.

MR. TIMOTHY: Ron Chevic (ph.), you're unmuted. Ron, do you have a question?

MR. CHEVIC: I'm sorry, my question was, I'm trying

to get the video. I lost the video connection. I thought maybe you guys would have the video up.

UNIDENTIFIED SPEAKER: Okay. We'll work on it right now.

MR. GALDAMEZ: Right. Okay. So well, while we fix that, we're going to have AHRI go ahead and present? Let me show you how to --

MS. PETRILLO-GROH: Shouldn't have touched it. All right, good afternoon. I'm Laura Petrillo-Groh with the Air Conditioning, Heating, and Refrigeration Institute. AHRI represents 300 plus member companies in the heating, ventilating, air conditioning, heating, refrigeration, and water heating industries.

We, as there will be no surprise to anyone here, have significant concerns with this regulation. We understand that the work that the CEC staff has done has been very good considering the complex nature of this regulation, and we look forward to working with you all to make something that is actually achievable, is energy for the state, the consumers and the businesses of California and manufacturers are able to comply with.

Just to give you a high level of our concerns, we see at this point California moving ahead with an extremely complex regulation for a product that has not been defined, which as proposed violates federal

preemption based on incomplete and essentially draft analysis on an accelerated rule-making and implementation schedule that stands to increase energy use in embedded applications, and I'll go over some examples which illustrate a reduction in FEI for variable flow systems, or with reduction subsistent pressure drop. Both measures absolutely and clearly reduce energy consumption, and which will confuse and increase costs to California businesses and consumers.

So regulated products, all fans in all regulated products need to be exempt from this regulation -- federally regulated products as well as California regulated products. For federally regulated products, the ASRAC working group list is incomplete and we have, as Ingersoll Rand mentioned -- Mark mentioned -- there needs to be additional clarification for transport refrigeration fans that can be plugged in to the grid. There are a number of additional products which need to be excluded, clearly, from the scope, including small commercial or split system air conditioning and heating equipment that are three-phase with a cooling capacity less than 65,000, as well as hydronic heating and burner fans. For those products, there was no analysis, and they served different functions. Similar to CEC highlighting that fans and vacuums are not used for air

movement for ventilation, these products, as detailed by Jeff and Lochinvar's presentation, are precisely matched to burner and heating applications and stand to increase overall energy consumption if are required to comply with a FEI.

We also have refrigeration systems. We're not included on that ASRAC working group list and should be excluded from the California regulation. Also as previously mentioned, there are products which have product performance or performance and Title 24 requirements which should be exempt from this, including very large equipment over 750,000 BTUs, commercial split condensing units, air cooled chillers, and central station air handling units.

We have discussed the problems with economizer fans and with heat rejection fans. There's no definition in the California draft report, and we support what was proposed by Cooling Technology Institute as part of the ASRAC negotiation. We also see problems with the availability of replacement fans for any product that needs to be repaired rather than replaced in the California market, if we're not allowed to replace a fan, like for like applications. But I cannot say it strongly enough, that all fans in all regulated equipment need to be exempt.

So the DOE NODA III analysis requires pretty significant corrections. We had supplied that information to the Department of Energy and to CEC as part of the AHRI proposal for this rule-making submitted back in October of last year. The major errors that we saw are the air handling unit annual fails, the percent estimated return, return air fans and exhaust air fans on unitary equipment, the number of air cooled chiller condensing fans per unit, and the underestimation of development costs. We appreciated the information provided by CEC staff today on how we can provide better -- or the information that you need to move forward -- how we can do that, we'll need to have further conversation on I think -- but these have been extensively detailed in our previous work for this proposal -- for this regulation.

Let me go over some of those though, for those that have not read our proposal. We clearly detailed required changes to the DOE analysis for the national impact analysis and the lifecycle costs in our proposal. The face case shipments for California is different from the national average. The -- there were also errors in referencing in those DOE spreadsheets that we provided a -- information on to CEC, it would need to be adjusted so that the calculations would be able to be complete and

correct. The equipment costs, again -- we'll provide more accurate numbers based on the feedback that was provided at today's meeting. And then the California electric rates and TDV should be California specific information should be accounted for rather than the national average.

Specific to centrifugal fans -- this report I keep referencing -- I'll go into more detail in the next slide, but it's from the US Department of Commerce, current industrial report. And it was the best information that was available at the time when the report was originally -- or the analysis was originally started. However, since that time, a revised report has been issued and we hope it wouldn't be that difficult to make a correction of a government report in the analysis. For percentage of commercial unitary units with return exhaust fans, we provided a more accurate percentage, which was the best information we were able to provide without going into specific market shares of our manufacturers.

We need CEC staff to look at the existing power limits and other provisions that are already in Title 24, any design -- any product sales or design of a system in California needs to comply with Title 24. In the staff report, there was mention that major renovations would

not have to meet provisions in Title 24. However, that's not how the Title 24 department here sees it. They are -- any new major piece of equipment is a retrofit and needs to be permitted. It goes through the permitting process as a major alteration and needs to comply with any efficiency standards in Title -- or referenced in Title 24, or any of the prescriptive or performance measurements as well. So I think that that part of the staff report needs to be looked at.

So the major change you see in the Department of Commerce current industrial report revises the number of units shipped between, I guess, 2004 and 2005. And the change we think is due to -- looks like is due to a high-sales volume product, which would most likely be a room fan coil, many of which are outside the scope of the one horsepower lower limit. And as we provided the information in our draft proposal, the revised numbers align with our AHRI statistical reporting, which we cannot release at this time. But we gave a rough estimate as much as we could of what the numbers are actually for central station air handling units, and this much more closely reflects that number.

It also provided additional corrections to the analysis regarding panel slant fans, which we think that the DOE got wrong and incorrectly characterized as

independent products. And virtually all these panel fans that are embedded are required to meet efficiency standards in Title 24 or 90.1. The remote -- there were problems with incorrect characterization of products using commercial refrigeration as well. And as many manufacturers had mentioned, any change of the fan will end up rebalancing the energy -- the product design rather than saving energy. There was incorrect but offsetting shipment data that we outlined in our report as well. So we would like that corrected even though it mostly -- the errors mostly offset each other. So for commercial water heating and boiler fans, I won't dwell on this, however, any federally preempted products should not be included in this regulation.

After we provided our -- we went through a detailed analysis for a proposal which really excludes embedded fans. We wanted to give the potential energy savings for the US and what that looks like with all these corrections, and it revises down to a much more - the original NODA is not correct for the embedded fan performance.

So we do acknowledge that the NODA III data is the best available data; however, it's still a work in progress. There were known substitution issues that are stated in that report, and the lack of the individual

Monte Carlo test makes that -- makes further analysis extremely difficult. And we think that California needs to undertake its own analysis with maybe the NODA III as a starting point. But rather than just make edits to and change that, it needs to be much more complete and really reflect what the market is doing in California with different base line. There's much more stringent building codes in this state than there are in the national average, and the opportunities for savings are not as significant as you would get if you just looked at the twelve percent of the energy savings from that NODA III.

So as I'm running short on time, I can let John Bade -- we can put John Bade on -- take him off of mute and let him present because he provided these pretty great examples.

But we wanted to show where you see FEI increasing and not an increase in overall energy savings for the product. There are three ways to reduce energy consumption with the fans. And you can either use a more efficient fan transmission, and or controller, you can make a system truly -- or variable volume air flow, or you can reduce the pressure required to circulate the air by specifying and installing larger ducts and larger components, which have a lower pressure drop. However,

only one of these three options will improve FEI. When you add a variable speed drive, you could end up with a lower fan efficiency. In the illustration we got static pressure on the Y and the air flow on the X-axis; in illustrating changes in system design, airflow and fans are fixed, and the flow resistance is reduced. So you see that only in the top left part of the selection bubble for these -- shaded for where the FEI is greater than one, will you end up with increasing FEI for when these changes are made. However, all three of those yellow arrows and anything to the right of the peak efficiency line will yield a lower FEI when you reduce the flow.

We also see that for these two different -- these are real air handling unit selections with identical fans, motors, and transitions with identical performance except for the fan break core style performance at the design point. The selection criteria is outlined on the screen, and the differences between the two units -- that unit b has a larger cabinet, larger coil, and filter face areas, and a larger entrance and exit opening. What you see that the -- that you end up with a lower FEI -- I'm sorry, a higher FEI for a higher rate horsepower. And I know that these are different duty points, but it may not be the most appropriate metric for an embedded fan

application.

So we also notice that in these two examples, this is unit B, with and without a VFD and adding -- where you see the VFD added, the calculation for an FEI was actually lower, and this was for the same duty point.

So we're having trouble seeing how this metric works for embedded fans with no energy saving measures taken. I think at its core, this entire metric is -- it's, in regulation, is an application-based metric and belongs in Title 24. There's no fan selection being knocked off; there's no sales that are -- you can't enforce the sales of these products except through Title 24, where there's design criteria and the ability to select a fan with an FEI that stands alone. You don't have to include a fan that's an emergency fan in that -- in Title 24. But defining those features in an appliance standard is extremely difficult from what we've seen.

I can't remember who, but it was definitely mentioned that the first public review for addendum AO was released, so I know that California has had the opportunity to see that and comments are due July 29th. However, I think California should and actually would be required to consider this as a introduction of this regulation in Title 24 as a viable alternative to a regulation through Title 20.

So the other ways that we can encourage more efficient design systems in Title -- in an appliance code would be to require variable flow operations meeting regs for certain products. And there are ways to address these issues that I've discussed here in different ways, but I think we have to think outside of the box -- sorry, bad embedded fan joke. Thank you for that obligatory little laugh; it's a tough audience.

So looking again at the fan pressure rise, we want to make sure that's it clear that consumers -- that a higher FEI does not necessarily result in energy savings when two fans are not operating at the same duty point are compared. And that would include the system, the cabinet effects within where the fan is embedded. So we've proposed some ways to clarify the definition of FEI, and we'll put those more in written comments.

So we also see some pretty big -- we also have some concerns with the labeling and reporting that was proposed in the draft staff report. There are issues with fan serial numbers not existing, with the ways the basic model groups are laid out, and how we would report numbers without acknowledging other standard air or density. There's high altitude performance in your beautiful Lake Tahoe area that will be different than it would be at your sea level cities. And amplitude ten

does require standard density, but that may not mesh well with the way that if unitary products are included in this regulation, how they are required to be rated.

The implementation for this is extremely aggressive, from -- we've eluded to maybe including more time to comment on this draft reg, which we would definitely appreciate, and we have submitted a sixty-day request for extension. But one year for implementing the standard is -- I'm not sure that would be able to be complied by many manufacturers at all. Looking at the federal rule-making, we have advocated for an additional two or three years after standalone fans would be required, so that we would be able to do all the testing and required testing on the embedded side.

In enforcement, there are many issues when you look at this from an embedded fan perspective and having to deal with not being aware of design conditions and not being able to verify this information. So from an enforcement perspective, how would that even happen? We would want to know how California sees the opportunity to enforce these standards when it comes to embedded products. I mean, there's nothing to keep a designer or owner from changing a non-compliance selection to a compliance selection by artificially increasing the total static pressure of the system.

When the unit is installed the conditions are significantly different than the design conditions. Will that actually save energy or how -- and how would -- how is California going to go through enforcement of that? At the end of the day, these are all application issues rather than compliance issues. It's also -- yes, Armin?

MR. HAUER: (Indiscernible).

MS. PETRILLO-GROH: OEM, and I think maybe not even the fan manufacturer would always know the design editions if they're selling to an OEM. But for stock units, they wouldn't know.

MR. HAUER: A equipment designer should know the design condition, right?

MS. PETRILLO-GROH: The equipment designers?

MR. HAUER: Yeah.

MS. PETRILLO-GROH: Not if it's actual of where it would be installed.

MR. HAUER: You have the rating point, right, of your equipment. And for that rating point, you have to have the CFM, and you know the RPM.

MS. PETRILLO-GROH: Well, they -- I think (indiscernible) do you want to --

MR. SHEEHAN: The building designer knows -- Darren Sheehan from Daikin. So yeah, at the rating point that data could be gathered. But as Skip said, the designer

of the building would know all the information from their pressure drop, what flow rates they want to run the equipment at. But a stock piece of equipment, it's set up to run in a certain range of air flows and static pressures. And so depending on how that's applied, as an OEM, we don't know its final exact characteristics when it's applied on a job by job basis.

