UNITED STATES DEPARTMENT OF ENERGY

ENERGY EFFICIENCY AND RENEWABLE ENERGY
OFFICE OF BUILDING TECHNOLOGIES

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ASRAC FANS AND BLOWERS :
WORKING GROUP MEETING :
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A meeting in the above-entitled matter was held on
Wednesday, June 3, 2015, commencing at 9:06 a.m., at 950
L'Enfant Plaza, Seventh Floor, Room 7140, Washington, D.C.
20585-0121.
MS. ARMSTRONG: So, we'd like to welcome you guys again today. Are we ready on the Webinar and the transcript?

COURT REPORTER: Yes.

MS. ARMSTRONG: We're good? Okay. So we're in a small room today as you might have noticed. We're going to make new friends and share new ideas. It's going to be good for all of us and fun. And there's no Internet too, so we can all really focus on fans and DOE regulations and how they might work together. We're going to go around the room real quick just for the transcript and everyone say their name and their affiliation. We'll start with this back corner. But I will say there's not microphones above you like there is in the other room, so speak loud, please, just so she can hear you for the record. There are some mini microphones around, but it would be most helpful if you could do that.

MR. STEVENS: Sure. I'm Mark Stevens. I'm with the Air Movement and Control Association.

MS. ARMSTRONG: Great. Thanks.

MR. TEAKELL: Kevin Teakell with AAON.

MR. BOTELER: Robert Boteler, Nidec Motor.

MR. MAGILL: John Magill with Howden.

MR. MORRISON: Frank Morrison with Baltimore
Aircoil Company, alternate member for the cooling technology.

UNIDENTIFIED MALE: Thank you.

MS. ARMSTRONG: You're welcome.

MR. ERNST: Skip Ernst, Daikin Applied.

MR. WHITWELL: Bob Whitwell, Carrier.

MR. DYGERT: Ryan Dygert, Carrier.


MR. FLY: Mark Fly, AAON.

MR. WINNINGHAM: Dave Winningham, Allied Air.

MR. DELANEY: Dan Delaney, Regal-Beloit representing NEMA.

MR. LIN: Paul Lin with Regal-Beloit representing NEMA.

MS. DAVIDSON-HOOD: Caroline Davidson-Hood, AHRI.

MR. JOHNSON: David Johnson, Berner International.

MS. MAUER: Joanna Mauer, Appliance Standards Awareness Project.

MR. DIKEMAN: Steve Dikeman, AcoustiFLO.

MR. FERNSTROM: Gary Fernstrom representing the California Investor-Owned Utilities, which would be Pacific Gas and Electric, Southern California Edison, San Diego Gas and Electric and the Southern California Gas Company.

MR. SMILEY: Bill Smiley representing Trane.
MR. SMITH: Wade Smith with the Air Movement and Control Association.

MR. BURDICK: Larry Burdick, SPX Technologies representing Cooling Technology Institute.

MR. HAUER: Armin --

UNIDENTIFIED FEMALE: No. Go. Sorry.


MR. DADDIS: Duane Daddis, Carrier.


MR. HOWE: Nick Howe, Carnes Company.

MR. PERSFUL: Trinity Persful, Twin City Fan Companies.

MR. WOLF: Mike Wolf, Greenheck.

MR. ROY: Aniruddh Roy, Goodman.

MR. MCCABE: Michael McCabe, consultant to Trane.

MS. ARMSTRONG: Ashley Armstrong, DOE.

MS. IYAMA: Sanaee Iyama, Lawrence Berkeley National Lab.

MR. COCHRAN: Pete Cochran, DOE.

MR. JASINSKI: Sam Jasinski, Navigant consultant.

MR. WIGGINS: Steve Wiggins, Newcomb and Boyd.

MR. CATANIA: Tom Catania, alternate for the Air Movement and Control Association.

MR. MATHSON: Tim Mathson, Greenheck Fan.

MR. FINE: Steve Fine from the Office of Hearings and Appeals.

MR. BOSWELL: Wade Boswell from DOE's Office of Hearings and Appeals.

MS. PONTILLO: Pam Pontillo, Department of Energy, Office of Conflict Prevention and Resolution.

UNIDENTIFIED MALE: Okay. And I understand that there are two members of the Working Group online with open mics, if they could introduce themselves?

MS. JAKOBS: Diane Jakobs from Rheem.

UNIDENTIFIED MALE 1: And is Greg, is Greg Wagner still online?

IT SPECIALIST: He is, but he needs to enter his audio again.

UNIDENTIFIED MALE 1: Okay. Any other Working Group members online at this point? So, once again, welcome to the fifth meeting of the ASRAC Fan Working Group.

Ashley, were there other housekeeping matters, or did you want to go into the status of homework and the updates there?

MS. ARMSTRONG: Yeah, so I guess this would be a good time just to talk about the agenda really quick, to
touch base on a few things. I, I do want to go through the
list of homework items that we had sent out like right
after, couple days after the previous meeting, and see where
we are on each of those. I know we had a handful of
requests to speak. I tried to catch them all last night
before I, when I was writing this agenda, but I might have
missed some. If, if anybody else would like to speak,
you're welcome to do so. If you have a presentation or a
file that you would like to share, either it's with regards
to detailed responses to homework, or specific items that
the committee's been grappling with, Alex is happy to load
that if you have a, you know, little disk, any, load that so
that everyone can see it. I didn't print out the individual
presentations though.

Does that sound generally good for the morning
part of the discussion? Additional issues? Yes, no,
feedback? Silence? Okay. Silence is happiness, so.
That's how we do things in this committee. So, one of the
things I wanted to bring up also. After the break, I think
we plan to, or at least after lunch, plan to do two things.

One is, DOE is going to give our presentation of
the NODA in terms of how the analyses were conducted, what
types of data sources were used, let each of us kind of walk
you through what we've already published with regards to the
analysis for fans and blowers to date. One of the things
that I also wanted to do, and it's kind of, we touched on this a little bit last meeting, but it's kind of a new, new subject to this group. It's discuss representations and, and kind of how you make representations, what does it mean to come up with a representative value or a rated value for your fan or blower, you know, how does that work typically with DOE regs, what are some options on the table here and then what does that mean in terms of certification and ultimately enforcement of those rated values. And that's just more of to give you a sense of what we do to date, generally speaking for all products. I think it might be helpful to inform you about that aspect of our regulations as we move forward. So that's more of a, I'm doing that ad hoc. I didn't actually come up with a presentation in the middle of the night last night. But hopefully we can have that dialogue towards the end of the day.

Were there any other items that people see that are missing that they'd like to bring up to actually discuss or try to come to a resolution? I mean, we're going to walk through some of the homework items. Some of them may be more detailed than others but. Yeah?

MR. SMITH: There's been a lot of work done on definitions.

MS. ARMSTRONG: Yes.

MR. BUBLITZ: Okay. Can we identify ourselves on
the record as we speak?

    MS. ARMSTRONG: That's fine.

    MR. SMITH: This is Wade Smith.

    MR. BUBLITZ: Thank you. Mark Bublitz is saying it to Wade Smith.

    MR. SMITH: This is Wade Smith.

    MR. BUBLITZ: Wade.

    MR. SMITH: The AMCA Fan Committee has done some additional work on definitions and we submitted, actually during the last meeting, work that had been done previously between the advocates and, and the AMCA members. And you know, some of those definitions I think we could close the door on with the consensus of the group. I don't think there's much controversy in other words. And some of them are still a work in progress, but we'll continue to beaver away at it. And I guess the question is, how actually you and or the Working Group wants to see this as, as it develops? Do you want it, in other words, do you want to see the debate as it unfolds or do you just want to see the end result? I don't, I, I don't, we don't really care. We'll be happy to share whatever the group wants here.

    MS. ARMSTRONG: So that's really up to the Working Group. I think at some point it would be helpful for someone from AMCA, or whomever at that point, to present the definitions to the Working Group to get the Working Group's
feedback before you present. I mean, obviously.

MR. SMITH: Well, we'd, we'd be happy to do that now, I mean --

MS. ARMSTRONG: Yes. So, perhaps we can put that as an agenda item. If you have a file that you want to work off of, if it's not the file you've, you've already sent out, if you have a --

MR. SMITH: Right.

MS. ARMSTRONG: -- a more revised one, you can just get it to me on a flash drive?

MR. SMITH: Sure.

MS. ARMSTRONG: We can get it to Alex. But I think the committee would benefit from hearing where you are now, kind of some of the ones. That could help shape the, some of the discussions moving along. So, yeah, let's, that would be great.

MR. SMITH: Okay.

MS. ARMSTRONG: Anybody else?

MR. HAUER: I have a question.

MS. ARMSTRONG: Yes.

MR. HAUER: Armin Hauer of ebm-pabst. I was wondering, is the Department obligated to, to any international commonization of standards? Obviously, all the trans, the trans-Pacific trade deals going on and the Atlantic trade deal, do we have to commonize (phonetic sp.)
any of that standards or can we reinvent the wheel here?

    MS. ARMSTRONG: That's a loaded question so early in the morning. Have is probably a, a bit strong of a word there, but I would say the Department's intent is to obviously work on harmonization where it makes sense. We have separate statutory obligations and in some cases there are statutes written very differently, so we have found cases where we have tried to harmonize as much as possible for other products, but it's not an identical one-to-one. Because, but yes, I mean, we should be working towards with that in mind, but we don't have to isn't the right word, I would say. We have to meet our statutory obligations. So if there's a conflict there. Fair enough?

    MR. HAUER: That's fair enough.

    MS. ARMSTRONG: So that can definitely be part of the discussion. Does anybody else want to bring anything up at the outset?

    MR. FERNSTROM: So this is Gary. When we did the introductions, Meg from NRDC was on mute, but she's on the Webinar now.

    MS. ARMSTRONG: Great. Meg, welcome. And can you unmute her, because she's an actual voting member too?

    UNIDENTIFIED MALE: Yeah, I did it.

    MS. ARMSTRONG: Great. Anybody else? All right. We're going to go through the list of homework items. And
I'm just going to go through them one by one. I don't have them on the board, but so one of the things I said we'd do is schedule meeting times, location. Everybody has those now and we've updated our website. We should all have where the meeting is, what, all the various times it starts and ends and all the various places that we could be meeting. Everyone have those that need that information? We're good? Okay. Check. Amber will provide feedback on the compressor cutoff definition on a fan. I think you provided something about her and I wonder if you want to just give a high level explanation of what you provided in case anybody has any other feedback they'd like to.

UNIDENTIFIED MALE 1: The question was whether or not 25, is it kilograms per joule or joules per kilogram?

UNIDENTIFIED MALE 2: Oh, joules per kilogram.

UNIDENTIFIED MALE 1: Or joules per kilogram. Is it appropriate to cutoff distinguishing between fans and compressors? And the answer is that we agree that, that, that's the right answer. It, it appears in both European and American standards and it's widely accepted and it makes perfect sense, so, it's easy to agree.

MS. ARMSTRONG: Okay. Does anybody else have any feedback on that item? We're in general agreement on that one? Okay. Great. So that saying, I said we'd send out redline to the presentation. Everyone got the
presentations, they were submitted, they were sent out a couple days after the last Working Group meeting, so hopefully they helped you in advance.

Next is the Working Group will review the definitions of each equipment cost to ensure they are mutually exclusive and then the associated testable configurations. So we got a variety of feedback on that one. I don't know if we want to, do you want me to load those slides and go through them again or, Wade, do you want to use this as your opportunity to present the definitions to your group? I know I may need some facts and feedback as well. So, I don't know if you want to, how you want to handle that with the group.

MR. SMITH: I accept it. I would answer questions, but I'm not prepared to.

MS. ARMSTRONG: Okay. Sounds good. So do you guys want to start and just dive in the definitions now? No, you don't. Okay.