MR. HAUER: But this is an appliance regulation, right? It's still Armin Hauer speaking with ebm-papst. So in an appliance regulation -- this is not a building regulation, right? So if you rate your (indiscernible) so many BTU per hour, then that should be a design point, and the fan has to be selected for the design point.

MR. ERNST: That's entirely -- this is Skip Ernst. That's entirely incorrect. On stock equipment is the most glaring example. The equipment is made and exists before the designer has even done his design. I mean that's entirely possible.

MR. HAUER: The building designer?

MR. ERNST: Right.

MR. HAUER: Yeah.

MR. ERNST: So to look at -- the customer is going to go pick up the unit with a pickup truck, and they -- the installer may or may not know the design conditions, but it's never passed to the manufacturer.

MR. SHEEHAN: Skip, this is Darren Sheehan again from Daikin. Even on an engineered job where engineering firms are laying out the exact characteristics and airflows of the equipment, so a manufacturer would know that beforehand, their design conditions aren't necessarily at AHRI test rating conditions to get that rating point. It can be applied in a variety of different climates and altitudes and things like that, right? So the unit complies with the efficiency standards, right, based on the test standards and all the temperatures and flows, but then it's applied in a variety of ways into building design.

MR. HAUER: Armin Hauer speaking. So how about you just use electrical ratings that you need for electric code, in these conditions? That would be a fixed condition, right?

MR. ERNST: But it has nothing to do with the design conditions, which is what the -- I think what the staff's proposal looks at and is the only way that it'll save energy. I mean to look at some fictitious condition which may or may not be close to design conditions, that doesn't save energy.

MR. HAUER: Thank you.

MS. PETRILLO-GROH: So lastly, I think this is a little bit more about what will happen if a fan is sold

to a California manufacturer for sales in an excluded product outside of the state. So does that fan have to comply going into the state because that's where it's being sold to and even if the final use is outside the state, because we do have manufacturers who --

UNIDENTIFIED SPEAKER: (Indiscernible).

MS. PETRILLO-GROH: Oh, yeah. Yeah. Please, John, if you want to chime in. But that was my last point.

MR. TIMOTHY: Okay. John Bade, you're unmuted.

MR. BADE: Okay. So to clarify the issue around the selection point, and by the way, I'm going to back up a bit. So I am a -- I'm with Johnson Controls; my name is John Bade. I was a voting member who voted enthusiastically in favor of AMCA 208. I was on the AMCA 208 technical committee and I believe that there is a lot of good value in using the FEI metric when properly applied. I believe it can be well applied in an application code like Title 24 or 90.1. And I'm currently working on a draft regulation -- some people in the room there have participated with me -- for 90.1 that incorporates FEI.

I think it's tricky, it's going to be really tricky on an appliance standard like Title 20. So when people were talking about well, you know the design conditions. Well, you may know the design conditions, but the fact of

the matter, that you can -- as a designer you can move the pressures around, and what the claims pressures are means that it really becomes very difficult to enforce.

So for example, if I have an exhaust fan that's at a .9 FEI, I've got a couple of choices. I can say, okay, I'm going to stick with my same duct design and my same pressures, and I'm going to go buy a bigger fan, and hopefully people -- some people would do that. But quite frankly, the much easier option is to say, I'm going to announce my pressure is higher, and that's very easy to do. So one of the pieces that is in all of our air handler selection equipment is the user enters how much they want to allow for a dirty filter pressure drop. So we know what the pressure drop is for a clean filter, but the user gets to pick when that filter's going to get changed out. So if I'm in that case where I've got that .9 fan, sure I can go to a bigger fan or I can just say I don't want to go to a bigger fan; I'm just going to say my dirty filter pressure drop is now three-quarters of an inch instead of half an inch and I'm compliant.

The biggest concern I have though, and that goes back to those slides that I created for this presentation that show that when you make system design changes that reduce the pressure or you add a variable speed drive, it makes the FEI go down. And I'm very concerned that

consumers and users in general don't get it in their head that better FEI always means lower power consumption. In the examples that I gave, my concern is somebody will present a design and then somebody presents a different design that has a lower pressure drop and has a lower FEI. People who are not well educated will think lower FEI -- well, that's going to consume more power, when that would be exactly wrong. So at a minimum, I would ask that the definition of FEI absolutely state that you have -- FEI is only a good metric for comparison when you know for sure that you're at the same fan duty point.

And then from an enforcement point of view, and I'll get into more of this in my written comments, I am very concerned that the way I read Title 20, if a fan manufacturer, and this is whether it's standalone or OEM, has their fan in the database; no matter the size of their FEI bubble, whether it's the one you see here or it's companion one that's a lot smaller, that makes the fan then legal for sale in California. There is no language in the proposed code that requires that the fan be operated or even sold to be operated in those conditions. I mean so if somebody walks into the distributor and says, hey, here are my conditions, and the guy behind the desk says okay, I can sell you this fan; it's got a .8 FEI, or I can sell you this other

somewhat more expensive fan that has a 1.2 FEI, and the consumer says I want the one at .8, I don't believe that there is anything in the enforcement, written into the standard or written into the code that makes that happen. Is there any penalty if I, as a seller, knowing that the customer's condition does not yield a 1.0 -- what stops me from selling that fan? The fan's got -- the fan's in the database; it's got a sticker on it, how do you enforce that that fan is being properly selected? And I believe that is some language that's going to have to be carefully thought through. That's the end of my comments.

MR. BUBLITZ: Hey John. This is Mark Bublitz. The 208 standard specifically says in section one that metric provides standardized and consistent basis to compare fan energy performance across fan types and sizes at a given fan duty point. So the request you're asking for is already in a standard. As soon as you move the duty point, it's not a valid comparison. So I don't know how to do a draft.

MR. BADE: So well, that -- but that's exactly my point, but that's not in the code language. So the typical person living and working in California is probably not going to go buy AMCA 208 to get that definition. And we've hoped that in the final code, that

information is made very clear, plus the further clarification that a comparison of FEI, of two fans at different duty points is not of value. I mean that -- sometimes that fan will be actually more efficient or use less energy at that point -- I'm sorry, not more efficient but it would use less energy. And sometimes it won't.

MR. BUBLITZ: This is Mark Bublitz again. I don't know how to answer the question. It's not the same duty point, so it's not a valid comparison. I'm sorry. Standard doesn't work.

MR. BADE: You and I are preaching from the same -- well, at least from the same hymn book, maybe we're saying it differently, and I'm just asking that that be made very clear in the code.

MR. STARR: So this is Louis Starr with NEEA. I mean the example we're talking -- so I worked as a design engineer for a number of years and then worked doing controls and then a number of years as a commission agent. If this -- if you had this thing that you showed coming into me I would reject this because one would not be at the design point on the drawing, so then I would just reject the submittal. So the idea that we're sending in different units at different points and that we're going to be comparing. I would look at the

drawings and look at the duty points and also look at the FEI on the drawings, and if those things matched up I would look at it and it would be rejected. So this is in case that doesn't exist.

I also worked for a large manufacturer, retail, so I'm going to hit all these, because I didn't want to wait 20 minutes at the end of the (indiscernible). So I worked for a large manufacturer that made large retail facilities, and every single unit I had, I provided design point, and those took sixty days for me to get a unit out on the job site. There's never a case where I didn't know something, or I'm designing something from a warehouse. Does that exist? Yes, it could, like in a replacement, but most of the stuff that a design drawing is you're working of a design point that (indiscernible) and these are going out as submittals. So these things I'm hearing are a little bit -- yes, they could happen.

Near the point about maybe take -- could someone add additional static pressure? So I worked as a design engineer, I'd come up with 1.2 as a static inch in (indiscernible) and CFMs. So I could put 1.3 down so that I would get a bonus or what -- because I get paid by the hour to do the job. There is no reason for me to put a higher static pressure on there. But, could it happen? Yes.

But the other thing is I would just look down there and see that break force power is higher than one and know that it's a larger unit, and it's using more energy. So I mean, are those things possible? Yes. But they're not realistic, so I think there's a lot of cases here that sound good but don't actually have it. and then the last thing is about the VFD where one has VFD and one doesn't have a VFD, and maybe Trinity or Armin or the other one can explain.

This sounds really great. It doesn't make sense; you've got a VFD. That saves energy, but in the actual AMCA 218 (sic) standard that has allowance in there, so it does not affect the rating, and those would have the exact same rating. Maybe we could have that one dispelled.

MR. BUBLITZ: That's fine, (Indiscernible). This is Mark Bublitz, I'll take a stab at it. I could use some help from my cohorts. If you put a VFD in and you run it at the same operating point, it's going to be less efficient because the VFD is not a hundred percent efficient. So that's just a fact.

The idea behind the standard was to make it energy neutral. So whatever you put in -- whatever loss was in the VFD could be credited back. Now, I don't know if that ever -- did that make it in the standard or was

that -- that was not in the standard because the standard's meant to calculate. But our argument was always, you could credit back the energy inefficiency of the drive. But if you don't reduce the duty point, a fan with a VFD will be less efficient.

MR. VOLPICK: Mark, this is Mike Volpick (ph.) and to add onto that. I don't recall exactly what's in 208. From what I recall, we discussed it but I don't think we put any requirements in but in -- if I recall correctly, Armin helped me out, ASHRAE Addendum ao -- he accounted for that and to avoid the potential of somebody saying hey, if I put a VFD on this thing and FEI goes down, that's a bad thing. We lowered the requirement for a fan with a VFD from 1.0 to .95, if I recall correctly. So we addressed it in the regulatory code language, and I think that's what would probably need to be done here as well.

MR. IVANOVICH: This is --

MS. PETRILLO-GROH: (Indiscernible) otherwise we would be comparing to different (indiscernible).

MR. IVANOVICH: Yeah. This is Michael Ivanovich. So language that John proposed regarding Title 24 is exactly the language that's in Addendum ao and proposed for ASHRAE, 90.1.

MS. PETRILLO-GROH: It is really well suited for an (indiscernible) for a building standard.

MR. IVANOVICH: Well, the idea of giving a small credit on FEI to account for a VFD and a VFD system was regarded well in the ASHRAE community, yes.

MR. WAGNER: Yeah. This is Greg Wagner. If you go back to the previous slide, I think there's misunderstanding about what John was presenting with this slide. Basically unit A and unit B have the same operating point in the field, so they have the same duty in that building. The point here is that one has a better FEI than the other one, and yet one uses more energy than the other one. Yet they're both operating and doing the same function in the field. So the point is that FEI doesn't always give you the best answer, is what he's illustrating here.

MR. TIMOTHY: All right, John, you're unmuted.

MR. BADE: Well, Greg, thank you. So that was exactly my point. So I'm going to respond to what Louis said. So my experience working with many, many consulting engineers over the years is very different. So typically in the air handler world, and I'm sure this is true for a lot of others, a sales engineer will work with a consulting engineer, and a consulting engineer will have a company selection software. And yeah, I mean I agree with you that a -- most engineers are going to look at that and say, yeah, I want the one with an 8.44,

assuming they have the space for that larger unit -- it is a physically larger unit -- but they're going to say yeah, I want the 8.44. Now I had thought about coming up with an example where I actually made the unit so low pressure drop so I drove it down to below a one and said, I can't use that unit, it's below one, that's a bad thing.

The only thing I'm trying to illustrate here is that it needs to be -- users of FEI need to understand that as soon as you get off comparing two fans running at the same airflow and the same pressure, FEI stops telling you whether you are more efficient or not. My fear about using FEI solely in an appliance standard like this is users will come to believe that just like IEER for VRF systems or gas mileage for a car indicates, okay, this one is better than that one -- that FEI can be traded the same way, and that FEI always means lower energy consumption. And I just want to caution the staff with Title 20 to work hard to make sure people do not accidentally believe that.

MR. GALDAMEZ: Thank you. If you have any data, please submit it to the docket to support the comment. That would be great.

MR. IVANOVICH: Alex, I have a question. This is Michael Ivanovich from AMCA. Does CEC have an idea of

how many -- given the fans that exist in California, how many are covered by Title 24 versus those that are not? Do you have a sense of that?