You want to do opening presentations first?

UNIDENTIFIED MALE: I, I, I'd rather get, get you, the, the slide and, and put the slide up and go through it.

MS. ARMSTRONG: All right. So let's kind of do it after lunch or after break when --

UNIDENTIFIED MALE: Okay.

MS. ARMSTRONG: -- we can do that. Okay. Sounds
good. Next is AHRI will provide some type of proposal to
the Working Group regarding the scope that attempts to
address the concerns voiced within the working group
regarding delineation and how, how it expands use and data
and energy use. So I think, Laura, you have the
presentation loaded, or do you want to --

MS. PETRILLO-GROH: Our presentation's loaded. I
think we had, the order of our presentations makes a little
bit more sense. I basically got it on, on the, on the board
right now.

MS. ARMSTRONG: Okay. Great.

MS. PETRILLO-GROH: And you know, we started
sending out data surveys for each of the different equipment
types. We're getting a lot of feedback, but the answers
were very varied, so it's going to take a little while to
finish that analysis. It is (indiscernible).

MS. ARMSTRONG: So when do you think you'll be
able to have that?

MS. PETRILLO-GROH: For the next meeting.

MS. ARMSTRONG: So that's the June, mid-June
meeting? End of June meeting?

MS. PETRILLO-GROH: At least some --

MS. ARMSTRONG: Twenty something?

MS. PETRILLO-GROH: -- at some of we'll be able to
have for that.
MS. ARMSTRONG: Okay. So the other thing we did, before we jump into the presentations, was we had asked about specific items for feedback regarding the test procedure. We had listed a bunch of test procedure items with regards to AMCA 210. Have you guys had a chance to look at some of those questions?

UNIDENTIFIED MALE: Yes.

MS. ARMSTRONG: Do you want us to tee it up for you when you're prepared? Why don't we let them do their presentations --

UNIDENTIFIED MALE: I didn't have a presentation.

MS. ARMSTRONG: -- and then we'll tee up the definitions and then we'll tee up the test procedure questions and we'll march through all, each of those. Does that sound okay?

MR. SMILEY: Yeah, it's Bill Smiley, Trane. In, in the presentation I have like, I have --

MS. ARMSTRONG: Some --

MR. SMILEY: -- reviewed several classes of embedded products and also reviewed test methodologies for those.

MS. ARMSTRONG: Great.

MR. SMILEY: So --

MS. ARMSTRONG: So with that, would you like to take the floor?
MR. SMILEY: Well, I thought we were going to do --

UNIDENTIFIED MALE: Skip, do you want to go first?

MR. ERNST: Yeah, okay.

MS. ARMSTRONG: Oh, Skip, I'm sorry.

MR. ERNST: Thank you. Just go up to the front?

MS. ARMSTRONG: Yeah, absolutely. So there should be a keyboard over there.

MR. ERNST: Is there a dancing bit?

UNIDENTIFIED MALE: No.

UNIDENTIFIED FEMALE: No.

MS. ARMSTRONG: Are you going to have to open that? Well, let's get yours then.

UNIDENTIFIED MALE: Do you want to explain that?

MS. ARMSTRONG: So he is the (indiscernible)?

UNIDENTIFIED MALE: No, no, no, no.

MS. ARMSTRONG: None of those. The first --

MR. ERNST: Preso.

MS. ARMSTRONG: Oh, up front. Weren't those cleaned up?

UNIDENTIFIED MALE 1: No. That one was like --

UNIDENTIFIED MALE 2: The first one was --

UNIDENTIFIED MALE 1: (Indiscernible).

MR. ERNST: That, that, that'll work.

MS. ARMSTRONG: All right.
MR. ERNST: Well, Skip Ernst with Daikin Applied. Thank you for taking this time to discuss some issues and opportunities. The, my presentation and some of the other AHRI presentations will have a common theme. And that is, there's lots of end uses for fans. And, and some of these are going to need some special consideration.

UNIDENTIFIED MALE: Mr. Ernst, could you speak up a little bit?

MR. ERNST: Okay.

UNIDENTIFIED MALE: Okay. Thank you.

MR. ERNST: Return fans and exhaust fans are very important to building owners and designers. They basically allow proper building pressurization control, as well as and if you do not do proper building pressure control and ventilation control, you'll waste a lot of energy, among other problems. Return, also, return fans and exhaust fans, just by their application and their nature, are going to be less efficient than the supply fan in a given unit. So we'd ask, you know, again, that regulations would consider these issues. As I go through the presentation, these are some of the acronyms that you'll see. Some of you, again, they're at the bottom of the screen, maybe you've seen them before.

UNIDENTIFIED MALE: Yes.

MR. FERNSTROM: So this is Gary for the California IOUs. I presume we can ask questions as you go through?
MR. ERNST: Please.

MR. FERNSTROM: And, and my question would be why fundamentally are return and exhaust fans less efficient?

MR. ERNST: Yeah, I'll show you that. That'll be towards the end of the presentation.

MR. FERNSTROM: Okay.

MR. ERNST: I'll first go through why --

MR. FERNSTROM: Thank you.

MR. ERNST: -- building pressure controls are important and why return fans and exhaust fans are important for that. The, first of all, building pressure typical values that you would want to see are very slightly positive. Again, numbers that are pretty hard to measure with normal instrumentation, 0.5s, 0.1 positive pressure is what you typically would want to see with building pressure. Listed some of the problems you have here if you do not properly maintain building pressure control. The doors are going to be difficult to open and close. You'll end up with poor ventilation control, which is either going to be one of two things. You're either going to have too much ventilation and waste energy or too little and your indoor air quality is going to suffer. And again, you'll have poor perimeter comfort control and you can, with negative pressure especially, have problems with condensation inside the walls of the building if you're pulling in moist...
summertime air.

Now rooftops, especially multi-story rooftops, very often require powered return fans and exhaust fans in order to achieve proper building pressure control. The, and what I'm going to go through now on these next few slides is to show you why. But again, and I'm going to give you an example where we're talking about a multi-story application with a ducted return typical of two, three, four stories with variable volume. The, the issue becomes most clear when you look at that application and I think you'll, as we look at the numbers and the science, you'll see it applies to other applications too, to either a greater or a lesser extent. But this one's a pretty common one that really illustrates the issues. If you take a look at that rooftop unit and the application, let's say your desired space pressure control is at a tenth of an inch and on this ducted return you have an inch of air pressure drop. Again, the fan has to generate an inch of, of pressure to force the air through that return ductwork. So, if again, if you're having it, this is a, the basic parameters that we're going to be looking at in this example. Now if you start with a tenth of an inch of pressure drop here and a one inch pressure drop loss, then you're going to end up with a negative pressure of about nine-tenths in the back end of the, of that rooftop unit in the economizer section, the
return air section, whatever you want to call it.

Now taking a closer look at that section again, this is, you would typically have your exhaust air dampers, your return air dampers, your outdoor air dampers and, again, in this section right here you have, again, nine-tenths of an inch of negative pressure. Otherwise, the air isn't going to flow. The, the air isn't going to flow back from the space to the, to the return part of the unit with that sort of return duct pressure drop that I showed you. So this is, again, this is important. Hopefully we're all together at this point, because this is, you've got to understand this to go, as we go through the rest of the presentation.

Now, the first problem that you're going to have on a supply fan only system, with a negative pressure here, atmospheric pressure here, you can't exhaust air. Right? Negative pressure here. This is zero pressure or atmospheric pressure. There's no exhaust from this supply fan only system from the back, from the rooftop exhaust section. That's a problem. That's the first problem and a big one. And again, this is, now when that happens, when you, if you end up with no exhaust from the unit, then the supply fan starts, it starts pulling air through two paths. The planned air path is back through the return air portion of the unit. But it's also pulling in outdoor air for
ventilation. And that ventilation air can't exhaust here. What it does is it builds up pressure in the space so that the air goes out through the walls of the building and then back through the outdoor air. Those are the two air paths that you will start generating on that supply fan only system. And again, whenever you have two parallel air flow paths, you get equal pressure drops through each path, it's just the air will, you know, adjust itself until you get equal air pressure drops.

So, now what happens on a tight building when all the doors are closed? What's going to happen? You've got this outdoor air, air damper open, the fan is going to be trying to draw in some outdoor air, but that outdoor air has to go someplace. The only way is to build up a big positive pressure in the space so that it goes out through the walls and that's why you often will walk into a building and open the door and you'll feel a blast of air in the face, because the door was shut and it built up this positive pressure. I bet everybody has experienced that. And again, that's typical of a supply fan only system where, again, you're having trouble exhausting air through the intended exhaust path. Instead, you're exhausting through the building. Now when the doors open, then you have this wide open path of outdoor air into the building and then out through that door and you get all sorts of ventilation air. Way more than was
intended. So you get, that's where you start wasting
energy. Now when the doors shut, it's a tight building.
You get very little ventilation control and there you get
your problems with insufficient ventilation and poor indoor
air quality. At the end of the day, you've had no control
is really what you have. It just depends on what happened
is when, you know, people go in and out of the building you
go from excess positive pressure to all sorts of, you know,
excess outdoor air when the, when the doors open.

Now, the, the typical pressure drop through the
return air damper, again, if we're nine-tenths of an inch in
this portion of the unit with a little bit of air pressure
drop through the open return air dampers, you're about one
inch negative in the, that outdoor air intake section.

UNIDENTIFIED MALE: That's a problem.

MR. ERNST: Now this is where you end up with a
second problem. You have this big negative pressure trying
to pull air in through this outdoor air damper. As we said,
whenever that, those door open, you get an, all sorts of air
coming in because you have this big suction pressure at this
point. The, so again, at, this is, you're going to end up
with very poor ventilation control is the second problem.
And I'll show you a little bit about dampers. You can even
quantify this to some extent. I can't reach to all portions
of the screen. But this is, your dampers, as damp, this is
as your dampers open and close. This is zero percent open. This is 100 percent open and then that, this would be zero percent air flow and 100 percent air flow. And this would be typical damper operation. And this is where you have very little pressure, suction pressure across the damper in a closed position. And this is where you have tremendous pressure across that damper. What happens in this scenario, you open the damper just a very slight amount and you get all sorts of air, because you've got all that suction pressure on the damper when it's closed. Now, that's the poorer control situation.

The good control situation is you have very little suction pressure on the damper when it's closed. You open the damper, you get a little bit of air. You open it more and you get a little more and you can have very good control in this situation. So then, yes?

MR. STARR: What kind of damper is that? Is it opposed blade or parallel of what you're showing there the operation of those?

MR. ERNST: There's, I don't know if I remember for sure which one this is.

UNIDENTIFIED MALE: Remember, identify yourself.

MR. STARR: Oh, Louis Starr of NEEA. I'm sorry.

MR. FLY: This is Mark Fly from AAON and that looks like an opposed blade damper. I mean, if you look,
the opposed blade damper will have a more linear effect than a, than a parallel blade (indiscernible).

MR. ERNST: Okay.

MR. SMILEY: This is Bill Smiley with Trane. It really doesn't matter to the point you're trying to make.

MR. ERNST: Yeah.

MR. SMILEY: What type of damper it is.

MR. ERNST: Yeah.

MR. SMILEY: Opposed blade damper you get more linear.

UNIDENTIFIED MALE: Let's go.

MR. ERNST: Right. Then again the, with, you also get better control if you have a low suction pressure on that damper when it's closed. Again, with either type pressure that's going to be the situation. It's some kind of code. So, we've identified two problems that a supply fan only system has. And in each case you end up with poor building pressure control. You get excess outdoor air which wastes energy or insufficient outdoor air energy, insufficient outdoor air you get, you know, poor ventilation control and, and you have trouble controlling the ventilation period with the dampers. So this is the supply fan only system.

This would be the, adding a return fan to that, to that unit. Now you set up the return fan, you draw this,
the suction, you drawn the negative pressure right here at
the inlet of the unit and the, the supply fan would be sized
for that one inch air pressure drop in the return so you'd
have essentially your slight positive pressure here in the
exhaust section of the unit. And basically, you've solved
that problem of no exhaust. You cannot exhaust from this
negative pressure. This with some relief dampers works very
well. The return fan, adding it in that way and sizing it
for the return pressure drop makes that problem, that
problem number one go away.

I can feel you're nodding yes. Is any
disagreement or questions? Yes?

MR. WIGGINS: Yeah, I have a major disagreement
with what you've shown because you're assuming that you
don't know how to design a system properly, you don't know
how to set the controls up to make it work. You can design
a supply only system and select your duct design properly,
select your dampers properly, install your controls properly
and make a supply only system work with a variable exhaust.
Can it work the way you've shown it? Well, the sad
statement is, the vast majority of them that are installed
today work exactly like you showed because they're not set
up properly. They're not designed properly. But you can
take a supply only system and make it work. I set them up
all day, every day and make them work. So, what your
example is, is right. That's how we typically see them in buildings today, but I can design the system with only a supply fan and set it up and make it work, because the Navy in 1978, '74 through '78, did a research project on over 1,500 buildings that were designed with return fans and supply fans to determine why they were having so many problems with fan tracking and what, and how it's controlled. And they determined that, I'm sorry, my name is Steve Wiggins. I forgot to say that when I started talking. They determined that in 99 percent of those cases, with proper design, they could have completely eliminated the return fan. In some of the cases, they felt like they needed a relief fan, but not a return fan. And so, with proper design, I can do everything you're talking about without having a return fan. I may be limited on space and configuration to be able to size the return ductwork properly and be forced to make a return, return fan selection and make it work. But let's get it on the record that I can design supply only fans, set it up, make it work and it'll work well.

MR. ERNST: What are the key aspects when you, you say proper design?

MR. WIGGINS: Sizing of return ductwork is the key element of it. The size of the dampers, the type of the dampers you talked about, the controllability is a key
element. Where am I going to monitor my building pressure and how I'm going to control the dampers has a key part of it? But I can set relief up and do all of that and make it work. We do it every day, all day long.

MR. ERNST: Now, if, if you have, if you do end up with a one inch return pressure drop, what, how would you handle a system like that?

MR. WIGGINS: I would say the designer should have done something different if he could have.

MR. ERNST: Okay.

MR. WIGGINS: But they shouldn't have a one inch drop.

MR. ERNST: And I would agree if you, as you reduce the return pressure, these issues do go away.

MR. WIGGINS: Exactly. Exactly.

MR. ERNST: I agree with that, but I, again, most, on multi-story buildings with ducted returns, this is what our customers typically ask from us on that return fan.

MR. WIGGINS: Well, it, it, it and, and I never said, but all I want to get on the record is --

MR. ERNST: Uh-huh.

MR. WIGGINS: -- with proper design, and I don't even have to have a return fan in a lot of applications. I personally feel like the vast majority. When I do need a return fan, even sizing the ductwork can minimize the impact
you talk and other control strategies can help them get what
you're talking about.

    MR. ERNST: Yeah, you, if you can, you can over,
if you get the ductworks large enough, get the pressure
drops down. That's the general approach.

    MR. WIGGINS: If I stood for design and all of
those things and I tied my hands, your example's perfect.

    MS. ARMSTRONG: Okay.

    MR. ERNST: Yes?

    MR. SMITH: This is Wade Smith with AMCA. The
system you're describing can also be handled either with a
modulating exhaust in the unit or with exhaust removed from
the unit.

    MR. ERNST: I'll show you an exhaust fan, what I
will view as an exhaust fan example in a second. Is that
okay? And then come back to that?

    MR. SMITH: Yeah. I'm just, I'm just saying the
return fan modulating exhaust or exhaust from the building
that is not part of the unit are all options.


    MR. FLY: Mark Fly with AAON. One of the things I
think we ought to point out for those of us that don't live,
live with fans and rooftop units every day, is that given
this poorly designed system, if the building's sealed up and
the doors aren't opened, that supply fan is carrying the
whole load that the supply and the return fan would be
carrying.

MR. ERNST: Right.

MR. Fly: So that, you know, that one inch of, of
negative pressure in a supply only system ends up on the
supply fan. So, there's really no, we can talk about
efficiency, but there's no less air horsepower being used by
having a supply fan or not having a supply, or having a
return fan or not having a return fan. Because you're going
to carry that load somewhere.

MR. WIGGINS: If you've got bad design, poor
design on that, I wholeheartedly concur. As I said, I agree
with the examples. Steve Wiggins again. I agree with the
example as long as I'm assuming I've got a poor design on my
return and I have to use that brake horsepower. If I can
design that brake horsepower out, by simply changing my
ductwork design, then I don't need to expend that energy at
all. That's actually the best action.

MR. STARR: So this is Louis Starr of NEEA. So I
just came off of the commercial air handler rulemaking where
AHRI provided shipments and they looked at it. And I can
tell you what we were using in the static were 7 and a half,
15 and 30 tons, which covers, you know, a certain size range
of air handlers. We were using one inch static pressure for
the whole system. That's supply and return. That's the
external static pressure, so. Kind of going into what Steve Wiggins said, and also if you look at where the, that the kind of units, there's a surprising, a lot of constant air volume units, so they're actually pretty simple systems. What, what you're showing here is, is a more complex system, but what it, it doesn't really capture much of the population is what I would say. And that's right off, it shouldn't, I was surprised too. I would think there would be lot more kind of VAVs, stuff with VAV boxes and distributed air systems, but a lot of it is just kind of your plain, simple retail-type stuff with a, you know, a 20 ton unit on a large box retail store and, you know, you've got to drop, drop a supply only unit and the return's kind of right there, so.

MR. ERNST: That is where the biggest portion of the rooftop market exists in quantity of units. But there are quite a few large units with, one, two, three, four, five story buildings with ducted returns. And that's where --

MR. STARR: Right.

MR. ERNST: -- this issue --

MR. STARR: Well --

MR. ERNST: -- comes into play.

MR. STARR: And that's what I'm saying. What, if you back and you, those are public record. When you'll see
exactly how many of them are and it's surprisingly, it's not that many units, but I mean, I think it's an important issue and it's worth talking about, but in, in the scope of how much energy and how much is related to these units, we should definitely take a look at that and I think it would be worthwhile to understand the, the effect of what you're describing to us.

MR. WHITWELL: Bob Whitwell from Carrier. I'm also with a, in the same group that Louis is and I just want to color Louis's remarks a little bit, because it's true that if you look at the rooftop from 6 ton up to 63 ton, the majority of those units are still constant air volume. But that, that's mostly in the, in the less than 20 ton range, which is where the majority of the products are. If you look at the, the very large, which is the 20 ton and above, it's a much larger percentage that are VAV --

UNIDENTIFIED MALE: What's the --

MR. WHITWELL: -- which are going to be more complex like this.

UNIDENTIFIED MALE: Wasn't it 24 percent?

MR. WHITWELL: It was 24 percent of --

UNIDENTIFIED MALE: Is that a lot?

MR. WHITWELL: -- that includes a large volume in the 20 to 30 ton. If you look at the 30 ton and above, the, the numbers are more like 75 percent. Okay? Now you won't
see that in the data, but, but that's, that is the case. And what Skip is describing here is not only equipment up to 63 ton, but this is equipment that is above 63 tons has these same, has these issues as well. So, we're talking about --

MR. STARR: Yeah, okay.

MR. WHITWELL: -- Louis, we're talking about the complete rooftop product range, which goes beyond what we've talked about in the, in the (indiscernible) Workgroup Meeting.

MR. STARR: So this is Louis. Do you have any idea of how big that second segment of the market is or does it, or I should say, do you know relevant, I mean, these are the type of things that would help in sort of a --

UNIDENTIFIED FEMALE: Limited might be the right word.

MR. FLY: Part of what they're, they asked, this is Mark Fly of AAON. This is part of what they ask is and that we're working on and, and AHRI is trying to find out what percentage of the population has return and which percentage of the population has exhaust and I don't know that, that's been collected.

MR. WHITWELL: No, that was not --

UNIDENTIFIED MALE: Yeah.

MR. WHITWELL: -- part of that --
UNIDENTIFIED MALE: No.

MR. WHITWELL: -- because those are not part of the test procedure.

MR. STARR: I'm just talking about the sales volume. Not --

UNIDENTIFIED MALE: Right. And that's what we're working on.

MR. STARR: I mean, not whether it has a return fan or not, but the 63 is a larger, you probably didn't collect that information. Correct?

UNIDENTIFIED MALE: We had no reason to collect --

MR. STARR: Right.

UNIDENTIFIED MALE: --that list. It's not a part of that rulemaking group.

MR. STARR: But when you subtract it out of the, no, you couldn't actually just subtract that from the total sales.

MR. ERNST: We don't have the --

MR. WHITWELL: AHRI does not collect that data normally.

UNIDENTIFIED FEMALE: No, that's, that's part of what we're collecting of this, for this effort.

UNIDENTIFIED MALE: Okay.

MR. ERNST: Now, again, let's look at --

MR. WHITWELL: And, and, I'm sorry, this is Bob.
Just one more thing. And, and, you know, I want to also
make it clear that the design issues that you're talking
about are, are the building and the ductwork design issues.
It's not related to the equipment. The equipment that we're
talking about here, the rooftops, air handlers and that,
they are designed to make up for those building and ductwork
design issues. If the building and ductwork was done right,
we wouldn't need these return air fans. But since they're
not, I mean, what Skip is describing here is the, the
industry's response or how we help our customers in order to
overcome those problems.

MR. ERNST: And --

MR. WIGGINS: Yeah. This is Steve Wiggins. I
would agree with that exact statement.

MR. FLY: This is Mark Fly of AAON. And I, you
know, I want to throw in, which I keep doing, but you've got
to remember that a huge part of all our markets in the
packaged equipment business is replacement. And so these
are design faults that may have happened decades ago that we
really can't overcome. It's nothing that you're going to
fix.

MR. WIGGINS: This is Steve Wiggins again. We're
actively, we're in the business of going out and fixing
that.

MR. ERNST: Yeah.
MR. WIGGINS: So we, we actually were doing.

MR. ERNST: But it takes a lot of work and a lot of money.

MR. WIGGINS: Yeah. We actually are doing that on many cases, you know, something that really where our big energy consumption's at.

MR. ERNST: Yeah.

MR. WIGGINS: So we really should focus on it.

MR. ERNST: So, looking at how, going to get to problem number two with how return fans fix this. But again, look, you can compare the pressures of the supply fan only system and adding a return fan. And again, you can see there is a big difference in the negative pressure at the outdoor air inlet of the unit. And you have the low suction with the return fan and you have the high suction pressure with the supply fan only.

So, again, when you add that return fan, you get the desired pressures that you want on your upper air damper and, again, you can greatly improve your ventilation control. And again, in the examples that I've been showing you.

Now, if you add an exhaust fan to the unit, things work a little differently. The, you can, again, add an exhaust fan, draw the negative pressure at the inlet of the unit and the fan provides the exhaust pressure that you
need. So that the exhaust fan takes care of that no exhaust problem. Takes care of this no exhaust problem. Just like the return fan did. However, the, you still have this big negative pressure at the outdoor air intake, so you still have that same potential problem, you can't control your ventilation air as well with a, an exhaust fan on this type of application as you can with a return fan. The, now the exhaust fans can be applied to save energy compared to a return fan. They, they don't maybe do as well on the ventilation control on that high ducted pressure return, but the more, the supply fan, as someone already mentioned, the supply fan is doing more of the duty. The exhaust fan is only sized to handle your maximum exhaust air flow.