MR. GALDAMEZ: I can -- no.

MR. IVANOVICH: Okay. Thank you.

MR. GALDAMEZ: Not that I am aware of. I have to -- sorry. Yeah. No, not that I'm aware of. I have to investigate that.

MR. IVANOVICH: So it might be -- it may -- a rough estimate might be a commercial versus industrial split in the market.

MR. GALDAMEZ: Yeah. We'll have to look at the -- I mean at the numbers --

MR. IVANOVICH: Okay.

MR. GALDAMEZ: -- because I don't have -- that data hasn't been provided other than --

MR. IVANOVICH: Okay.

MR. GALDAMEZ: And I don't -- what I can gather and get from -- for -- I mean what is submitted in the docket and all that.

MR. IVANOVICH: Okay. Thank you.

MS. PETRILLO-GROH: No, that was the last -- that was the end of the presentation. So the -- just my contact.

MR. GALDAMEZ: You have more? Yeah, go ahead.

MR. TIMOTHY: Hello. (Indiscernible) staff, do you have a question?

Okay. John, you're unmuted.

MR. BADE: Yeah, I just want to make a real quick point. On the language that I had proposed regarding allowing the .95 for the VRF system or for -- excuse me, not for the VRF system -- for the system that had a variable speed drive on it, that was proposed language to go into Title 20. Somebody mentioned that it was Title 24 language. It's not intended to be Title 24; it's -- I'm saying put in Title 20. If the system is to be operated as a variable speed system, meeting these requirements in Title 24, then they can have the .95, but it would be Title 20 language. That was all.

MR. GALDAMEZ: Thank you.

MR. WORTH: I have two comments. This is Chad with the California IOUs. I guess a couple of things. I just wanted -- on a number of your shipment, the last presentation, I just wanted to say we acknowledge and have dug into many of those, and I think there's a lot of merit to a lot of the shipment assumptions that were put up there. And so we'll be reflecting our thoughts on that in more detail on the docket, but thanks for getting that started. With regards to the selection and what -- if folks take a duty point outside of the range or you

could tell whatever you wanted to somebody. The distributor --

MR. GALDAMEZ: You might want to move away from the speaker, you're right under it; it's probably why you're getting the feedback. There you go.

MR. WORTH: I guess this is very different. And I mean, I'll go to the other speaker. They're everywhere, where am I supposed to go?

MR. GALDAMEZ: Try in the middle.

MR. WORTH: It never did that for Louis. Okay. Where was I? This is very different. I mean, I think a lot of us work with a lot of different metrics and a lot of different appliances and things like that. I think there's no doubt that the FEI framework is very unique. It's certainly unique for the CEC, just publishing an allowable operating range and not specifically this fan is legal; this fan is illegal in California.

It is a very different -- it's a paradigm shift and it's a -- I think a flexible approach to getting at this energy savings, which is I think why it was put forward to replace FEG. And I think with that, there is going to be some education and a thinking differently within the industry, not just among manufacturers, but downstream to designers and distributors and everything. And I think a lot of that work has begun within ASHRAE and AMCA.

So it is going to be challenging, there will be a lot of education to overcome. But it's different, and it's unique and it does provide a lot more flexibility than saying this fan is illegal; this fan is not. People can lie about their flow or their CFM and -- or their pressure and get a different fan if they want, but it is about putting the information out there and overall moving towards better fan selections, not better fans.

MR. STARR: So this is Louis with NEEA. Just one thing I would -- just to add onto what Chad said there. When a design engineer sits down and selects a flow and pressure on there, they have liability insurance and so they're not designing to get efficiency necessarily. They're first to make sure it actually does the job it's supposed to do, and efficiency comes second. So drawings coming out here in California get a -- an engineer gets stamped on the drawings, got four years of experience and at least two years of designing, and then he has to pass the licensing test and this is not going to be -- if they can't handle this, they shouldn't be doing engineering.

So I do have a couple a couple questions for Laura and maybe -- and you know what? I'm not trying to be -- I'm trying to move the conversation forward. But maybe you can help me, Laura, with two questions I had. One, based upon what AHRI is kind of putting up there, is

there anything that you think should be -- any of the equipment should be regulated based -- should have a fan regulation on it? One like, for instance, I'm thinking are air handlers still in the wheelhouse of something that would be regulated or not? I'm not really clear on that?

And then the second question I have about Title 20 and Title 24, fighting it out at the O.K. Corral -- is it very -- probably this -- and I don't want to be -- I know this is a hypothetical, so I know everybody hates hypotheticals but, if DOE had passed this fan regulation -- this issue of there being a fan regulation on federal equipment, and then Title 24 having an IEER requirement would be an issue, and I'm kind of wondering how that would have resolved itself. I mean in other words, right, there's a fan, if DOE said hey, we're going to regulate fans then exactly what you're worried about would happen, where you have double regulation in California, because there'd be a federal regulation or FEI on the fan and then you have an IEER. So how would you feel AHRI would have handled that? Do you get what I'm saying?

Okay. So if FEI had passed the DOE, it requires FEI and (indiscernible). Okay, so right now, Title 24 has a requirement on a greater than 760,000 that you have an

IEER of what? Eleven or something? So I'm just wondering basically how that would have worked itself out. So that was a realistic (indiscernible)

MS. PETRILLO-GROH: Sure. So --

MR. GALDAMEZ: (Indiscernible) do you have --

MR. LESSANS: Well, no. I raised my hand before in case Laura was having -- Laura didn't understand the question at first. But I can -- why don't you go ahead and answer it, and I can help, I can add to that if necessary.

MS. PETRILLO-GROH: So okay. And I didn't write it down. So the first question is on air handler. I think that metric for -- metric has significant problems when you look at it in embedded products. I think it's illegal for California to try to regulate any fan in any regulated product. I don't think it's illegal for them to go -- for going after fans that are embedded in air handling units, central station air handling units for -- let's just say that. However, there are design problems, that it doesn't make a good metric for that equipment.

MR. STARR: (Indiscernible)

MS. PETRILLO-GROH: Right.

MR. STARR: (Indiscernible).

MS. PETRILLO-GROH: And so if a fan -- an FEI regulation had passed federally and California -- but

there's no federal regulation for unitary equipment over 750,000 BTUs, but there's regulation on California, how would we have handled it? I mean grumpily. I mean -- not -- I couldn't fight that on a legal battle. I mean, that's not federally regulated double counting of energy savings, which is a problem. When California went to maybe increasing the levels of IEER for those products for those, we would have pointed out I think where you would have gotten energy savings in the miniscule amounts from the release fans. But we would have also had a problem with what you're looking at for (indiscernible).

MR. STARR: I guess the question is -- the point I would say to that, the fact that it's federally regulated or state regulated, it could just have a Title 24 requirement I guess is the takeaway I get from that.

MS. PETRILLO-GROH: If there is -- I mean I don't know exactly where we go down the road with it, but --

MR. STARR: You wouldn't have the double regulations that (indiscernible) wouldn't have liked it, right, (indiscernible).

MR. LESSANS: Do you want me to --

MS. PETRILLO-GROH: Who (indiscernible).

MR. LESSANS: Maybe I'll just add. This is Mark Lessans of Ingersoll Rand. I've got a mic here. You're right. DOE was going down that path, and maybe just to

provide some context here, Ingersoll Rand Trane was the other party that did not sign that ASRAC term sheet because we had some enormous issues with the way that embedded fans were being treated most notably for unitary large equipment that's larger than 760,000 BTU. What was in that term sheet -- maybe I shouldn't say this -- that had us freaking out, because we were looking at potentially redesigning all of those products to save probably no energy whatsoever. So yes, it could have happened and it would have been a real problem for us.

I mean I don't have a better way to answer that. Perhaps I was going to say that DOE did not publish a proposed regulation. They had a term sheet that was -- that had unanimous support but it -- if you want to read between the tea leaves, it seemed pretty apparent that they were having a difficult time taking that and turning it into a useable regulation. And I want to believe that the continued commentary that we gave him -- gave them on the third NODA and on -- in our continued attempts to get the same methods that I presented on today across to them, there was potentially a real possibility, maybe they even realized it, of the mismatch between the energy savings that they thought they were going to get and the actual energy savings a lot of these products that already are designed today to meet a certain IEER.

MR. STARR: So we -- this was a question for actually Jeff --

MR. GALDAMEZ: Yeah. So we're in the part of discussion, so any comments right now are accepted as comments. So that we're done with the presentation, just letting everybody know, even the people online, so.

MR. STARR: So about two hours ago, Jeff presented on presented on his boiler and his thing, and I -- just more to move the ball down the field for Jeff. So one of the things he's presenting on is he has a picture of a really efficient boiler, and I talked to him a little bit during the break, and he said basically if we pick the system curve that has the most efficiency is kind of -- it's very parabolic looking and really what the kind of fan curve I need is more of a kind of flat one, which is typically more characteristic of an inefficient curve that dials up the curve.

And so his point was that's the kind of fan we need, sort of inefficient to make our equipment work properly. And so one of the thoughts I had was would it potentially be better -- first of all we'd have to look at his information a little more on that, but perhaps he could have a limit on the size -- a one horsepower rating. He could basically have -- there's a correlation between the size of the boiler itself and the size of the combustion

fan. And I think if you put a limitation at, like, greater than 600,000 and you're exempt as opposed to exempting everything that's in boiler.

So I thought that was one regulation or one way to get around kind of your concern. And then another thing is just looking at peak efficiency of the fan, and maybe doing something with that. So I don't know if you had any thoughts on that, but I know it's been quite a while.

MR. KLEISS: Jeff Kleiss of Lochinvar. So Louis, I don't think I agree with you on necessarily us needing a less efficient fan or a flatter curve. If anything, a speed fan curve actually helps us because we're dealing with very high differential pressures. We still have high flow rates, but the higher efficiency heat exchangers have very high resistance to air flow, which causes very high differential pressures and can push us to the left of the allowable FEI range.

MR. STARR: Yeah. Actually, I misstated that. What I meant by flatter was essentially the thing you're talking about. It's the shape of the curve is more steeper and flatter also shifting down the curve. So yeah, again it's just ore as you're striving --

MR. KLEISS: Right. And I don't want to get hung up on the specifics because what we're looking at is -- I pulled together a few data points on one model as an

example. But ultimately, you're going to put handcuffs on us as far as developing products, not just this one that we're looking at but also future products. Over potential energy savings, it's a rounding error, or are already regulated efficiency matters.

MR. STARR: So I mean I guess my thought on that is first of all, basically it's the covers went more complex so if you're (indiscernible) less fan and you're not having to worry about meeting those requirements. So that's why I (indiscernible) that. But I don't think you can be handcuffed in that sense. But the problem is, is that when you have a very efficient product, and you're (indiscernible) motors and doing some things in there that obviously they're looking for efficiency -- not everybody in the market is doing that. So you don't want to just design your regulations around the most efficient guy in the marketplace. You have to get the CEC thinking about and everybody says well -- I mean, your argument that well, (indiscernible) my product, but when you take that across the full marketplace, everybody puts a little bit of energy in my (indiscernible) have to be uniform is your treatment of things. So it's -- that's the sort of -- that's why the CEC is trying to design a regulation that sort of makes sense while doing the efficient thing. So -- but I don't necessarily -- that's just a thought,

so --

MR. KLEISS: Just -- all I'd ask is that you don't lose sight of the fact that the scale of the energy that we're using versus the energy in the fan, and there are definitely some potential loss -- a lot more to be lost by this than gained.

MR. WAGNER: This is Greg Wagner. To turn that around, it's basically ninety-six or ninety-eight percent efficient. So if I dropped it down to ninety-seven and I lose a bunch of restriction for the fan, now I bring the fan in scope but now I'm down a ninety-seven percent efficient boiler. I'm saving a little bit of watts in that power, but I'm losing tons of BTUs in the heating side. So that's the point of the scale of the energy use, is what it does is now it takes and compromises the design of the appliance -- not necessarily helping energy use, it's actually increasing energy use to reduce that pressure requirement let's say, on that fan system.