The VAV systems may only need 60 to 80 percent of design air flow during economizer operation. And if so, the exhaust fan motor and fan and motor can be downsized. You can save some first costs there and especially when you're working with airfoil supply fans, you can, the more efficient the supply fan will do more of the work. It actually handles that much of that return duct pressure and I'll show you later on why the supply fan is typically a little bit more efficient than the exhaust fan.

So, with all that, I, this was the thought that I wanted to leave you with. The, I mean, we focused on a rooftop with a ducted return with a fairly good sized
pressure drop. The issues apply, it's just a matter of how big is that return pressure drop. That tells you the magnitude of the problem. The problem's very big on the application I showed you and I can assure you on 40, 50 and large ton rooftops, this is your typical example. Almost every one of our orders comes in with a return fan or exhaust fan and they're all sized for about an inch of pressure. That is your typical value on the orders we receive. The, the, when you add the return fans and the exhaust fans, you can properly control building pressure and you're going to need that as you get pressure drops larger than this. But, and return fans and exhaust fans, they perform differently. The, you size them differently. They perform differently. It, the building designer has to choose, they, this is, these are valuable tools for the designer and they're in the best position to decide. Do you need one of these fans and which one? Agree? Little bit?

Okay. The, now if you look at a, if you put a supply fan and a return fan in a box, the, you put the same fan, both your supply fan and your return fan in that same air handler, in that same rooftop, in that same box, here's what's going to happen. You're typically going to see a peak efficiency line somewhere like this. Your supply fan is going to have about two or three times more static pressure than the return exhaust fan, so it relatively is
going to be much closer to the peak efficiency line and, and much, and more efficient. The, again, AHRI is collecting data on this and we'll see what all the manufacturers submit. But what we submitted to AHRI would show that what we typically see is the exhaust fan, return fan is about one-half or two-thirds the efficiency of the supply fan on our typical applications.

MR. STARR: So I, I have a question. This is Louis with NEEA. So in the case of the return fan, you're saying it's, I'm, I'm trying to understand is the return fan you're saying is less efficient? Why? Is it because you're selecting it to be less efficient or what's, I was trying to --

MR. ERNST: Right.

MR. STARR: -- pick up what the point of the --

MR. ERNST: If you put the same fan, if, if your exhaust fan and your supply fan are the same size and you put them in a, in a given air handler and they're each, let's say, they each fill up all the space and you put in your biggest fan, the supply fan is typically going to be a little bit to the right of peak efficiency so that it's stable. You get this as efficient as possible and this fan, because it's at less static pressure in the same CFM, is at a much less, much farther from peak efficiency. It's a much more efficient selection.
UNIDENTIFIED MALE: So why do you do it?

MR. STARR: Yeah, I was thinking why would you put the same --

MR. ERNST: I'll, I'll show you in a second, a little bit more why that happens. Okay?

MR. FERNSTROM: So, so this is Gary for the California IOUs. I understand the point you're making relative to the way we conventionally measure efficiency and peak efficiency. However, the, the return fan operating at a lower static pressure or a head, wouldn't it, wouldn't it have a higher system efficiency, in that facing a lower head it would move more air for less energy consumed?

MR. ERNST: It might consume less energy, but it's going to be less efficient. Just by the, on the, the way fan selection works and efficiency lines work.

MR. FERNSTROM: Well, well, you see I don't care whether it's less efficient or not in that classic way of thinking. What I care about is how much air it moves as a function of the energy it uses. So, yes, it's less efficient, but from a system perspective, it's more efficient because you're getting more air for less energy.

MR. ERNST: No, I, I wouldn't agree with how you said that. The, there, let me go a couple more slides and build on why this is how the selections often fall and then we can come back.
MR. FERNSTROM: Okay. Thank you.

MR. FLY: This is Mark Fly with AAON. Can you define efficiency as watts per CFM? Gary's right.

MR. SMILEY: Yeah.

MR. ERNST: That's true, but, but again --

MR. SMILEY: Yeah, for the most part.

UNIDENTIFIED MALE: Yeah.

MR. FLY: But it's --

MR. ERNST: -- again, it depends on the application.

MR. SMILEY: Depends on the application.

MR. ERNST: But in general you're right.

MR. SMILEY: Well, that's your opinion.

UNIDENTIFIED MALE: That was Bill Smiley talking.

MR. SMILEY: Sorry.

MS. PETRILLO-GROH: Gary, the metric as we discussed it, would that reflect the way you're interpreting efficiency or the conventional one.

UNIDENTIFIED FEMALE: Speak up, please.

MS. PETRILLO-GROH: Sorry. Laura Petrillo-Groh, AHRI. I was wondering if the metric as we define it here would measure energy in the way that you're describing it versus the way that the metric describes?

MR. FERNSTROM: So Laura, it admittedly I'm thinking about efficiency a little different way than our
conventional metrics --

        MS. PETRILLO-GROH: Right.

        MR. FERNSTROM: -- think about it. So there's, there's no question that in terms of the conventional metrics the point that's being made is correct.

        MS. PETRILLO-GROH: And with the metric we're discussing for fans also?

        MR. FERNSTROM: Yes.

        MS. PETRILLO-GROH: Okay.

        MR. ERNST: Yes?

        MR. SMITH: Yeah, this is, this is Wade Smith. Listen, you fast forward when we were developing the metric that's being proposed. There's a pressure constant and a flow constant that go to the formula and the pressure constant is there to, as a gift. Because low pressure applications where fans are, by their very nature, less efficient. A fan operating at 0.4 inches of static would require half the efficiency by virtue of the 0.4 included in the equation. So, the need to accommodate fans that are operating at low pressure has been, has been accommodated basically in the proposed metric.

        MR. FERNSTROM: So this is Gary. Laura, does that, does that answer your question? It sounds like it's a little different answer than the one that I gave you.

        MS. PETRILLO-GROH: Yeah, let's, could we return
to this when we, once he finishes, because I'd like to talk
through it a little bit more?

UNIDENTIFIED MALE: Sure.

MS. PETRILLO-GROH: Thank you.

MR. ERNST: And we, just in our discussions we've
kind of hit on some of these issues. But again, the supply
fan is closer to the, this, you know, these are constant
efficiency lines. A supply fan is operating on this in, in
a much more efficient mode of operation than the return fan.
Again, because it has a lot more static, it maybe draws more
energy. But it is, this is a more efficient point of
operation. And if you were going to try to bring these fans
to peak efficiency, you've got a lot farther to go with a
return fan, exhaust fan because of that lower static
pressure and the fact that they both are going to handle
about the same CFM, roughly speaking.

Now this is why the return fan is not sized near
peak efficiency. The, this would be your typical, it's one
way of designing an air handler or a rooftop, the air
handler portion of a rooftop. The, looking at a plenum fan,
again, this would be looking at an elevation use with return
air coming back in this direction to a plenum return fan and
your plenum supply fan being down at the discharge end of
the unit. Your filters and coils are typically sized for
about 500 feet per minute. The, that's because you don't
want to blow water off the cooling coil and it's, again, where, at least where your, some, a lot of your filters are, depending on the type of filter you're choosing, it is a fairly common arrangement to see this arrangement with about a 500 foot per minute velocity. Now your outdoor air dampers, return air dampers, exhaust air dampers all work pretty well at 1000 feet per minute. At double the velocity and what happens is the designers are able to downsize this portion of the unit. You kind of put the return air fan, your return air fan needs to go into this return section and you can set up and design and, a unit like this in this configuration. But again, there's more room for the supply fan than there is for the return fan. And as we saw in the last example, this fan actually has to be bigger to have the same efficiency than the supply fan. So this is how your, this would be the typical designs as you see them today. There's other arrangements that you typically will see. This part of the return, the return economizer section, outdoor air section, has been sized smaller and the return fan has been squeezed into it and this has been going on for 20 or 30 years, 40, 40 years.

UNIDENTIFIED MALE: So this of course, would be a sort of the driving factor really to make, in other words, you're, you're pumping up your base velocity so that the exhaust air and, what the other one? The return air, you're
pulling up?

MR. ERNST: Exhaust air, return air, outdoor air. This would be your typical double mixing box.

UNIDENTIFIED MALE: Okay. So you're, you're moving that velocity up because you can, whereas if you blew it, if you ran that air across the coil, you'd have water going down the ductwork and that would be a problem. So, you have a performance problem.

MR. ERNST: Right.

UNIDENTIFIED MALE: As opposed to the other, you just have, your burn up more energy, but you move the air. The pressure drop is directly proportional to velocity. Right? So the faster you run the air, the more pressure drop you have and --

MR. ERNST: Uh-huh.

UNIDENTIFIED MALE: -- that's how you size your fans. You're trying to keep the box in certain size footprints, so it's forcing everything into a smaller box, except where there's design consideration such as water carryover over the supply coils. That's kind of what's driving that more or less then. Summation, correct summation?

MR. ERNST: Yes, I agree.

UNIDENTIFIED MALE: Okay.

MR. ERNST: Now this is what you'd have to do to
put in a return fan of equal efficiency. It's going to not have to be bigger than the supply fan, because it's applied at, at a lower static pressure for the same CFM. And you can see, the unit is going to have to grow tremendously, and you completely redesign to put in a return fan in the same, it's going to be analogous for an exhaust fan too. The, the units as they exist today will have to be completely redesigned. They will not work on replacement applications, especially on indoor applications where you're especially space constrained, but you also have flatbed sized limitations and so on. Yes.

UNIDENTIFIED MALE: Have you evaluated the formula that was proposed to see whether or not you have to increase the size of your return fans?

UNIDENTIFIED FEMALE: You shouldn't have to do that.

MR. ERNST: Well, this would be to get equal efficiency to the supply fan, so I, that's, I, so I don't know the answer to your question. I haven't fully evaluated our units on that basis.

MR. FLY: Yeah. This is Mark Fly of AAON. I don't think we can because we really, this is not data that, that we have typically collected. And I know for my company, we're, it's, it's painful that we're going back and basically looking at every order to extract this data,
because this is not something that we collect, on what size
supply fan and steady pressure was, was selected with, with
the supply and the return. So, I think the push-back you're
seeing is yes, I know that you guys have, have a, has, have
attempted to accommodate it. I don't think we know at this
point whether it's sufficient or not. And that's --

UNIDENTIFIED FEMALE: That's the --

Mr. FLY: -- that's the truth.

UNIDENTIFIED MALE: I think the data will tell us.

MR. Fly: Well --

UNIDENTIFIED FEMALE: -- and so I think that's one
of the reasons from the outset we asked for data and we
appreciate that you guys are working on that. But I think
just fundamentally we would disagree with that first
statement on there. Because that's exactly what we did and
tried to do.

MR. ERNST: Uh-huh.

MR. FLY: Well --

UNIDENTIFIED FEMALE: But in the premise --

MR. FLY: -- what you, what you did was --

UNIDENTIFIED MALE: Well --

MR. FLY: -- well, I, I think this was, it's a
different deal.

UNIDENTIFIED MALE 1: -- by their training. I
think the analysis has been today is really more fan
standalone and not embedded fans and products. Because the cost increase of the product if you put a bigger fan in, I don't think is included in your analysis. I don't know for a fact, but I suspect that. And that's what we're trying to work towards.

UNIDENTIFIED MALE 2: Well, as, as opposed to me, and until you do what Wade does, you don't know whether the unit's being larger. I suspect you are probably right if I had to guess.

MR. ERNST: All right.

UNIDENTIFIED MALE 1: What he's talking about is absolutely correct. If you want a fan that is absolute efficiency number --

UNIDENTIFIED MALE 2: Right. But the regulation --

UNIDENTIFIED MALE 1: -- is equal.

UNIDENTIFIED MALE 2: -- we're talking about --

UNIDENTIFIED MALE 1: What Wade's talking about is --

UNIDENTIFIED MALE 2: -- does not have that.

UNIDENTIFIED MALE 1: -- is the proposed methodology --

UNIDENTIFIED MALE 2: Right.

UNIDENTIFIED MALE 1: -- of measuring. The metric to measure torques.
UNIDENTIFIED MALE 2: Right. Right.

UNIDENTIFIED MALE 1: -- we haven't done that analysis.

UNIDENTIFIED FEMALE: Right.

UNIDENTIFIED MALE 1: We don't know.

UNIDENTIFIED FEMALE: So what --

UNIDENTIFIED MALE 2: Yeah, but you don't necessarily, I mean, you're right --

UNIDENTIFIED MALE 3: All he's saying here is to get the same efficiency, you've got to go bigger because you're the high flow low pressure.

MR. SMITH: This is, this is Wade Smith. It's a strawman and it's not correct. The metric that is proposed would not require you to increase the fans. It would be just as efficient with a supply fan. So it's a false premise.

UNIDENTIFIED MALE: Correct.

UNIDENTIFIED FEMALE: Right.

UNIDENTIFIED MALE: And you need to evaluate it based on what is proposed.

UNIDENTIFIED FEMALE: Right.

MR. SMITH: Maybe --

MR. ERNST: Well, we wanted to make sure that you understood --

UNIDENTIFIED MALE: Wait. Wait. One person speak
at a time.

MR. SMITH: -- maybe is what I'm saying.

MR. ERNST: --that this needs to be done. This is a situation we need to avoid and, and perhaps has been --

UNIDENTIFIED MALE: And have done.

UNIDENTIFIED FEMALE: I, I think that's what we tried to do. I think that's we're trying to tell you. We tried to already take that step --

UNIDENTIFIED MALE: So --

UNIDENTIFIED FEMALE: -- so, and our analysis to Bill's point about what is our analysis and what is the cost, we didn't run into any cases where the fan inside was, had to change because we believe that the metric properly accounts for that, because it derates based on the pressures. That's what we were trying to explain to you guys at the last meeting. So, you have to take it a step further and talk about what you're seeing, what you think potentially might happen and then overweigh. The approach we're trying to take to actually avoid this from really happening. That's where the disconnect is. And we actually tried to do this. Tried to avoid this happening.

MR. WHITWELL: Right. So actually I think, you know, the manufacturers are working --

UNIDENTIFIED MALE: Please identify yourself.

MR. WHITWELL: Bob Whitwell, Carrier.
UNIDENTIFIED MALE: Thanks.

MR. WHITWELL: So, the industry is working to, to understand whether this is an issue or not. What Skip is explaining is what, what happens in the design, so now we've got to, we've got to dig. We've got to do some, some analysis to understand what these fans are actually doing, because it's not, it's not data that we normally would collect. So there's some work we have to do and then we'll determine whether the, the constants that are included in the formula are adequate or not. So we've got work to do.

UNIDENTIFIED FEMALE: Right.

MR. WHITWELL: And I don't know, I mean, you may did, maybe did some analysis, but I'm not sure that you had the data that we don't have in order to do the correct analysis. So that's got to be determined.

MR. STARR: So this is Louis from NEEA. Just, hopefully this will be helpful. So it sounds like the manufacturers are taking some particular air handlers or sampling of air handlers and the flow and pressure and sticking it into the proposed metric to see if that changes the size of the fan. Is that kind of what's happening or not?

UNIDENTIFIED MALE 1: Not yet.

UNIDENTIFIED MALE 2: Not, but that's the intent.
Right?
UNIDENTIFIED MALE 1: That's the intent.

UNIDENTIFIED MALE 2: Oh sure. Yes.

MR. ERNST: That's really the gist of my presentation. Last couple slides, pretty much say what you all have just well. Here we go. Okay. This is just the summary slide. And again, it was saying please consider these, these fans. They need some allowance so that they are not forced to be too big.

MR. STARR: Sorry. This is Louis Starr again. So I was waiting until you go to the end. So, why are the supply fans and your, your return fans the same size? Is that because when you exhaust a building it has, it's, it seems like the different flow of pressure?

MR. ERNST: I think they typically today, exhaust fan return fans are a smaller diameter.

MR. STARR: Right. I'm saying though, but why are you making the assumption it's the same size fan? I'm, I'm trying, I would think, okay, when you go into economizer mode, you have to exhaust all the air in the building. Right? But you're at a lower static than you would. The supply fan you would have a higher static pressure. You've got ductwork and evidence downstream of it. On the return, you just have to blow the air out the damper and the return ductwork. So I was trying to figure out, I was thinking that's why, I understand that they would be the same flow,
but it seems like it would be a different static pressure.

MR. FLY: This is Mark Fly with AAON. Let me, let me address it a little different way. From a design standpoint, not looking at regulations with what's happened in the past, for example, your, your supply fan might be a 20 horsepower motor. Your return fan, with this reduced size smaller than the supply fan, is a one horsepower motor. So, I mean, it was an economic and energy issue, it, you know, it didn't make, it was one-twentieth of the energy consumed by the fan system.

UNIDENTIFIED MALE: Right.

MR. FLY: And yes we were selecting at a lower horsepower, but it was so much less, or your watts per CFM that the, the consideration was from an economic standpoint, it didn't pay to put, you know, a, a 30 inch supply fan and a 60 inch return fan. Because that's the kind of things we were talking about to get, and --

UNIDENTIFIED MALE: To get equal efficiency, it could happen.

MR. FLY: Or something that was just going to save, you know, 20 percent of one horsepower as opposed to putting your money into saving, you know, 20 percent of 20 horsepower.

UNIDENTIFIED MALE: So if the metric in theory captures this change in size, that would take care a little
bit, but, but then you're saying it wouldn't be the economy, it doesn't make sense to chase after one watt --

    MR. FLY: Right.

    UNIDENTIFIED MALE: -- a unit when you've got 500 that you can save --

    MR. ERNST: That you can chase somewhere else.

So, the question is, when you get the return fans then what's economically justified on the return fan, besides on efficiency. And it may be a different answer than the supply fan.

    MR. STARR: So, I guess if you do your analysis and there's, there is no change in your fans, then you won't have to really go any further. Right?

    MR. FLY: Right.

    MR. STARR: Okay. And so, if, if you do find that there is a difference, then that would be like, then we can get into discussion is --

    UNIDENTIFIED MALE 1: Well, how big do they --

    MR. STARR: -- does this work well --

    UNIDENTIFIED MALE 1: -- have to grow?

    UNIDENTIFIED MALE 2: Yeah, or are the constants differing?

    UNIDENTIFIED FEMALE: Yeah. Exactly.

    UNIDENTIFIED MALE 1: But as, as you, as you increase the size of that return fan, you increase the
length and the width of the units and at some point --

UNIDENTIFIED MALE 2: Yeah.

UNIDENTIFIED MALE 1: -- you may get something that you can't --

MR. ERNST: On some of our larger units, we probably couldn't get it on a truck.

UNIDENTIFIED MALE 1: Yeah. I mean, essentially what this slide show is about is, is as you go smaller in powers or replacement blades or fan wheels, essentially your efficiency inherently decreases. And in theory that's what AMCA has developed their metric around, which is now the basis of the thing was, and to account for that. And the question is, is have they done a good enough job with the equipment that they're (indiscernible).

UNIDENTIFIED MALE 2: So in general for the same flow and lower static, you have to spin a larger fan at a lower speed? That's, that's where you get your efficiency at.

MR. ERNST: Thank you very much. That, any other question or comments? That's everything I had.

MS. ARMSTRONG: Thank you. No questions about it.

UNIDENTIFIED MALE 1: Go ahead and load that.

UNIDENTIFIED MALE 2: Easy act to follow.

MR. SMILEY: Yeah. You guys are a tough crowd.

UNIDENTIFIED MALE 3: We're safe. We're waiting
on you.

MR. SMILEY: You're warming up for me. I have one more file. It's in that same directory. So probably bring up the air handler one. If I get this all figured out.

UNIDENTIFIED MALE 4: Air handler open?

MR. SMILEY: Yeah. Now, basically I just wanted to spend a few minutes going over a fairly large product grouping in the industry for HVAC applications called an air handler. Typically, an air handler is a big box with a fan. And typically a water coil unit. So there is no direct refrigeration system inside the unit itself. It could be a rooftop. It could sit on a rooftop or it could sit, most of them are actually inside a building. So when you fit them inside a building, you have to have an equipment room or some space to put it in that ends up being not rentable or useable space for the occupants of the building.

It can be a fixed geometry design with very limited variability or it can be structured like building blocks to create a custom one of-a-kind unit for any particular application. And most air handlers today have a catalog. Most of the catalog air handlers, but they're set up that you can configure them in a variety of ways depending on the application and the need. It could be horizontal, vertical. They have different types of fans that are used in them. Typically housed centrifugal fans,
single-width, double-width, BI, BC, airfoil, FC, un-housed fans like plenum fans. Typically BI, BC, airfoil type fans. Or you can have multiple fans.

In this particular picture right here shows what we would call a fan array or a fan wall where there are multiple un-housed centrifugal fans. But you could have multiple housed fans as well. You can use vane axial fans. You could use any type of fan. Typically, the fan draws or blows the air through the coil and distributes it through the building. So the fan has to have pressure capabilities to push the air through the whole building, return it to the, to, to the unit and provide all those functions.

MR. FERNSTROM: This, this is Gary.

MR. SMILEY: Yes.

MR. FERNSTROM: I have a question on your previous slide?

MR. SMILEY: Yes.

MR. FERNSTROM: In the multiple fan picture --

MR. SMILEY: Yes.

MR. FERNSTROM: -- where is the fan blade? Is it on the end of the motor shaft?

MR. SMILEY: Yeah.

MR. FERNSTROM: It's --

MR. SMILEY: It's direct, direct drive mounted right on the other end of the motor.
MR. FERNSTROM: Okay. So --

UNIDENTIFIED MALE: It, it's spinning.

MR. FERNSTROM: -- so I'd, yeah, so I'd make the observation, that's a real big motor with a real small fan blade.

MR. SMILEY: Could be. Depends on the speed, you know, variable speed a lot of times they’re inverter-driven and, and the design speed is higher than synchronous on the motor, so, yeah.

MR. FERNSTROM: I'm just looking at the physical size of the motor.

MR. SMILEY: Yeah.

MR. FERNSTROM: Not its horsepower rating necessarily.

MR. SMILEY: Right. And I think this is the wheel here --

MR. FERNSTROM: Yes.

MR. SMILEY: -- being powered.

MR. FERNSTROM: Thank you.

MR. STARR: This is Louis with NEEA. Maybe you could explain why someone would use, use a fan wall instead of, of, what Gary's getting at is he's thinking the fans are probably inefficient because you have a whole bunch of little small fans rather than one bigger fan. But in fan wall applications, there's, there's application reasons why
they do that.

MR. SMILEY: Yeah.

MR. FERNSTROM: Well, well, this is Gary. I'm thinking it's inefficient because you've got a great big motor and a teeny tiny fan.

MR. STARR: My understand of why you have a fan wall --

MR. SMILEY: I did not design this, so I can't answer, I cannot answer the specific numbers.

MR. STARR: Well, that's his, that's his competitor's view.

MR. SMILEY: Yeah.

MR. STARR: I think the reason they have a fan wall is because they want redundancy, like for clean rooms and --

MR. SMILEY: Right.

MR. STARR: -- some other things.