MR. STARR: Let me paint you an alternative picture. Let's say an eighty percent furnace and I want to put the absolute cheapest thing I can on the market. So I buy the cheapest fan I could find, the most inefficient fan, and then you bring out your efficient fan, you get to compete with me, and a lot of jobs are going to go that way. So at least by people making a bare level of

efficiency such that it doesn't create -- I mean, so Jeff has painted a picture where he has a very efficient product. But I would also think about painting the picture I just did, where you have someone that really is just trying to use the cheapest piece of thing that is available. And so that's what you also have to think about in terms of regulation. It's not just what you sell but what other people --

MR. ROY: Louis, Aniruddh Roy with Goodman. So on the furnace side, that should not be an issue because in Title 24 now you have the watts of CFM per .45, plus the DOE regulation which is the FER -- furnace fan will be going into effect on July 3rd of 2019. So I think we should be covered on that front.

MR. LESSANS: Mark Lessans, Ingersoll Rand. Maybe just to build on that point. I agree with you, Louis, in the fact that I would certainly be concerned if we were creating some kind of loophole to allow other OEM's to put the cheapest thing out there as possible. That would just be an energy hog. I can say with great confidence though, at least as it applies to our products, that that is just not an issue because a majority of those fans are captured by the way that those products are certified to their energy performance today. And the way that they are priced are based on that IEER rating.

So for commercial unitary, that's not an issue. For air compressors on our Ingersoll Rand products, that's the same exact issue. So yeah, our competitors could put a horrible fan in there, but it's going to cost them in other places and that's where -- at least where a company like ours would pride ourselves on is our ability to be as innovative as possible to get to that highest performing product at its system or product efficiency and figure out from an engineering perspective the best way to get there to serve our customers.

MR. STARR: So a couple things. One of the things -- maybe Mark, you can address this, but so the IEER metric is another thing that I have a lot of concern for me because I look currently, and I know in our 90 -- or in our ASRAC of RTUs that we talked about revisiting that test procedure. But today, the test procedure we have is one that helps for very little fan energy use. It uses a very low static pressure. It doesn't have the economizer mode. Some of those things that you talked about in the energy model, those aren't accounted for. And so we're trying to drive efficiency where the very inefficient metric -- the next time we will actually be able to get to that thing on like the five and half to sixty-three tons, 2027. And so I'm not all that familiar with California energy goals, but I'm pretty sure they're

2030 which means that the best you could hope for is that you had a really good test procedure by 2030, so part of the problem is the time frame to actually get this stuff carried out is very integrated. And the other thing is hardly modified -- I hear that there's work on the IEER, but I was talking with Mary who is with PG&E and Marshall (ph.) was with ASRAC on that. And I'm in the northwest, and between us, we have twenty percent of the customers in the United States, or somewhere around twenty percent -- anyway, a certain percentage of -- a fairly good chunk and we haven't really heard about anything about revisiting the test metric, and we certainly have access to lots of data. So to sum that up I'll just say I have concerns about using IEER as our way forward when it seems like an imperfect metric. To me, we're behind the time on changing that metric. So it's like, I get the whole policy overview that yes, we want to (indiscernible). I don't know, is there anything you can help me with on that?

MR. LESSANS: So there's a couple points that I probably need to address. Let me try to lay this out -- and Mark Lessans of Ingersoll Rand. There are others in the room that can speak to the revisions to 34360 better than I can, but I can tell you that based on the discussions that I've had with our engineers that

participate on the development on that standard, it is very much in the process of being revised. The -- right now -- you guys have not heard anything about it, but the intention has been to include you. Right now, the -- basically the AHRI section that's responsible for updating that standard just finished up making the necessary changes in order to align that standard with the DOE test procedures for 2018. So that required some substantial work, and they just finished that up. They're now in the process of going through and revising the -- all of 34360 in order -- as part of that negotiated rule-making. That term sheet that came out of the unitary air conditioner standard. So you'll have to trust me that that will get updated and that you will be included in that process. But it's -- I don't have anything tangible that I can present right now. I don't know if anybody else in the room can.

A couple other, I guess, points that I want to make. First of all, there's a difference I suppose between the energy model that we're looking at and the amount of energy savings that are available from regulating these fans and IEER. I can tell you that the analysis that I presented was not based on IEER; that was based on the same operation out of that energy model and the expectations of how that rooftop unit if going to run in

that climate for that building based on the expected cooling and ventilation needs. It used an IEER rating for the cooling operation based on the test procedure, but it's not like it ignored the energy from when it was operating in ventilation or economizing mode. So that -- at least with the way that we've been trying to present the potential savings opportunity or lack thereof, I suppose, that took into account the expectations that we have based on a design building and application, not based on an IEER metric.

What was the last -- there was one more point that -- well lastly with IEER, I think being an imperfect metric -- I think, I guess, back to what I was saying before, it's in the process of being revised but it is -- the best thing that we have right now, and really in our opinion -- I recognize that every climate zone is different, and in the Pacific Northwest you are going to have more ventilation hours than you will cooling hours, but right now what we have is an attempt to be as representative as possible for the entire country, and IEER is what we have.

We'll continue to try to improve that metric to capture as much of that energy as possible, but I'd like to think that that's still a much more effective way to demonstrate the actual overall energy consumption of a

rooftop unit than to try to look at the fan operating outside of that box and make some assumptions and then try to regulate and squeeze some of that additional energy savings out of it.

Based on the way that -- certainly the way Trane designs products, and we optimize around IEER and then base price points for those products based on that IEER. We will always, no matter what, revert back to that system or that product level efficiency metric. So if you require us to put a more efficient fan in there, all that's going to do -- if we have to redesign the product, which in almost all cases it will because it will -- that fan will get larger, and there's no space for it in our current design. It will -- it's going to force us to rethink, not just the fan itself, but the entire refrigeration system that's contained inside of that box. And when we have to do that we're going to go back to, okay, this is going to be for a minimum efficient unit. This is what we need to price it at and this is what it's going to look like going forward.

And I'm sorry, lastly, the last point that you made about the DOE standards in 2023 and the future savings opportunity there. One thing that -- one observation there is that the fans that are embedded in those -- in those products that we're talking about, the majority of

the energy consumption of those fans is already captured by that DOE standard. What California is proposing to do is exempt all but the relief fans from that regulation already. So we're talking about the next opportunity to direct the energy consumption of the fans being 2027, but this proposed standard doesn't even get at those fans, except for, the only thing that it gets at is the relief fan.

MS. PETRILLO-GROH: This is Laura Petrillo-Groh from AHRI. Just to quickly give an update on 34360, DOE has had a version to look at mid-April or the end of April probably. And now the committee is starting -- we're waiting on feedback. The committee is now starting to look at standard pressures associated with field conditions for those products and energy advocates have previously mentioned, that they think that the set of pressures are too low on that standard, so we're looking at going through those models and requesting field information on that. So there is work in progress. I know that you don't see it, but calm waters run deep in the system. That was just the AHRI update.

MR. STARR: (Indiscernible) with me, yeah. One of the things is, like -- I think Mark was saying well, it's already lot of the energy you're trying to get to capture in Title 24, the IEER if greater than 750,000, so greater

than twenty tons, or is that sixty-three? Okay. But the problem is, is that we'd argued that the metric is -- has so little fan (indiscernible) the statics and all that in, is it's not really going to do a good job with it. And to my mind -- let's just take for instance -- let's say the energy that you use in a hard to use half fan and half compressor -- it seems to me the best thing is to optimize both of those. And so I mean, the example you put is like well, the box stays the same size, and then I -- and I have to put in a bigger fan, which means then I have to take costs and make things smaller and other things to make things fit. But at the same time, first of all, not every unit has to have six casing size, right.

So in other words, some of them you're just going to be able to put in a bigger fan, and it's fine, and a lot of times design engineers will specify bigger casings for other reasons. And so to me, some of it's the ability to size the casing up already exists in some of this. And the other thing is we heard John Bade this morning -- earlier talking about what (indiscernible) fans have FEI of one, which tells me that some of these fans have a pretty good FEI. So it's like we don't really -- I guess what would be helpful is understanding maybe what some of the products -- the concerns you have, what are those

FEI -- I mean obviously not to me, but maybe the California Energy Commission is taking a look at what those current FEIs are and giving a line of products and seeing how that -- is it impossible to meet FEI three and what would you have to do and how close are you to meeting it? But to me, it seems like that's a path forward, but it's just pretty hard to know that the first time that we just crack -- let's just say -- and 34360 gets that all figured out pretty soon. The first time we'd really be able to see a regulation that captured all that would be 2027, and that's going to be hard for the goal that California has as their 2030 goal of whatever. It seems problematic (indiscernible).

The other problem is the IEER metric is the basis for a lot of other test procedures across a lot of the equipment in DOE, so it's not just this one, but everything seems to be -- the coefficients that were chosen for the IEER are across the eight climate zones, averaged there. It's not a seasonal, or it's not a regional efficiency or anything like that. So it's like -- it's really hard for somebody like California to take an efficiency and -- or an IEER metric and get some value out of it. That's my concern.

MR. LESSANS: (Indiscernible).

MR. STARR: Yeah. (Indiscernible) talk about it.

MR. SHEEHAN: All right. Darren Sheehan from Daikin. So I just want to comment that like some other people have said previously -- I mean, at our company, we are looking for innovation and trying to sell certainly higher than minimum efficiency on a range of products for customers. But just want to make a comment on taking an IEER metric, and in particular for rooftops and the next time that that could be looked at in tracing would be in 2027. Just want to make sure that people have a little bit of background and look at this holistically as all these things work together. All right?

So in January 1st of '18, right, seven months ago now, it was the most recent regulation change for six tons and up. That was a negotiated rule-making. It switched from EER to IEER, right? So maybe things never moved fast enough for any of us, right? But that's a big improvement.

We know were 2023 is. Again some people might have wanted those levels in earlier. But that's set there, and someone is going to have to jump in and correct me because this might be wrong, but I remember in looking that from DOE, I think they proposed that that was the single largest energy savings of a regulation. Is that true or right?

So I just want to make sure we have this right

balance, right -- of in five years implementing that to not -- just saying we have to wait until '27 to jump, right? We're actively looking at a metric that includes economizer and fans and everything else, right? And we're not against moving. We just want to make sure we're moving forward correctly.

One last comment I'll make is kind of a background too. We all have different kinds of equipment that are here. Packaged units though -- just keep in your mind, it is a combination of the most amount of regulations, right? It's got furnace in it, right? It has refrigerant. It has your air handler, right? Your supply fan, release, exhaust, right? So sometimes when we think how would the fan affect that or even a commercial furnace, we'll know there's no other rule makings. We'll know we just redesigned packaged units. Now we have to do a commercial fan for that unit; that's kind of a background to keep in mind.

So again, yeah, not against moving forward, just need to make sure that we kind of have a holistic thing, and we're moving the industry and what can be done forward appropriately.

MR. WOLF: This is Mike Wolf from Greenheck. I just wanted to kind of tag onto that. We started this process back with DOE five or some years ago. I think in the

opening meeting, we had the same issue come up, and to your point, some things don't move fast enough for some; some it moves too fast. But I think we'd all be making a mistake and doing a disservice and manipulating the process, honestly, if we're trying to use this rule-making to fix the problem with another rule-making, or trying to move something forward faster because we think it's not moving fast enough, because it's flawed or because there's improvements that need to be made. If there's problems or improvements that need to be made, with an IEER or whatever these other things are that I'm not familiar with, we should fix those.

Okay, let's not bastardize what we're trying to do here or prevent this from moving forward because of that. That's my first opinion on that. Second of all, and I kind of want to shift here, and Alex, I'm looking at Table ES-2 of the staff report. And another issue that we seem to kind of kick around, but we never really are able to pin it down -- I feel like it's trying to pin Jell-O to a wall here -- is we talked about the potential embedded fan savings in this table ES-2. And there had been a couple presentations today that have said, well, look, you can't just look at the fan savings; you got to look at the overall energy savings of the equipment. And at least, I think two examples, if I remember the

Lochinvar and the Ingersoll Rand showed examples of okay, we can squeeze a little bit of energy savings out of the fan and make this -- these fans and this embedded in this equipment comply, but at the end of the day we're not going to save any energy. And I guess my question is, how can we get to the bottom of that? What would CEC need from the industry to really nail that down? Because I believe everyone wants to save energy, and if we're not looking at this analysis correctly, and we're only focusing on the fan energy, and we're going to end up using more energy, I don't think any of us want that. But I don't know how to get the answer to that question. So I don't know if you can --

MR. GALDAMEZ: (Indiscernible) that you mentioned, and an analysis of what the differential will be if we just do the fans only comparison to the total energy of the units that are going to be affected. So the units of 760 and above BTUs, maybe we need to implement a new regulation for those units only, right, and take out the fans, embedded fans for those type of units only, right? But none of that data has been presented so far that I can tabulate and further support the argument to take out the embedded fans. So I need more data analyzed and that supports the argument to take out the fans. Right now, the data that I have and what I have analyzed, it shows

savings. And because I have to do a cost analysis that is cost effective and is technically feasible, they both apply and therefore we should move forward on this rule.