MR. SMILEY: There's a --

MR. STARR: -- and, and if one fan fails, you have --

MR. SMILEY: -- there are a lot of reasons.

MR. STARR: -- it's easy to replace it.

MR. SMILEY: Yeah. You can cycle fans on and off for modulation if you want.

MR. STARR: It's never usually for efficiency so
much or, I mean, you can state that the air flow rights that
may be off.

MR. SMILEY: You, you, there, there are a lot of
reasons. You can save space in the longitudinal direction
of the unit, because you have a whole bunch of little bitty
fans this way rather than one big fan this way. You can
cycle fans on and off, which gives you the A, B or
modulating capabilities. You have, like you said,
redundancy.

UNIDENTIFIED FEMALE: Thank you.

MR. SMILEY: There, there are lot of marketing
reasons for doing this. Okay?

UNIDENTIFIED MALE: And, and application reasons
as well.

MR. SMILEY: Right. Well, yeah. Yeah,
application reasons. Okay. Definition of an air handler.

AHRI is an industry organization that is supported by a
large number of air conditioning manufacturers. They're an
international organization. They're well-known and, and
respected around the world for the technical aspects, much
similar or similar AMCA is on fans and ASHRAE is on overall
systems. For AHRI, we have a large number of air
conditioning equipment already defined and regulated per
AHRI standards for testing and performance reporting and
certification. We have and definitions of these equipment
as well. Definition of an air handler is basically a factory-made encased assembly consisting of a supply fan in parallel, which may also include other necessary equipment to perform one or more of the functions of circulating, cleaning, heating, cooling, humidifying, dehumidifying and mixing of air. It shall not contain a source of mechanical cooling. So, it's, it's a box with a fan and a coil in it and other types of things in it, filters, et cetera, that provides the air that supplies an occupied space with comfort and with the opt for ventilation to provide healthy air.

Fan types typically used, we saw some pictures of the fan types typically used, but just to review them real quick. A double-width or double-inlet housed centrifugal fans. It could be either forward-curved, BC, BI, backward inclined, airfoil. Single-width centrifugal fans. The same type. Just a single-width instead of a double-width, which would just be half of a double-width. And the single-width, single-inlet un-housed centrifugal fan, plenum fans. Typically BC, BI or airfoil.

Not as prevalent, but sometimes used, housed axial fans, vane axial or tube axial. Housed centrifugal fans of the mixed flow, flow type, usually single-width. And there may be some others, but probably not as popular in the overall population of air handlers.
Typical applications that I mentioned earlier, you can have, have them mounted on a roof and they can bring in outside air, return air and supply the building. Or, you can mount them indoors, which the majority of air handlers are actually installed indoors. Where, again, they get the return air and some outside air, maybe from a connection to the outside or a fresh air type unit that pre-conditions the outside air. And then provides air and comfort to the occupied space. It can be a VAV system. It can be a constant volume system. There are a variety of ways you can apply these and each type of application can have a lot of different variables or components in the unit. You could have just a single unit or you could have two that are connected together. Here you might have an air handler or some type of unit pre-conditioning the outdoor air or the ventilation fresh air coming in and supplied to the indoor air handler. So, as opposed to the return air exhaust fan, a return fan exhaust fan sample, this could be two separate units.

A typical application, you could have either a draw thru where the fan draws the air through the coil and the filters or you could have a blow thru where the fan blows the air through the coil. Or you could have vertical. You could have just about any configuration where the fan's on top, fan's on the bottom. Because you create this unit
with basically building blocks of the different components you can arrange in a lot of different ways. And the way it, it's arranged is a function of the application and what the customer orders or wants. We don't dictate that it has to a specific design.

It could have energy recovery. It could have a ERV wheel or return air heat exchanger applied in it. It could have ventilation. It could have both. It could have exhaust. It could have return and it could have all of those, or it could have none of them. But it's always going to have a supply air fan and a, and a coil. And they'll be in a box. And that's the way it's supplied.

It can get a lot more complicated. Here's one with a heat recovery wheel. Another one down here with exhaust and return fans. So you can see, you can start out simple and you can make it as complicated, complex as you want.

The one thing they all have in common is a fan. The fan is in a box and the box is the minimum configuration when trying to assess the fan performance. And that's the way the AHRI standards are, are written, is you take the bare basic configuration, which is a fan in a box and that's how you test it. That's how you rate it. Because the box can make the fan work differently than the fan works all by itself. It can change the way the fan performs.
The industry generally, sort of, kind of knows what the ideal pressure drop of all the components they offer for sale are. Because in, in configuring one of these units, you need to know what the component pressure drops are and the application external pressure requirements are in order to size the fan, the motor and the RPM so you match what the customer needs.

Standalone fan by an AMCA 210 type test versus same fan in a typical air handler cabinet. They do not perform the same. There are two, possibly two things going on. One is, you have the pressure drop of the, of the box and then you have a change, potential change in the fan's capability by the way the fan or the box influences the way the air goes into the fan. If you have a one mile wide box, and a little bitty fan sticking in it, there's probably not going to be any interaction between the box and the fan. But you can't sell a one mile wide box. And a more practical size and application assessed, a more optimized efficiency, you would have a box of some size with a little bit smaller fan inside. That, that variation changes. But it does change the way the fan works. So, you can't tell me what that fan's going to do in a box by giving me the fan-only performance. Unless you tell me what the box is, what the box is doing and I understand that interaction. Is there a question?
MR. STARR: Yes. This is Louis from NEEA. So I don't, I don't spend all day looking at fan curves. But the red and blue one --

MR. SMILEY: You're good.

MR. STARR: I can imagine that.

MR. SMILEY: That's good.

MR. STARR: It doesn't look all that different and I, I'm sort of wondering, I was thinking, is the blue one the one that was actually tested and you predicted the red one or did you actually do a test on both of those? Was there a, a fan test?

MR. SMILEY: This, this relationship was developed based on testing a fan only by itself in the AMCA 210 and testing that same fan in a box with a coil and without a coil per AMCA or AHRI 430.

MR. STARR: Do you have a mathematical relationship between those two or not? I mean, is it --

MR. SMILEY: It will --

MR. STARR: -- I can look at it if I multiply it by .9 when you look, you're about right.

MR. SMILEY: Yeah, but that's going to be a function of the geometric variation between the box and the fan. The fan type --

MR. STARR: Yes, but --

MR. SMILEY: -- the fan type, where it's
positioned in the box, how close the sidewalls are, how
close the coil is, whether it's blow thru or draw thru,
whether it's ducted or not. But yes.

MR. STARR: And it's substantially different with
all, all of those items?

MR. SMILEY: And also configuration of the coil.
It could be a deeper coil versus --

MR. STARR:  Right. Right.

MR. SMILEY: -- versus a mere over coil.

MR. FLY: This is Mark Fly with AAON. I, you
know, I think that there, there is kind of a few sides to
this. The people that build lots of boxes that have the
same cross-sectional area and the standardized fan head, did
a lot of testing and test, test this stuff and, and do that.
But there's another whole section that market custom air
handlers, people where the cabinet changes on one inch
increments on width and height. And then you have to come
up with a rather sophisticated ADM computer model of, of the
best guess you can of, of what it's going to do.

MR. SMILEY: And, and we'll stand manufacturing --

MR. FLY: And you do that with a lot of testing.

MR. SMILEY: Yeah. What most air handler unit
manufacturers, the bigger ones, have that long term
proprietary database that they use. The AHRI 430 allows
some of that modeling where you don't have to test every
cabinet of every fan. You can predict, much like AMCA allows with using fan laws. You can use fan laws and cabinet effects that a lot of manufacturers develop their own proprietary relationship. There's, there's not a, an industry-defined relationship that I'm aware of.

MR. FLY: As, so if you knew, so I, I would guess most of the time the manufacturers end up knowing the red line up there. Right? They've --

MR. SMILEY: Yeah.

MR. FLY: -- in order to do their equipment --

UNIDENTIFIED MALE: Well, what are catalog --

MR. FLY: -- catalog goes out the door, they have to --

MR. SMILEY: For, for catalog, the standard equipment in general, most large manufacturers do know that. Yes.

MR. FLY: So in theory, these red, red lines --

MR. SMILEY: I, I can only speak for one company. I can speculate what the other companies do.

MR. FLY: In theory you can take that red line and stick it into the, the metric and just, I mean, I know it's a couple steps down, but that's what would sort of be the next step to do.

MR. SMILEY: If, yeah.

UNIDENTIFIED FEMALE: Just from, this is just for
a central stationary?


UNIDENTIFIED FEMALE: But they don't have all the --

MR. SMILEY: That, that, that would be --

MS. ARMSTRONG: Side comments won't make it on the record. Just so you know.

MS. PETRILLO-GROH: I, this is Laura Petrillo-Groh from AHRI, and I was mentioning that this is just for central station air handling units and Louis said that relationship (indiscernible) all the types of equipment are.

MR. STARR: Well, I just meant if, if you could accurately predict it for each kind of equipment and it's really, you're getting that information on particular equipment and then you're, you're applying it into the fan metric --

MS. PETRILLO-GROH: And --

MR. FLY: This, this is Mark Fly with AAON. I think the answer to your question is no, there is not a defined standardized method for applying a fan in a box. And there'll be, I mean, some people do CMD computations with aerodynamics, there's all kinds of approaches that, that all of us manufacturers in the group, you know, have done. Some of it's experience. Some of it's, you know, I've sold 10,000 units and measured 5,000 of them and I know
what those 5,000 did. So, it's not, it's, it's all very proprietary and no two people does it, do it the same. But, regardless, we have to know the red line to sell a product.

MR. SMILEY: Wade, hi.

MR. SMITH: So this is Wade Smith. Just a couple of comments. One comment is that all fans perform differently than their rating curve when they're finally applied in the field. Whether they're in an air handling unit or not in an air handling unit, because they are subjected to system effects and pressure losses in and around the fan. And so, the difference I would say is that somebody who makes an air handling unit takes on the obligation, at least this is the way it has been in the marketplace, takes on the obligation to describe the air performance of their box.

MR. SMILEY: Uh-huh.

MR. SMITH: Whereas when the customer buys a bare fan, the consulting engineer or the system designer takes on the obligation to describe the performance of the fan in the system. So he has to account for the system effects, whereas in this case they're incorporated into the rating of a box. Right?

MR. SMILEY: Right. That's correct.

UNIDENTIFIED FEMALE: And that also changes, but then just like that bare fan, when you apply the air handler
in the field, there's also a system effect, the building on
the air handler.

MR. SMILEY: Well, you know, no.

UNIDENTIFIED MALE: No, not --

MR. SMILEY: You know, as well as I do AMCA has
four application manuals that address these issues very
well.

MR. SMITH: All right. So this is Wade Smith. So
I would say that the system effects associated in and around
the fan are incorporated into the air handler rating.

MR. SMILEY: Uh-huh.

MR. SMITH: But they are not incorporated into the
fan rating, units purchased standing alone and so that's,
that's one principal difference. You know, the, the
question on the table is, what air handling unit
manufacturers want to, how they want to draw the testable
configuration.

MR. SMILEY: Well, and that's what I'm leading up
to.

MR. SMITH: I know you are.

MR. SMILEY: Okay.

MR. SMITH: But if you, if you, if you want to
wrap the circle around the fan, right? Then the casing
effects are external to the rating of the product and the
certification of the fan performance. And the important
point that I want to make is that, that's no different than
the rating of the fan which goes into the field. So it is
an option. It may not be the option you choose. It's
totally up to you. It is an option and it does work. If
you instead choose to draw the circle around the box, then
those casing effects are incorporated into the certification
that you have made to the Department of Energy.

    MR. SMILEY: Uh-huh.

    MR. SMITH: So in one case the air handling unit
manufacturer who purchases a certified fan may not have to
certify. In the other case, if you draw the circle around
the box, they clearly do have to certify, regardless of
whether or not they buy a certified fan. Again, it's your
decision. Whatever you guys want. But you know, the
challenge here going forward is to really understand what
your advocacy is.

    MR. SMILEY: I know. I, I think that's exactly
what we know, Wade. And you know, I, I agree with you.
Exactly what we know is what you just said.

    MR. SMITH: Yeah, you can have it either way is my
point.

    MR. SMILEY: Uh-huh.

    MR. SMITH: Okay.

    MR. SMILEY: And we have a recommendation.

    MR. STEVENS: Well, I don't know if that's, this
is Mark, Mark Stevens for AMCA. And there's actually two
effects that are going on. You, you mentioned it --

MR. SMILEY: Yes.

MR. STEVENS: -- in the narrative in the bottom.

But I think the two, the two effects are kind of muddled
together in the top. And that's the system effect and then
this pressure drop into the, whatever purposes are attached.

MR. SMILEY: Right.

MR. STEVENS: So I think if you took out the
pressure drop or actually added the pressure drop to the
coil or the pressure drop to the filter or what have you,
and is added back into that system effect --

MR. SMILEY: Uh-huh.

MR. STEVENS: -- those, that the system effect
defined it a lot smaller than what you're depicting it.

MR. SMILEY: Oh yeah.

MR. STEVENS: You know, you would have the red
curve, if you took the coil out or subtracted the coil air-
side pressure drop out, you would have the red curve.

MR. SMILEY: Uh-huh. You're absolutely right.

MR. STEVENS: But you, you, you alluded to the
fact that there were system effects. What I'm saying is, is
that this exaggerates that point. But as, I don't, I don't
think that, that delta you're showing is all system effect.

Most of it's pressure drop.
MR. SMILEY: No.

MR. STEVENS: Which would explain red and blue.

MR. SMILEY: No. There's the fan only. Here's the fan only, Mark. Here's the fan in a box. Here's the fan in a box and a coil.

MR. STEVENS: Uh-huh.

MR. SMILEY: I'm sorry if I misled you. This is the box effect on the fan's performance capability. This is the coil pressure drop on the fan in a box. This from here to here is the combined of those two.

MR. STEVENS: Yeah, it's all --

MR. SMILEY: If I said, okay, I want to test this without a coil, I would get the red curve. Now in there, in the outside chance that having a coil in there affects the way the fan performs a little bit more than just the box, the test methodology that I'm going to describe, you test the, the box with a fan and a coil in its standard configuration. Then you mathematically remove the coil from that measured performance to get the fan in a box performance. The reason we do that is because we have multiple rows of coil we could use. We have infinite variation in fin series we could use. We have different tube diameters in the coil we could use. So every order could have a different pressure drop coil applied. But we can't test every, every one of those configurations. So we
make an assumption. And we've been doing this for 50 years.

MR. STEVENS: Understand that.

MR. SMILEY: Yeah.

MR. STEVENS: It, it, at AMCA we, we've done some research projects for ASHRAE on system effects. And part of the last group was exactly, exactly this.

MR. SMILEY: Now, and you know, depending on what your box design is, this could be a bigger difference or a lesser difference. It, it could, the red curve could lie right on top of the blue curve. I've seen that. I've also seen it be a lot worse than that. So, you know, it, it, it depends because the geometric relationship. And if you have a unit where you're inducing pre-swirl, you can have a huge difference, where your spin and the, the air spins before it goes into the fan.

MR. DYGERT: This is Ryan Dygert with Carrier. One thing that's not showing here too is the downstream resistance behind the fan. So if you put a coil or a heat pack downstream of the fan, we often see fairly large gains in the fan performance, usually a positive effect. And that's something that you would not get from a, a standalone versus in situ tests.

MR. SMILEY: Well, this, this is an example.

MR. DYGERT: Yeah, I agree.

MR. SMILEY: Based on real test data, but there's
no data on there.

MR. DYGER: No. Yeah, I'm just adding --

MR. SMILEY: Yeah.

MR. DYGER: -- another example --

MR. SMILEY: Yeah.

MR. DYGER: -- that goes to the point as well.

MR. SMILEY: Well, yeah. If you go back to, where is it, these different types of configurations, each one of those, the same size box, same size fan, each one of those configurations will give you a different red curve.

MR. DYGER: Agreed.

MR. SMILEY: They'd all have the same blue curve, but they'd all have a different red curve. Good.

MR. DYGER: So I have, I, this is information correct on your, your slide with the three color lines. So, between the red, so the one on the left, the red and green, so the system is affect, the system is affected you're talking about is, so it's, it's not necessarily a bad system effect, in other words, when you wrap air in the wrong direction. It could be that or it could just be the fact that you have pressure drops. So it's not, the terminology system effect doesn't necessarily refer to fan system effect, or is it, I'm just trying to understand the terminology to make sure. The difference between the red is not necessarily a fan system effect. It's just a system
effect of having maybe a pressure drop in there and potentially could have a fan system effect --

MR. SMILEY: Yeah. You can't --

MR. DYGER: -- if you had to move the air in a direction that's not so great.

MR. SMILEY: -- the key which I always look for to determine if it's having a true effect on the way the fan's actually performing, or it's just acting as a pressure drop, is looking at the horsepower change. If you check the same CFM and if you change the fan's horsepower, brake horsepower, horsepower, you change the way the fan is operating. The aerodynamic operation of the fan has changed.

MR. DYGER: Okay.

MR. SMILEY: If there were, if those two horsepower curves were the same, and that's what these are, these are, this is an FC fan by the way. These are horsepower curves, constant speed. If the horsepower curves change, you change the way the fan's operating. It's not just a pressure drop.

MR. DYGER: Okay. So in this case there is a system effect? It's your horsepower is 1 and now 1.2?

MR. SMILEY: Well, it went down, because part of this difference here is not only a cabinet pressure drop, but a reduction in the fan's pressure rise probably, because
there is a reduction in the fan brake horsepower for this particular example.

MR. DYGERT: It, it could make sense in a, if you were talking about backward curve, but forward curve's a little bit different animal, because it's got that rising pressure drop. The, the rising power --

MR. SMILEY: It doesn't matter. It's the same CFM. If you change the way that fan's performing by changing the way the air goes into that fan, pre-swirl is a good example. You could swirl with the fan, power will go down, pressure will go down. If you swirl against the rotation, power go up, pressure may go up a little bit. It doesn't matter what kind of fan it is.

MR. DYGERT: Yeah, but we're not talking swirl here. Right? We're talking a coil and a pressure --

MR. SMILEY: It could be anything. It could be the air all comes in the back of the fan. It doesn't come in this way. It comes in this way. It comes in this way.

MR. STARR: You know, I was, this is Louis with NEEA, I was just thinking, you could --

MR. SMILEY: I, I can show you real data if you want to see real data if you don't believe me.

UNIDENTIFIED FEMALE: Well, you, well --

MR. SMILEY: It's an example.

UNIDENTIFIED MALE: Please identify yourselves.
MS. PETRILLO-GROH: Laura Petrillo-Groh, AHRI. So where, where you have the horsepower curves, is that where the blue, is that for the fan --

MR. SMILEY: Yeah.

MS. PETRILLO-GROH: -- only? And then the --

MR. SMILEY: Red is --

MS. PETRILLO-GROH: -- fan in a box and the coil.

MR. SMILEY: Right.

MS. PETRILLO-GROH: No filter? Nothing else?

MR. SMILEY: Well, and it turns out that with the fan in a box with a coil, it's the red horsepower curve as well.

MS. PETRILLO-GROH: Okay.

MR. SMILEY: So the inclusion of the coil did not change the horsepower consumption of the fan. The coil acted like a pure pressure drop.

MR. STARR: This is Louis. I, so this is not, you know, I'm, I'm just trying to understand.

MR. SMILEY: I, I hope we're not going way off track.

MR. STARR: No, no. I just, I, I'm trying, so are we, so it seems like you had a pressure drop in there and you apparently would need more horsepower to overcome that pressure drop. But you're saying not necessarily?

MR. SMILEY: Uh-huh.
MR. STARR: Because you're saying it's just a pure pressure drop, you wouldn't --

MR. SMILEY: Well --

MR. STARR: -- see a change between your red and blue lines.

MR. SMILEY: -- if this is the designed pressure and here's where it is with the coil, or here's where it is in the box, I have to speed that fan up to recover that pressure decrease that the fan is now seeing. Or I use a bigger fan. Have to, have to increase the test speed of the fan somehow to get the pressure back up to where I need it. So the fan in a box with the coil at 6,000 CFM would operate right there. But if I need it at that much pressure, or that much pressure, I would have to speed the fan up which will take the horsepower curve up as well. So, you see it in the efficiency curves. This is the fan only efficiency curve and this is static efficiency. This would be the fan in a box efficiency curve. So the efficiency went down. The effect of the box on the fan caused the fan's efficiency to go down. So we may or may not know what the real applied pressure drop is of the components. What the real fan performance, or what the real fan performance is inside the unit. The industry has developed over many years of test and rating methodology for commercial cataloged air handlers. Performance in that box. The test methodology
and data analysis presents presentation are defined in the
AHRI standard 430. Methodology is well accepted in the
industry. It's used by most of the major manufacturers.
AHRI can speak to, to that. Throughout the commercial air
handling industry, product specifications, applications,
building codes and customer bases. So when we get
specification and an order for an air handling unit, it
usually defines, so it has to meet AHRI 430 performance
certification industry standard. You take, here are the,
the standard test configurations. Now before everybody
jumps all over me, I understand that we don't really have a
fan wall for a mobile fan test methodology defined yet for
430.

UNIDENTIFIED FEMALE: That's right. But this is
what --

MR. SMILEY: So don't jump on me because I show it
up here, because it's just my thought of what it might be --

UNIDENTIFIED FEMALE: Yeah. Well, (indiscernible)
major fan, multiple fans and air handlers is a, a situation,
but we're not incorporating the standard right now.

MR. SMILEY: Well, it's not, you could have
multiple housed fans and you would connect the discharges
into a common duct to do testing, so that's already covered.

UNIDENTIFIED FEMALE: Yes.

MR. SMILEY: This is, would be indicative of
what's called a fan wall or --

    UNIDENTIFIED MALE: Fan arrays.

    MR. SMILEY: -- fan array. Yeah. I guess fan array is probably the more industry --

    UNIDENTIFIED MALE: Correct.

    MR. SMILEY: -- term. Fan wall is a trademark or something.

    UNIDENTIFIED MALE: Right.

    MR. SMILEY: Anyway, basically you set up a fan in a box with a coil. You attach it to a wind tunnel or a test facility, which is usually AMCA 210 certified. That's the type of facility you would really want to use or most people do use because it's certified by a well-known --

    UNIDENTIFIED MALE: Accredited.

    MR. SMILEY: -- organization. Accredited. Excuse me. Accredited. And that's well-accepted as well. I don't know if there's, I don't think there's an AHRI test facility accreditation. I think it goes by AMCA and ASHRAE.

    UNIDENTIFIED FEMALE: Yeah, AHRI only has a test facility on standards percent.