Now I understand that it's not the right thing for embedded fans. I understand that there's a lot of issues in the past that happened in the ASRAC and the DOE and all that. But that is the past; that is done. And right now I'm presenting the staff report that is -- yes, it has assumptions and it has a lot of information that was taken from DOE, okay? But the calculations, the numbers and everything is California specific, right? If the shipments are wrong, we're going to fix that. But I need data. I need arguments that can be supported with data. I cannot go in front of the commissioner and say, we going to take embedded fans out because Ingersoll Rand said so. Why not? It doesn't work that way, right?

MR. ERNST: So as far as the question, packages has been, an example that's been talked about a lot, this is Skip Ernst from Daikin. The -- how would you -- I mean, there is no data to support one of our contentions because it's the logic if -- on a product that is already regulated by California to have a total unit efficiency ---

MR. GALDAMEZ: From what I understand Title 24 regulatory is for buildings, right, and in the units,

they specify the EER they have to comply. Correct?

MR. ERNST: IEER.

MR. GALDAMEZ: Right. So there's a table set for that. However, is fan efficiency part of that test?

MR. ERNST: Yes.

MR. GALDAMEZ: It is? So that argument is what you guys need to present to me. And how is it done? How is the test done? None of that has come up to my table for me to say, like, okay, well, you guys have a point here. Let me verify it. Let me make calculations again and run it over like that, right?

MR. LESSANS: So --

MR. GALDAMEZ: Those are the things that I need.

MR. LESSANS: So Mark Lessans of Ingersoll Rand. I need we need a little bit of help because I feel like we've explained that. And so we need some help whether that's modeling and analysis or something that's going to be believable. The other issues that we have though, is that we're -- if you don't believe that IEER is an accurate metric for the energy consumption of that product then there's -- I suppose there's nothing I can do to demonstrate. If that's not --

MR. GALDAMEZ: I'm not saying that. I am not saying that at all.

MR. LESSANS: Okay.

MR. GALDAMEZ: Okay? I'm not saying that at all. But I mean the calculations that you guys need to present to me have to support your argument. Like when you -- like for example, this is for example, okay. You guys brought up the cost -- how much is it to increase a unitary unit, right. It'll be so many dollars per ton, okay. Based on what?

MR. LESSANS: Yeah. So again, we're happy to delve into that analysis further under an NDA. When we presented that to you the last time around -- if I recall, we were told that we could not have -- we could not get an ND -- we could not get some kind of nondisclosure agreement. So once we get that in place, we can show you much more -- with much more detail. But at some level you're going to have -- I mean unless you'd like to come to Clarksville where these products are made, you're going to have to believe us with some of the things that we're telling you as far as how much it costs and what the energy savings are in order to get to that point.

MR. GALDAMEZ: It's not a matter of me believing. It's the matter that I can make the argument to support it.

MR. LESSANS: Okay. Yeah. So --

MR. GALDAMEZ: And that's basically what it is. I

believe what you're saying. It's just I need to support it. So when I grab that cost and I put it in -- where did you get that cost from? Oh, well, it's a cost that came from Ingersoll Rand, so --

MR. LESSANS: Well anything that we can give you is solely going to come from Ingersoll Rand. I get that.

MR. GALDAMEZ: So what I'm saying is like we have meetings one-on-one. we can discuss the issue and maybe talk about this so that I can understand where the costs are coming from, right?

MR. LESSANS: Okay.

MR. GALDAMEZ: That is all.

MR. LESSANS: Yeah. We're -- I --

MR. GALDAMEZ: And I'm willing to work with you guys, but the thing is I need to really support the argument to -- if we need to move into a direction in which we take it into our units, and we create a new ruling for that, then we'll go that way. Right?

MR. LESSANS: Exactly.

MR. GALDAMEZ: Take it out, take all the passages for those separate unit. Now I haven't seen anything for air chillers and I haven't seen anything for air handlers that will prohibit me from moving forward and including those in the regulations because those units are manufactured taking the (indiscernible) off hand, quote

unquote.

MR. LESSANS: So I appreciate the feedback. We will certainly -- I'm more than willing to talk to you in as much detail as you're willing to listen to me on what the issues are, but the issues today have been that we've been operating under the assumption that anything that we tell you could become part of the public record. And we're starting to delve in territory that we can't --

MR. GALDAMEZ: Well, I have to -- always, I'm going to check the legal (indiscernible) on that.

MR. LESSANS: Okay.

MR. GALDAMEZ: But I understand it is -- I, you know, if it's (indiscernible) online, I don't see (indiscernible).

MR. LESSANS: **Okay.**

MR. GALDAMEZ: I'll do my due diligence to let you know, how can we go about it so that -- well, what kind of information that won't show your competitors the information that you don't want it to show, right? How about you submit it so that I'll at least have something to work with?

MR. LESSANS: Okay. Yeah --

MR. GALDAMEZ: Not the details, right? But something to work with so that I can, like, support that.

MR. LESSANS: I appreciate that. We will come up

with a way to get you the information that you need in order to complete that analysis. We're just -- I think to date we've kind of gotten to a point where we feel like we've given you everything that we can with -- that wouldn't -- that we would be comfortable with. I mean, we're not even really that comfortable telling our competitors this is going to cost 246 dollars a cooling ton, but, you know, we already did. So --

MR. GALDAMEZ: I need to run those numbers, but like I said, I know it can be explained where -- you know, it doesn't have to be a detailed bill, you know, this is why. But it's close enough so that I can explain, well, this comes from (indiscernible), this percentage in engineering or this percentage in material, and just percentages, right? Just percentage --

MR. LESSANS: We can -- under an NDA we can certainly break that down for you --

MR. GALDAMEZ: You know, and then --

MR. LESSANS: -- yeah.

MR. GALDAMEZ: And then phrase it that way so that I -- okay, well, this made sense -- but that it's included. I mean, I want to include the numbers (indiscernible) this one because when I received the information it was delayed. In my analysis -- I had already completed my analysis, right? Not that you guys

were delaying. I'm just saying the analysis that I had was already with the numbers I had from you, correct?

MR. LESSANS: Okay.

MR. GALDAMEZ: So --

MR. LESSANS: Yep.

MR. GALDAMEZ: -- I'm going to take those numbers and use them for the new analysis that is going forward, but I do need that supporting information.

MR. GALDAMEZ: Okay. Thank you.

MR. WOLF: I just want to follow up. Mike Wolf with Greenheck. So with regard to this NDA issue, would it be helpful or provide more cover if manufactures were to kind of, I don't know how to say it, cool their data through AHRI or some other, kind of, independent agency so that it wasn't just me coming to you with my Greenheck stuff and Mark coming to you with Ingersoll Rand stuff? We have a central collection --

MR. GALDAMEZ: Yes.

MR. WOLF: -- data set, that's --

MR. GALDAMEZ: Yes. Basically, yes. I mean that -- yeah. If you had things work an NDA through --

MR. WOLF: -- some law.

MR. GALDAMEZ: -- that you're working under or that can send you that, that's even better. Because then you guys can submit to me a summarized --

MS. PETRILLO-GROH: Laura from AHRI. This will make answering particularly difficult for our association because of the vast number of products that it touches. You know, twenty different products that are -- thirty-nine that we represent could -- we don't -- at some point, they're potentially impacted by this.

We have polled manufacturers and provided this information to the Department of Energy and consulted with you, but have repeatedly received the feedback that the percentages that we are providing -- for example, that we provided in our proposal, are not detailed enough, which I'm getting that feedback because it was not --

MR. GALDAMEZ: Can you give me an example, specifically of which one? Like, which one -- what percentage are --

MS. PETRILLO-GROH: I think the percentage of exhaust or really stands in unitary equipment versus supply in the energy --

MR. GALDAMEZ: Do you -- do you have any of that information or was it in the DOE --

MS. PETRILLO-GROH: Our presentation that we made in November to CEC, which was taken from our proposal that we submitted in October. So there has been a lot of information that we presented that has not been

account -- that has not been taken into account into analysis, which is, I think, part of the frustration. And I want to make sure that if, you know, I'm putting all of our members through an exercise to collect data that it ends up being disaggregated enough where -- you know, for you to be able to justify using it.

MR. GALDAMEZ: Yeah, and I'll work with you on just -- (indiscernible) for sure. I mean, I -- I -- like I said, the numbers on some information had been -- was received after I completed my analysis, but I need to reanalyze for some additional information that you guys provided me.

MS. PETRILLO-GROH: Wait. That was provided back in October.

MR. GALDAMEZ: Yeah, but I completed my analysis before that, right? So I need to move this project forward and this (indiscernible), in other words get the ball rolling or this -- that's like --

MS. PETRILLO-GROH: So what --

MR. GALDAMEZ: This is -- this is that --

MS. PETRILLO-GROH: I'm -- let me just get this straight.

MR. GALDAMEZ: (Indiscernible).

MS. PETRILLO-GROH: Let me just get this straight from, you know -- stakeholders were asked to put together

proposals on what a fan circulation would look like in the State of California. That was submitted back in October of 2017. At the point, the staff report had already been written and -- and to the point where --

MR. GALDAMEZ: (Indiscernible) proposal that you submitted had those numbers I used were comparable to the ones that were submitted for the proposal. I mean, there was no change for the calculations when I compared them. You're talking about your submittal?

MS. PETRILLO-GROH: Yeah.

MR. GALDAMEZ: Those numbers were just -- when I run the numbers, they were just a blob of different type of fans and they came out almost with the same energy savings when I did the calculations. So I probably need to work with you and to, like, really understand what you submitted, because when I ran the numbers based on what -- the numbers you provided, the savings were still there.

MS. PETRILLO-GROH: I think I --

MR. GALDAMEZ: Really big savings from that fan.

MS. PETRILLO-GROH: We saw pretty substantial differences --

MR. GALDAMEZ: It was --

MS. PETRILLO-GROH: -- when we --

MR. GALDAMEZ: -- lower that we calculated, but it

was still substantial savings to California.

MS. PETRILLO-GROH: I -- I'd be happy to follow up with you --

MR. GALDAMEZ: So --

MS. PETRILLO-GROH: -- on what it was --

MR. GALDAMEZ: Okay.

MS. PETRILLO-GROH: -- because we provided very specific numbers and procedure for (indiscernible) changes, and they were substantiated.

MR. TIMOTHY: Michael, you're unmuted.

MR. IVANOVICH: Yeah. Michael Ivanovich, AMCA International.

Totally different track, sorry to break away from this great discussion, but can you explain in the staff report more about the testing requirements? I saw in your presentation your seeking more information about fan laws and that. I couldn't see in the test -- in the drafted report about the testing regime that would be acceptable to California. Can we, like --

MR. GALDAMEZ: So the regime that we normally follow -- from what I understand is a basic model, right? You test the basic model and then you can extrapolate your information based on that same basic model, so that basic -- if your basic model operates, say, at 130 horsepower, then every 130-horsepower fan would be the

same for that specific fan.

That would -- yes, that would be -- so what you guys are proposing for what I understand is do like three ranges of testing and then use fan laws to see which -- you know, switch up --

MR. IVANOVICH: To fill in between the cycling.

MR. GALDAMEZ: Exactly. In between the cycles and all that. So what I need is more information. How can we go about it, because we -- the CEC, in the testing that has been done -- how we have done in other appliances is based on the basic model, not a scheme of fan laws, or laws per se, right?

So how would work or how would the CEC go ahead and do it? Do we take this 150, 300, and 500 fan, right, (indiscernible) or whatever, and then (indiscernible) loss so it can interpolate -- well, this is the operating FEI for this one here at 130, right? How do we go about it and how would that go into the database? How do we include that into the labeling of the fan? How would we label the fan so that everybody knows they can peek at the label and be like, well, I don't need to go to a catalog to know this FEI means such and such a (indiscernible) point, right?

MR. IVANOVICH: So we have to prove that the fan laws are actually --

MR. GALDAMEZ: No, no, no. That's not accurate. How do we put them into the database?

MR. IVANOVICH: Okay.

MR. GALDAMEZ: Right? How do we go about it so that we can implement it at a database level? Now, the catalog is out of -- we can't do that just based on resources, based on -- we can't keep catalogs as part of the regulation. Catalogs change. Regulations change when it's time to change. You can't have a catalog attached to a regulation. That's, like, a no-go on that.

MR. IVANOVICH: Can you decertify software or not? Is AMCA certified soft -- or is that not a -- I just got to ask the question.

MR. GALDAMEZ: It's something that I will have to look at. I don't see how I can attach it to the database that we have or how can I make the link to that software happen.

It's just we're limited in resources not only technologically, but also manpower. You guys got to understand that we're not Lockheed Martin, or somebody with a big -- like that can hire endless engineers and (indiscernible) --

MR. LESSANS: Can we get some clarification on what a basic model is? Because in the fan industry when we're talking basic model, we're talking design. So you can

stretch that design all you want, and the fan lines take care of it demand. I think you -- I think we have a fundamental disconnect on what a basic model is.

MR. GALDAMEZ: Yeah. Maybe one of -- can you take that, to explain a basic model or --

UNIDENTIFIED SPEAKER: A basic model -- we have a definition in our (indiscernible).

MR. STEFFENSEN: Sean Steffensen, California Energy Commission. We have a basic model in our regs that describes what a basic model is. It's an appliance where a test is run and all the characteristics that go into the performance and the energy efficiency have to be substantially the same. So we're -- an example would be --

MR. LESSANS: What's substantial?

MR. STEFFENSEN: It means, like, the input power or the output power, or any sorts of characteristics such as test points would all be identical in nature. So I think -- I don't know -- I would say with fans, particularly that would probably be the airflow, the pressure test points would have to be substantially the same.

The input power would be substantially the same. The output power would be substantially the same, because in this instance what we're looking for is a model that

is substantially the same. It has all the same operating characteristics, but maybe the color is different. There are other sorts of features that are offered that don't affect the power consumption or the energy efficiency of the product. That's the kind of the spirit of the definition.

MR. WAGNER: Greg Wagner. First, I was going to say, the problem with that definition is that we've been talking about the model or the FEI where it's the map (indiscernible), so. There's a wide range of powers, and operating speeds, and other things for any given fan. So you can't just look at output power or input power, those kinds of things. There's going to have to be some other discriminator that's going to have to define what a basic model is.

But I kind of want to go back to the data and the discussion of input data and what's necessary. I was looking at the numbers you put out today, and I was looking down that list of the cost-effectiveness of standalone fans. I noticed three out of the seven groups that are paid off way less than a year.

I'm just -- I got a question to -- maybe it's the AMCA people, the energy advocates, the utilities people of California, why are people not adopting these? If hundreds of millions of dollars can be paid back in less

than a year, this whole thing just doesn't smell right. It sounds like the cost numbers are not quite right, because you could go up the -- just up the road or down the road, wherever it is, in Silicon Valley and find investors that would be happy to pay for these kind of returns, getting paid back in three months. This -- this -- these numbers that you've adopted -- and I'm not sure where they came from, but they don't make sense.

MR. GALDAMEZ: If you have data that came from -- that you can support -- that can disprove that please, by all means, provide it, because, I mean, that's exactly what we're looking for.

MR. WAGNER: Well, what I'm saying is, if these investments can be made, you can take this up the road, like I said, to Silicon Valley and there'll be people more than happy to take these kind of paybacks.

UNIDENTIFIED SPEAKER: (Indiscernible).

MR. GALDAMEZ: There's a person on the web with a comment.

MR. TIMOTHY: John, you're unmuted.

MR. BADE: Thank you. So I'll speak to a couple of things. So I'll continue Greg's comments. So you know, we've been asked to provide data and so, I have a question. You know, I am very uncomfortable with not knowing the base data -- the base assumptions that are

being made about efficiencies of fans that are sold today, because to exactly Greg's point, in the world we live in -- you know, gosh. I mean, I never see a fan selected that horribly by an engineer.

You know, Louis made the point, "Well, a good engineer, you know, knows what he's doing. He's not going to do that." Well, yeah, Louis. I mean, you're right. These engineers aren't dumb. They're not picking terrible, terrible fans like this data would imply, so the question is can we see the work behind how you arrived at these numbers? And again, I'm not arguing the (indiscernible) numbers, where that seems to be a whole lot of discussion. I'm --

MR. GALDAMEZ: I would think the appendix --

MR. BADE: (Indiscernible) --

MR. GALDAMEZ: -- (indiscernible) in the appendix.

MR. BADE: Oh, okay.

MR. GALDAMEZ: And it is explained in the appendix on the report.

MR. BADE: Oh, okay. Well, I'm sorry. Thank you. I didn't realize. I'll be honest with you, I did not read the appendix. I --

MR. GALDAMEZ: (Indiscernible).

MR. BADE: And I'm going to respond also to Louis's comment about, "Well, you know, all these guys are saying

hitting FEI1 is not a problem. At least John Bade is saying that." And I want to very clear, I come from the air-handler world. It's a bit more expensive product than rooftops and some of the other products that are out there.

But I will say this -- gosh, in our world a lot of our fans are up at that high FEI level. For one reason, our fans tend to run at fairly high pressures so it's -- you know, we tend use some, I would say, normal fans, not anything real special.

But yeah, my concern and my comments are going to be not around FEI in and of itself is a bad idea. My comments are all going to be about, okay, if you want to do it in an appliance program, we need a lot more detail about how our data is going to be worded in your database.

For example, there's a comment in the staff report text that says okay, well, FEI or OE -- or (indiscernible) equipment manufacturers who are already using a fan that is produced by somebody -- you know, a fan manufacturer who's already registered, well, they're covered. No problem. Well, okay. We do that. I mean, all the product my group makes falls into that category, but there is absolutely nothing in the proposed code that says that.

And then further, we do package those fans that we buy with drives -- you know, with belt drives and motors, and VFDs. So one of the questions I'm going to bring up is okay, does that mean that all of the possible fan and motor combinations that we could possibly sell, which is hundreds of thousands, of combinations have to be in the database?

So that's the kind of thing that I'm going to be driving at. And I think there's a lot of work yet to create language to be very clear about what the requirements for manufactures are going to be.

I'm not concerned about us meeting the FEI1 for our products. I'm concerned about how is it going to be documented in your system, and how do we ensure that we all have a level playing field, so that if I'm telling my customer he's got to have a 1.0, he can't go down the road to somebody else who's going to game the system.

And to me, that's just as important. It wasn't talked about today, but I think that is a very important piece of the equation. So that's my comment.

MR. GALDAMEZ: Thank you for that comment.

MR. WORTH: This is Chad with the IOUs. We've spent a lot of time talking about exhaust fans and the rooftop units. One of the biggest savings opportunities in the original NODA 3, granted there may be some shipment

changes, was the air handlers, which are not covered by any metric. And I kind of like to hear a little more of why that is not -- the FEI is not applicable there.

There's lots of other constraints on the other products, the IEER, and things like that, but air handlers was the big embedded fan in the room, the big opportunity within the entire working group. I'd kind of like to hear what opportunities we see there and why FEI would not work there.

MR. ERNST: Skip Ernst with Daikin. The --

UNIDENTIFIED SPEAKER: The people in the room can't hear you.

MR. ERNST: Oh. First, it's kind of answering the question with a question. The break horsepower for CFM is already a requirement in California on air handlers and most other fans. Why is that not sufficient? Why is something else required?

The DOE says that this the average efficiency or this the -- and then they set this EL 3, and -- California already has many fan requirements already. California fans must be up here already, because they have more -- especially the break horsepower for CFM already exists, has for a long time. You must have more efficient fans already.

Why another regulation and one that is very onerous,

because we give our customers embedded fan performance. That's what they need. They don't really care what the standalone fan performance is. If you make a portion of your fans, we don't even have our current efficiency levels in the metric that is required by the proposed regulation.

So our first step would be to find out -- to go through a tremendous testing program to find out well, are our fans compliant now or not. And these fans are generally variable geometry with many, many options, and the labeling or enforcement is probably is going to eventually get to the point where you're putting -- you're' going to have to label -- I mean, it's going to be considered. You're going to have to label the job -- the project -- the design information for the project. So now you're generating a special label for every single unit based on whatever the customer told you, which may or may not be correct, and changed, perhaps, after they told you.

Now I think I'm going to guess what Laura is aiming at. And again, when you look, I guess, at this embedded fan performance versus standalone, somebody showed a good graph that shows that difference. The -- and again, we don't have that current performance information. I couldn't tell you the exact effect, other than we have

tremendous development to go find out what our current ratings. And if a fan is not compliant, we'd have to find a way to -- and it's again, there's no such thing as an illegal fan. You have to find a window of acceptance and show that to your customers. And again, we don't have any information like that at this point in time.

UNIDENTIFIED SPEAKER: What models in the NODA 3 and the whole working group, but it was a big energy saving opportunity there, right? So a significant work has been done on air handlers. They are unregulated, and my understanding the fan power limits have been around for a long time. And if the answer is there's no more energy to be saved because there's fan power limits and building codes all over the place, then the opportunity quantified within the DOE process is completely --

UNIDENTIFIED SPEAKER: Flawed.

UNIDENTIFIED SPEAKER: I knew you were going to say that.

UNIDENTIFIED SPEAKER: (Indiscernible) shipment data was --

UNIDENTIFIED SPEAKER: What --

UNIDENTIFIED SPEAKER: -- totally (indiscernible) --

UNIDENTIFIED SPEAKER: Okay. --

UNIDENTIFIED SPEAKER: -- (indiscernible).

UNIDENTIFIED SPEAKER: -- but that doesn't mean it's

not cost-effective. I mean, the shipments could be lower. The magnitude of the savings could be lower, but it doesn't mean there's not cost-effective savings to be had there.

UNIDENTIFIED SPEAKER: (Indiscernible) six times the volume.

UNIDENTIFIED SPEAKER: I get that, but we've focused a lot on this relief fan issue, which is even a smaller amount, even considering that if (indiscernible) call, so. We've been focusing on one fringe case all afternoon.

MS. PETRILLO-GROH: Actually, I have a question for the AMCA folks. So we're talking about the duty point, the FEI being applicable for the duty point. When you're looking at the system, the duct work, and other (indiscernible) that the air handling unit is blowing air through. There's a system design point, right? And then there's the pressure that -- the pressure is another obstruction that the fan has to overcome within the cabinet.

Now, if you're going to change -- looking at the example that I showed, if you're changing the cabinet and the coil or the filter or anything that's within the unit, you're look at different -- what ends up being two different duty points. And so the FEI of one is not

comparable to the FEI of another.

So two different air handlers that can both provide air to the space cannot be compared with this metric. And this is what you're talking about as being a fundamental metric for comparing products in an appliance standard.

It's a building performance standard. You need to limit the power consumption of the overall of the product -- of the fan within the product. You need to place that limit with proper allowances for known energy-saving measures in a building standard, not in an appliance standard where you cannot compare the performance of two products performing the same job.

MR. GALDAMEZ: Hold on. So we're going to have an answer here in the room, and then we're going to take the questions online. All right.

MR. STARR: So this is Louis. Can you hear me? Well, we'll assume --

UNIDENTIFIED SPEAKER: (Indiscernible).

MR. STARR: -- they can.

UNIDENTIFIED SPEAKER: (Indiscernible) mic. It's clearer.

MR. STARR: Right. How about that? So maybe I can answer this first thing, and then the AMCA people can correct me when I get it wrong.

So what Laura was asking, we have a graph up on the page there, AMCA 208. So essentially, you would take the fan out of the unit, and that would be A or line 1. You would stick back in the unit on the test stand so the outlet of the duct and right before the duct, and that would be line B.

And then you would basically know the RPMs at N and you would make sure it's the same RPMs when you get the second line, B. And those two give you -- that's how you get those two lines. Am I right, or what am I missing there, Armin?

MR. HAUER: (Indiscernible).

MS. PETRILLO-GROH: No. Well, what we're looking at here is -- I mean, other than Greg pointing out there's not test standard B, you're looking at -- for a essential station air handling unit, you would design a specific product for a specific application. You would be able to use a different number of coils to achieve the same cooling -- a different of number of coils and rows in inch per inch for --

MR. GALDAMEZ: So you're talking about --

MS. PETRILLO-GROH: I'm talking about --

MR. GALDAMEZ: What fan are you talking about now that you're talking about coils and all that? Are you talking about the exhaust fan? Are you talking about the

condenser fan? Are you talking about --

MS. PETRILLO-GROH: The supply fan. And it --

MR. GALDAMEZ: -- the main fan --

MS. PETRILLO-GROH: The supply fan of the --

MR. GALDAMEZ: -- of the unit? The supply fan.

MS. PETRILLO-GROH: The supply fan for essential station air handling unit. You can use different coils. You can use different configurations within the unit --

MR. GALDAMEZ: Okay.

MS. PETRILLO-GROH: -- to achieve the same desired --

MR. GALDAMEZ: So let me ask you --

MS. PETRILLO-GROH: -- outcome as it would have different FEIs based on the system effect of -- the cabinet effect.

UNIDENTIFIED SPEAKER: Right.

MR. GALDAMEZ: So if you guys -- all right. When you -- when the fan is tested in those units, how do you go about testing the fan performance where the fan efficiency, like Ingersoll Rand mentioned, if there is no test procedure? I mean, I don't understand how will you then --

MS. PETRILLO-GROH: So a --

MR. GALDAMEZ: -- say that --

MS. PETRILLO-GROH: So a --

MR. GALDAMEZ: -- the fan is so much efficient, or is there a way?

MS. PETRILLO-GROH: The AHRI 430 test standard looks at the fan performance in the box with the most restrictive coil that can be tested. And that test of a single product or several different products that are related in that basic model group as the fan community looks at it, which is not the same power consumption.

MR. GALDAMEZ: So we know the most restrictive. What is the pressure drop on that?

MS. PETRILLO-GROH: Okay, but only with that one coil. We then, from that point, are able to calculate using quite extensive computer software programs, how the coils which are tested to another AHRI standard, and the pressure drops from that impact the performance of the fan in that box. But there's -- you do have to look -- when you're looking at something as complex as a central station air-handling unit, there are commercial units and then there are custom units.

The custom units, which would have a completely custom configuration box size, are engineered to order for specific jobs. You cannot use AHRI 430 for another product.

And the fan laws don't apply when you start changing the cabinet geometry so significantly for a family of

commercial products where there is known geometry difference between different cabinet sizes in that group for that different capacities. Then you end up with some reasonable test standard, which is what is included in the AHRI certification program for that.

But when you go to completely custom units, you could do the test with that product. But you couldn't ever take the performance of another unit and extrapolate that -- or interpolate between two points to get the performance using the software program.

MR. GALDAMEZ: So we're going to go to the questions online, because they've been waiting for a while.

UNIDENTIFIED SPEAKER: (Indiscernible).

MR. GALDAMEZ: Well, you need to leave, right?

UNIDENTIFIED SPEAKER: Yeah.

MR. GALDAMEZ: Okay.

MR. STEFFENSEN: This is just -- again, going back to that definition of a basic model. That's not a small issue.

MR. GALDAMEZ: No.

MR. STEFFENSEN: And I asked -- there's no definition of a basic model in the draft staff report. I've been looking at some of the documents that you showed these were different basic models are fine, but we need one for fans.

And I would really humbly request that one be provided during the comment period, so we can kind of have an idea of what you guys are thinking about, what a basic model of a fan is. Because as I currently understand it, the testing burden based on what you told me for the basic model blows the testing requirements out of the water, and we really need to address that in real time.

UNIDENTIFIED SPEAKER: You are first on for sure.

UNIDENTIFIED SPEAKER: So generally in California, and because the proposal didn't change anything, what we require is every fan that's pulled off (indiscernible) offered for sale be certified by the Commission, be tested, and meet any applicable standard. So every fan model would need to be certified through the Commission, every model number.

We allow the basic model to allow for manufactures not to have to test every single model. So every collection of models that are suitably similar, in that they have the same electrical and physical characteristics, maybe they're a different color, maybe there is a mounting scheme or something that differs, that doesn't affect the energy consumption, those can all be lumped together as one basic model. And only that one basic model needs to be tested.

MR. STARR: So that's kind of a very quick explanation of the certification and testing requirements in California. And I understand that -- we want to hear comments as to how that may affect your industry.

UNIDENTIFIED SPEAKER: (Indiscernible).

MR. STARR: So there is --

UNIDENTIFIED SPEAKER: (Indiscernible).

MR. STARR: So it is up to the manufacturer to determine what models are in a family.

UNIDENTIFIED SPEAKER: But you just said that if changed (indiscernible).

MS. PETRILLO-GROH: So I wonder for -- I mean, fans are definitely different. I think maybe where, like, how you come up with the ratings (indiscernible) diameter, and it may be too late for you (indiscernible) fan laws rather than asking (indiscernible). So I think it's not quite the basic model approach, but it defers the limit testing burden so that (indiscernible) fan.

UNIDENTIFIED SPEAKER: So what --

UNIDENTIFIED SPEAKER: (Indiscernible).

MS. PETRILLO-GROH: I think maybe that's a discussion.

UNIDENTIFIED SPEAKER: (Indiscernible).

MR. GALDAMEZ: Yes, if you guys can -- exactly. That's exactly what I need, just an explanation on how to

go about it and all that.

All right. So we're going to go online, because they've been waiting for a while. I'm sorry.

MR. TIMOTHY: All right. Ron Cosby (ph.), you're unmuted.

MR. COSBY: So I'm not sure I remember what my comment was, but one, I think back to the regulations for air-handler fans. That does fall under Title 24, Section 140.4 around KW per CSM. So air handlers are regulated via Title 24 in terms of the total air flow in a building. So though it may not be a specific regulation to the air handler, it is on from a building perspective.

Now, to the comments around why we've been talking more on unitary rooftops versus air handlers, you have to look at how air handlers have typically been built. They're typically designed around the fan, and with that the box effects are typically a little bit less.

So Laura went into some of the issues that we had with those. They have a difference between what we call catalog air handlers and then custom. Catalog, we are building that box around the fan. So it's a more representative test or more closely resembles standalone.

When you move the custom air handlers, it is not because that fan may not exist on its own. We don't necessarily -- it's a one-time type of build.

When you move to unitary rooftops, we don't build the box around the fan. We put the fan inside the box because there are roof constraints. There are lifting constraints. There are space constraints.

So fan footprint is a big deal, and the fans that a lot of OEMs use in rooftops do not exist as standalone fans. There is no framework for a fan. That fan does not exist. The framework of that fan is the box that it's put into.

So there is no way to test that. There is no fan. So that wasn't my original question or my original comment, but I don't remember now, because it's been a while.

But I thought just based on the conversation, you need to understand -- because I think one of the things that Alejandro had in his presentation was that air-cooled chillers are built around a fan. That is not right at all.

Air-cooled chillers -- it's a condenser fans, and condenser fans are -- I mean, it's not air-flowed delivered to a customer. So if we are any -- it's a heat-rejection fan. If we are regulated on heat-rejection fans, we're going to redesign that to take the fan out of the equation. That will be zero energy savings whatsoever, because we'd change coils.

MR. GALDAMEZ: Oh, do we have another --

MR. COSBY: So heat-rejection fans should be off the table period.

MR. GALDAMEZ: Thank you. Do we have anyone online or -- oh, one more online. Sure.

MR. TIMOTHY: Okay. John Bade, you're unmuted.

MR. BADE: And this is John Bade from Johnson Controls. So I'll respond to a couple of things. First of all, everything Ron just said, yeah, absolutely correct. I will say in the air-handler world our projects are largely built around the fans, and our customers are extremely concerned about fan-powered consumption.

And Skip, I'm going to disagree with you. I think we really do have the data to know whether we're meeting the FEI requirements. We know the power input to our units. We know the pressure drops through our air handlers, which quite frankly, most embedded products don't know that, but as air-handling manufactures we do, because we do have to know them component by component. I will tell you, I'm not concerned about the air-handler industry, like, from what we physically sell, doing anything different.

I am worried about A, the paperwork process and making sure that it is well documented and not onerous.

And quite frankly, I'm not sure how to make that happen.

The most important thing I'm concerned about is making this enforceable. And I believe that the reason the DOE never came out with anything was because they realized that in an appliance standard where every appliance was okay at some point and not okay at another, was ultimately not going to be enforceable.

In Europe they do it a different way where they base it -- every fan has a particular performance and they meet it or they don't. That has its downsides, too, but at least that works as an appliance standard.

This is -- I think FEI will work great in Title 24; It'll work great in 90.1. I think you are signing up for a nightmare putting it as an appliance standard.

So I have some questions for Alejandro in terms of what would be considered sufficient data. So for example, if I shared -- here's all the air-handlers sold and the FEIs of air-supply fans, and exhaust fans, as shipped and selected, and maybe we got some other air-handler companies to do that. I mean, would that -- would you consider that sufficient data to --

MR. GALDAMEZ: Can you repeat --

MR. BADE: -- see where we are?

MR. GALDAMEZ: Can you repeat the fields? I didn't understand the fields you were talking about. So you're

saying, what again, the air handler plus what?

MR. BADE: So if we gave you the data -- So I'm -- as we were talking here I downloaded a bunch of data. Now, all the air handlers we shipped, and their air flows, and their static pressures. And we shared with you where they are today, I believe what you're going to find is that we're already pretty well above one on the supply fan side, and many of our fans on the exhaust fan side even are above one. Some of them will not be, but the ones are not are because they are operating at very low pressure.

MR. GALDAMEZ: Okay.

MR. BADE: Would that --

MR. GALDAMEZ: Yeah, that would help. That's exactly the data that would help, because then I'll see what the percentage is and maybe it'll lead into lowering the FEI for the exhaust fans that cannot comply with the 1.0.

MR. BADE: I guess the other thing that I was wondering about is certainly the number of the people in the room there may know some engineers in California who are very well respected. I mean, Louis made the statement engineers aren't picking (indiscernible) fans, and I agree with that.

I mean, would it be of any value to you if we were

able to arrange a short call with you with some of the engineers to have them explain to you what goes into their process for picking fans?

MR. GALDAMEZ: Yeah. By all means, yeah. That actually helps me, yeah. And you --

MR. BADE: Okay.

MR. GALDAMEZ: I mean --

MR. BADE: Yeah.

MR. GALDAMEZ: Yeah.

MR. BADE: Like I said, I'm not concerned about any -- I'll even say for, you know, when Skip was talking about his product. Believe me, we -- he's our competitor.

And I can tell you, Skip, your FEIs are just fine. You know, I'm not worried about you guys even making it either, so.

We have to come up language that makes sure that this thing is well documented. What are the BMGs? What do manufacturers have to put in for their data? What do the embedded fan manufacturers have to put in for data? There is very little language around that, and that really concerns me. We have to do a lot work together on that.

MR. GALDAMEZ: Okay. By all means, please submit some ideas; that'll be great.

MR. BADE: Oh, yeah. They're coming.

MR. GALDAMEZ: Okay.

MR. STARR: This is Louis with NEEA. First of all, the fan power allowance as a way of driving fan efficiency is totally impractical. It's widely known -- it's called an ankle-breaker to get over that thing, which means is you just have to jump over it and it's at your ankle. So the idea that you're going drive fan efficiency for the fan power limit regulations 90.1 or even California (indiscernible), it's not realistic.

It's the fan and the part of the efficiency, there's other elements in it. There's the building system. There's filters. There's everything downstream of it. So it's just so -- you're trying to affect a small part of the equation with a big regulation that includes a lot of other parts. So to me, that's not a really realistic way of doing it.

Mike Wolf about forty-five minutes ago said, "We don't want to do anything that DOE wasn't headed down." And I would say, "That's exactly right, Mike."

That's why Joanna, I, the California -- picked up the term sheet that we'd spent three -- that the DOE had spent three million dollars working on, and went that way. And what it included is going after air handlers with the fan metrics.

So we are headed the direction that -- you are headed the same direction that DOE is headed, which to my mind I didn't like certain aspects of it, but the analysis is there and some of the long hours of negotiations are there. So for me, it's the smart thing to do.

And the other thing is on the fans, and we only make fan for an embedded piece of equipment, we don't know if it is separate. They know other things like they know the cabinet losses, they know the fan. So it's kind of like you know two, and you don't know the third one. And so there's more than one way to get at that.

If, Alex, you called down and wanted a -- if you were working at a fan manufacturer, I'm sure you could tell me based upon knowing the fan wheel and something, how to actually create a piece of equipment that met the customer's needs.

So the idea that we can't figure out those cabinet losses -- and that's in 208 -- AMCA 208 annex B or something. That's a method of how to go about doing it. So it's quite of bit of time thought (indiscernible). So to me, I think all things are in place there.

And last thing, and I would say this is maybe too helpful. Laura was mentioning that she's got forty-eight pieces of equipment bought; what information do you need?

Well, my thought is is that there are some things that have a lot more savings associated with it, and maybe CEC could focus on those things that have a lot of savings with it and get the data worked out on that. And then (indiscernible) five or ten. And then, I think, Chad had alluded to that, but that could be a good approach.

MR. WOLF: (Indiscernible), Mike here. So Louis, I just want to clarify what I said and what you heard me say. Maybe we need to extend this to refreshment later to get it fixed.

But I was part of the ASRAC. I agree that we were a long ways down that path. Whatever I said, I didn't mean to imply that what we did there wasn't taking us along the correct path, okay?

What I did say is we shouldn't be using these fan regulations to problem with some other regulation that may exist out there. That's all I said. That's all I said.

Now, how you interpret that is up to you, because now I'm take and turn it on you. If I understand what you just said, that the fan parliaments in 90.1 in CEC don't do anything, let's get rid of them. Let's just get rid of them.

MR. STARR: They do --

MR. WOLF: Is that what you're saying?

MR. STARR: Well, an ankle breaker is better than no breaker.

MR. WOLF: Well --

MR. STARR: It's not just for the equipment. It's for the design. The design --

MR. WOLF: Okay. So the answer is no --

MR. STARR: (Indiscernible) --

MR. WOLF: -- we shouldn't get rid of them.

MR. STARR: Right.

MR. WOLF: They are helpful. They help move the process --

MR. STARR: They help with the design.

MR. WOLF: -- forward and save energy.

MR. STARR: (Indiscernible), but they're not meant for the air handler --

MR. WOLF: Okay.

MR. STARR: -- or the air (indiscernible).

MR. GALDAMEZ: I have a question, and this is just what I have heard. I have heard here that most of the fans are above one or one FEI. Well, I mean, what would -- I just want to understand because that is the argument that has been presented here constantly. What is the actual (indiscernible) --

MS. PETRILLO-GROH: No --

MR. LESSANS: Mark Lessans with Ingersoll Rand.

That may be the case for air handlers that was stated. That is not the case for commercial unitary equipment. I needed to make sure I cleared that up.

MR. GALDAMEZ: Thank you for clarifying that.

MS. PETRILLO-GROH: These aren't the level of products that could be impacted by this. There hasn't been the same level -- there isn't the same level of data, and there hasn't been the same level of analysis. So the testing, and labeling enforcement, and record keeping on this are extremely onerous, and they're very complex when it comes to -- like, California doesn't address engineered to order products.

Like I was mentioning, when you go down to the design -- the design engineer will go down -- for example, a train selection program, or carry a selection program, and actually say, I've got this amount of space to use in my mechanical room. I cannot go above eight feet. I have to choose and -- but I have to deliver 60,000 CFM to my floor of my department store, if people are still building department stores, which they're probably not.

But either you go through and you build a specific product for that specific application. How does that get sold in California? I mean, that's the only one that was ever built. These are engineered to order products, and

this is not an uncommon situation. And even if it was, you'd still want to be able in the State of California.

MR. GALDAMEZ: So the products that you're saying they're really low in the market, right? I mean, is there a custom and just one built every, what?

MS. PETRILLO-GROH: I mean, every building is custom if you think about it that way, but some of them require more precise or engineered products. And these are regional manufacturers that are largely not represented by AHRI.

MR. WOLF: Mike Wolf from Greenheck here. So an example, yeah. So please don't think that all embedded fans should be raised to something higher than one, because that is not the case. The engineered to order example that Laura gives, that encompasses pretty much all of the Greenheck products in terms of embedded equipment, and they're unregulated products, as well.

So examples of that would be a make-up air on a kitchen system. For example, okay? I mean, just walk out this building and you're going to see a ton of that stuff. We have a number of those fans in our make-up air units that probably do not have a FEI of 1.0, which will be impacted by this regulation.

What concerns us more, and I think probably concerns others in the room more is that, okay, if we start at one

then next time it's 1.2 or 1.3. We know that pretty quickly we get to a point of I guess, what we call max tech or diminishing returns, or something that's just physically not possible to do pretty quickly once we get above that 1.0 mark. So that's another concern that I don't think anybody has raised today and said, okay. If we set the threshold here, but we know that our -- okay, next time it's going to be ratcheted up.

MR. GALDAMEZ: (Indiscernible) not -- that it's almost impossible to get 1.0, okay? What suggestions do you guys have for what FEI level should they be if we include them? And how can we -- what is the range of performance to get it to a comparable FEI, in which the fan is easy to test, easy to be implemented, doesn't require a lot of testing? I mean, can you guys give me a number on that?

MR. WOLF: We can give it to you on our products. I can't speak for everybody else.

MR. TIMOTHY: John Bade, you're unmuted.

MR. BADE: Thank you. So first, I'm going back to Louis' comment about the fan power and FEI 90.1 being an ankle-breaker. I take complete exception to that as a voting member of the 90.1 mechanical subcommittee.

For the mechanical part of 90.1, that particular provision, I promise you -- our members will tell you,

that's one of the ones that we hear the most complaints about from engineers about being difficult to meet. Yeah, there are times if your air handler is located very close to the space its serving, so it's efficient because you don't have a long duct. Yeah, then it's not an issue, but believe me, to call it an ankle-breaker is a complete mischaracterization of that.

And to that point, as I mentioned earlier -- and, Louis, you have seen the PowerPoint of the draft -- we can make that tougher, and I am working on making that restriction stricter based on FEI. But that's the place where we can work it, because that's when engineers are making their decisions about their airflows and their pressures, when they're building a design.

So if you don't think -- if you don't think it's tough enough, that's fine. I'm willing to make that tougher, but that is the place we need to do it -- that and Title 24. It is going to be very, very complicated and very onerous to do it here.

That's my comment.

MR. GALDAMEZ: Thank you. One and then two, or -- let's start where the mic is and then we'll go to you. That'll make easier.

Go ahead.

MR. WAGNER: All right. This is Greg.

Yeah, I wanted to say that comment that these fans all meet 1.0. Well, all fans meet 1.0 at some point or another as we've discussed many times. The question is is how do those operating maps overlay with the operating maps of the equipment, and that's where the challenge lies.

It's not in just saying a fan meets a 1.0, because that's always the case. So a lot of this analysis breaks down when you start looking at just saying a fan meets a 1.0.

UNIDENTIFIED SPEAKER: Go ahead.

MR. CATANIA: Tom Catania consultant to AMCA. Alex, I think you've done a great job in being clear about what you need to help move this process along as you're required to.

I think some of the room may be not understanding the significance of the difference between the federal process and the state process. It's been my experience that -- and especially when presented with a nearly complete, whatever the reason DOE decided not to issue it, but a nearly complete multi-year process looking at this product category and a record that was available to you to look at in preparing your work, that the CEC does not often reject well-documented staff recommendations, and their decisions that they take are not often

overturned later in long, drawn-out litigation proceedings. So I'm just reinforcing, for the audience, the need to proactively submit real, heard, reliable data, because in the absence of it, the Commission has plenty to draw conclusions from.

MR. GALDAMEZ: And that's exactly the point. I mean, I'm not here to just impose a regulation that doesn't make sense, but if I don't get participation from everybody, and enough information to support that, I can't help you. I can't go against the data that I have in front of me.

So if you really want embedded fans to be excluded and you have enough information, by all means, please submit all that information, work with your AHRI, work with PG&E on getting those legal primers set so that information can get to me without things that cannot be public, be public. So that I can work with it and support what you guys see as a problem.

What we look for is energy savings, nothing else, for California. I mean, we reach a point where -- I'm sorry to sound so green here, but I think if we don't improve technology and push it in a regulation basis -- I mean, there's a lot of denial of the climate changes and a lot of denials and (indiscernible) and I'm not one that denies that we need engineered solutions for the future.

I mean, we're in a pickle here in California, the only state, so far, that always been at the forefront of environmental laws and getting the future -- saving energy. I mean, if you look up our record.

So I mean, I do need your help to make this happen. I'm not here to be against -- oh, embedded fans. We didn't agree with -- all right, that's the past. Let it be. Let's take this report and give me the information that I need so I can work with it.

MS. ANDERSON: This is Mary Anderson from PG&E. If you see any errors or things that you want us, on our team if we do the analysis, come talk to us. We'll come to you. We will talk to you multiple times until we get it. We'll ask questions. I will send these guys and myself, and whoever else we need to make sure we get this right.

If you want to work with us, we are open and interested. So okay.

MR. GALDAMEZ: Go ahead, Mike.

MR. IVANOVICH: Yeah, this is Michael Ivanovich from AMCA. And again, I echo what Tom said. You've done a wonderful job looking at the, almost, six years of established record.

Our rulemaking and working for California, I think from our perspective this still represents the first

draft regulation for fans and one that uses a new metric. And based on our discussion today and some of these revelations, I just have to reiterate that our request for a sixty-day extension is sincere and that we're not just here to look at it and comment. These aren't going to be editorial comments. We have to do some development. We have to look for things that are probably not in the regulation wording, but are inferred.

So we have some research to do. We have some coordination with your office, with Mary at PG&E, and the advocates as well, and our own members. And it's a process that requires time. It's not just read, and review, and comment. It's a coordination process that's going to take some time.

So I'd just like to reiterate that our request for a sixty-day extension is based on a process thing, not just a reading and review (indiscernible).

Thank you.

MR. GALDAMEZ: Nobody else on the line? So I know you guys got to catch some planes -- oh, good. We have one more.

MR. ERNST: Skip Ernst from Daikin. One thing that hasn't been talked about is replacement fans. There are some replacement fans where nothing other than the original can be safely used, particularly with use with

gas furnaces and electric heat, and seismic performance.

So if the fan on this building broke, and they go to replace it, and they find that that fan is not compliant, you would have to replace the unit, which is an incredible burden for the building owner. And not just the cost of the replacement, but the lost air conditioning and heating in the meantime, because it takes months, at best.

So the replacement fan -- and again, it's a safety issue. What you're going to find is people will be substituting unsafe fans. I mean, a building owner is not going to have a choice. That's what you're forcing them into.

MR. GALDAMEZ: I understand.

MS. MAUER: I know a lot of people have flights to catch, and they need to get on the road. What I'd like to do is to reiterate our need for data. Please send us your data.

If you do have confidential information, Mary has the ability to keep it confidential and still provide us with information we need. So I would implore you is to work with Mary. She does have the ability to do an NDA.

So a lot of people said they would send in information. Either send it to Alex or work with Mary for an NDA. We do have a confidential information

process here, but it's a little bit different than an NDA. So if you're extremely concerned about that, I would say work with Mary. She can get it done a little bit faster.

MR. GALDAMEZ: So with that, I will close the meeting for today -- the workshop. Thank you for coming.

And again, if you guys need any one-on-one meetings or explain to me something, I'm available on my email or give me a call, and I can set a meeting and we can meet over here and go with it.

Thank you so much for coming.

(End of Recording)

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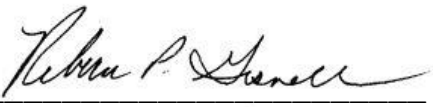

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