    MR. SMILEY: Yeah. So you basically connect the, the box and coil and the fan to that test facility and run an air flow test. You measure the power in the motor, bring horsepower into the fan and you develop the performance map. Blow thru, draw thru, vertical, doesn't matter. It's a bare
configuration for the testable configuration for an air
handler fan. Test methodology defined in AHRI 430. So,
what we have is a test method that's technically-based,
well-defined and proven. It's been around a long time. We
have a way to determine fan in a box performance
experimentally. Manufacturers have developed over the years
methodology to predict things that they don't test. What we
don't have is an efficiency metric that would be applicable
to fan in a box. So we don't have a metric right now as far
as I know, as far as I'm concerned. I don't know what value
we need to shoot for. We recommend using the air handler
performance determination based on the AHRI standard 430 as
the test methodology and the testable configuration
definition for air handlers. The performance-based and
efficiency ratio methodology, similar but may be different
from that developed and presented by the current industry
through AMCA. It seems to be a reasonable approach for air
handlers. Maybe a low pressure, a medium pressure and a
high pressure application point for basing the efficiency
ratio might be a better one to use for air handlers. I
don't know. We need to look at the data and do the
analysis. The required efficiency levels are yet to be
determined and will need to be adjusted to accommodate the
fan in a box configuration, since that's how the product is
tested and applied. We're interested in the energy, the

unit consumes in its application, not some number in an ideal situation. We are collecting the data to help assess what levels we think that metric should be based on what they are and what the values in the data tells us they are now. If we don't have cabinet fan testing, we may want to consider some way of taking a fan standalone results, like a certified fan and applying some sort of a cabinet de-rate to it, similar to what we're, what we were working on for motors and drives and controls. I think we want to leave that open as a, as an item to think about and discuss.

So, I don't know if you want to go through any of this or not, but, you know, I've, I've got, okay VAV systems, sound, specific speed, why you might use one fan versus another. It may not be the most efficient fan in the world, but for the application it is. That type of stuff. Size, relationships and so on. Paul?

UNIDENTIFIED MALE: Maybe the specific speed would maybe be good though or that discussion. But it's understanding why it might make sense to use a forward curve fan instead of an air flow. Is that what you would cover in that slide? It --

MR. SMILEY: Yeah, a little bit.

UNIDENTIFIED MALE: -- it might be worthwhile, but it should still --

UNIDENTIFIED FEMALE: Go ahead.
UNIDENTIFIED MALE: Go ahead.

MR. SMILEY: Okay. I know in terminal machinery, specific speed in the old days was used a lot from a design standpoint. And we never really used it that much in the fan industry. Although I have, and I know a lot of you guys have as well. In trying to understand why you would design or select or pick a fan of one type versus another, and it's a function of diameter, operating conditions, et cetera. Specific speed is a dimensional relationship that is a function of CFM, pressure and RPM. And this representation is using cubic feet per minute, inches of water and RPM. Now coupled with that's another dimensional relationship called specific diameter, which is a function of pressure in inches of water, CFM and cubic feet per minute and the diameter in inches in, in the particular relationship that I show for the value of the numbers. And what you see on this plot is a variety of fan types and low specific speed is basically low flow, high pressure or low RPM. High specific speed is high CFM, low pressure or, I, a high RPM. And any combination of those metrics. So, the different fan classes or types, like a FC fan, the red curve. Airfoil fan, the blue curve, double-width. The single-width airfoil fan, the green curve. A plenum fan or plug fan, which would be an un-housed centrifugal, usually single-width fan, BI, airfoil. A prop fan, a high efficiency prop fan and a, kind
of a standard efficiency prop fan. Or a panel, panel axial
fan. So they all have different peak efficiency
capabilities. And these are static efficiency, not total
efficiency. They all have different characteristic shapes.
They're all located in a different location as that, that
particular fan type on a specific speed curve. Specific
diameters is the same way. Panel axial fan is the highest
specific speed. The very first specific diameter, which
means for the same CFM static pressure, you need a big one
of those suckers. And double-width FC fan is a red curve,
which means for the same CFM, static pressure, you'd use a
small. So when you look at this, you go, okay, I've got to
design CFM static pressure of some value. I can look at any
speed I want, any diameter I want and you can use this type
of relationship to zero in on, based on the design criteria,
how much space you have, what type efficiency you're trying
to get to, where are you on that efficiency curve? You can
see what the relationship is for speed and diameter to hit
that same CFM static pressure with different fan types. So
you might take a small FC fan and run it at a low speed or a
big BI fan, running it at a higher speed or a huge prop
running at a very high speed.

MR. STARR: So this is Louis with NEEA. So in
theory, you can't just say you were designing an air
handler, handler from scratch. You had to make some design
decisions, you would first go to the first, the first chart there and look at your flow and pressure. Right? That your design requirements --

MR. SMILEY: If you, you were going to use this to do a very crude rough first shot at what types of fan should I consider.

MR. STARR: Correct.

MR. SMILEY: This could be one way of doing it. Yes.

MR. STARR: So that would, you know, depending on where you ended that specific curve, you'd look at all of the different colored curves there and make the choice of the fan. And then you go down to the next one, help you decide the fan or that fan, but in reality you're, you have space limitations that might affect all the decisions you made --

MR. SMILEY: Right.

MR. STARR: -- that are --

MR. SMILEY: So then you might start at the size and then go up to the fan type.

MR. STARR: You could work backwards.

MR. SMILEY: I mean, you, you could do it either way or you could iterate on it.

MR. STARR: I mean, in general isn't there, so I imagine space has a lot of, or a pretty controlling factor.
The document goes the way I described it. Right?

MR. SMILEY: Well, this is just one, one initial way, very crude, kind of a one dimensional rough estimate of what fan type should I consider. Then you need to start looking at the specific application, the fan map, how it will operate around that operating point, what type app? If you're going to do VAV, do you have to worry about stall, surge, you know, have you got enough range to cover the range you want for the product? You know, on and on and on.

This, you know, it's. Wade?

MR. SMITH: Yeah, so there was in the first, the very first note out, there was a lot of talk about using a specific speed and it was used in the pump rule as well. And the membership of AMCA looked at using specific speed. The thing that is attractive is that it invites product substitution. So if somebody is making the wrong decision, and they're mis-applying a fan where a different type of fan would be a better choice, a metric that, that incorporates specific speed drives those product substitution ideas. And so, we had some of our members, relatively late in the process, arguing for a metric that incorporated specific speed.

MR. SMILEY: That's not what I'm doing.

MR. SMITH: I know. I, I just want, I just want to, I want to give this a little history because I think
It's important for folks to understand. And at the end of the day, the membership came back around to, to advocate, to decide upon, to build a consensus around a scheme in which the requirement, the DOE requirement, develops a maximum horsepower for a given flow and pressure. And coalesced, the membership coalesced around a single number for ducted fans, a different number and a different basis for un, non-ducted fans. Fans that didn't have ducts on the outlet. And the, one of the attributes of that approach that our membership liked is that within the ducted fan category, it encourages sub, product substitution. And one of our observations, as we looked at the actual selections that were made in 2012, is there were a lot of bad selections. Meaning they picked the wrong fan. And when we tried to evaluate the impact of correcting those selections, many, in many, many individual cases, and this is not a general statement that, that should be applied as an average, but in many cases we found a more efficient, lower priced, lower horsepower fan, because they had picked the wrong fan type. Right? And so this idea of choosing of, of inviting, right? A regulation that says, look, you've got this flow, you've got this pressure, this is the maximum horsepower. Figure it out. Invites product substitution and does for the regulatory environ what a specific speed would do and I think it's actually what the consultants were trying to get
at with this specific speed-based metric.

So, as you pointed out, very few people in the industry deal with specific speed. It's done with quite a bit actually on the industrial side, with custom fans and it's dealt with by fan designers like yourself working inside a major company, you know, responsible for fan engineering. But it's, it's not part of the vernacular that exists within the industry in the field and taking the benefits of specific speed and masking it in this other approach that's more easily understood and more approachable is basically what we did, what we ended up with. We, we, we spent a lot of time on the subject and ended, well, we ended up for reasons I described.

MR. SMILEY: The, the main reason I, I put this in was to, to try to help non-fan design experts understand why you have different types of fans, why you might pick one versus the other. The other thing about this, this plot is, if you took all the data that's out there, you don't get a single curve, you get a, you get a half inch wide band. You know, these are or this is not the absolute every fan --

MR. SMITH: Right.

MR. SMILEY: -- that's, that type's out there falls on that curve. There's a band around that. That's just kind of a, an average accepted static efficiency, not total. You know, Armin I'm sure has one that's based on
total efficiency that, that historically we've never really worked at total from an application or design standpoint. Well, from a design standpoint I do all the time, but anyway. So, I, I hope this helped a little bit. You know, it doesn't answer all the questions. It, it points to different designs of fans work differently. You pick one versus another for a lot of reasons.

MR. SMITH: One, one last question. In general, when a quick air handlers are getting designed, I mean, is it ending up that they're sort of trying to use the, I realize they're not actually using the service, but you end up using the best fan for the application? In other words, you look at your flow and pressure and do you end up choosing either the red, blue, or black fan that makes sense for that application or does it start down at the bottom with like, we've got this small box, where do we go?

MR. SMILEY: It, it becomes an optimization process. Speaking from my experience and not for other manufacturers, and I don't want to tell you proprietary design information, but the products that the company that I work for, Trane, produces, we would have, we size the air handlers based on coil square footage. And that implies a certain capacity of heating and cooling. And based on that, there's a design CFM, 500 feet per minute, 550, 450, whatever you want, and that's usually an optimization of
heat transfer, air-side pressure drop, cost and also there's
a limit as to how high a velocity you can go so you don't
blow water off the coil, you know, which nobody wants rain
in, in their building. Because of the air or moisture
condensing on the coil, which is part of the heat transfer
process. We know that, that capacity can be applied to an
occupied space. It could have a very wide range of static
pressure requirements. This building needs four inches of
static because of the way the, the, or the consultant
designed the ductwork. This building might need six. This
building might need two. Well, in order to allow an optimum
selection based on whatever criteria the customer has, we
may have four or five different fan selections, fan types
for that one box. We may have an FC fan. We may, you know,
we, we probably have an FC fan. We probably have a double-
width airfoil fan. We might have two or three different
diameters of each one of those. We could have a single-
width airfoil plenum fan and we have a fan array. So we
might have, you know, six or seven different fan options for
that one cabinet size. Cabinet size based on how big the
box is to contain that square footage base area of the coil.
And there's an optimum aspect ratio of the coil design from
a cost heat transfer optimization. So, it, it's kind, to
answer your question, it's oh yeah, yeah, sir, but well, no,
not really, but yeah, sort of. You know? But it, the neat
thing about the custom air handler, the, the air handlers is
there's a lot of flexibility. You know, from a
manufacturing standpoint, you try to minimize the
manufacturing cost and you've got money made and space and
everything to build this equipment. But you want to give
the customer the biggest amount of flexibility so you don't
have to do a modification switch to the equipment, which
would cost him more money. Or you might have to, it might
restrict how he designs his equipment room or his ductwork.
So, you know, over a hundred years you try to, you know, and
all the manufacturers do that. They try to accommodate what
the customer will pay you for. And if the customer comes to
us and says I'm only going to pay for the, for the highest
efficiency product in the world, we've got it and we can
give it to you. But you know, there's a lot of decisions
that go on in the customer's mind. Same way with a
standalone fan, you know? I want 90 percent efficient fan.
Well, we've got it. Here's, here it is. If you want to pay
for it, here's how big it is. Now it's, so.

Anyway, there's a variety of available fan types,
including variable frequency drives and other methods of
variable air volume, control of the fan performance either
by a standalone fan or a fan in a box, any, any type of fan.
So you can, you can best fit not only the air flow and
pressure requirements, but also acoustics which are
important, efficiency and discharge requirements in an efficient and cost-effective package, so.

UNIDENTIFIED MALE: There's also a lot of motor types too. Right?

MR. SMILEY: And only we have, you know, what motor do you want? Okay, we--

UNIDENTIFIED MALE: ECM one.

MR. SMILEY: Yeah. We, we have, you know, premium, we've got high efficiency, we have VAV motors, we have ECM motors. We can give you the, the variable speed controller on the unit. All the controls are in it. It's a package drop-in. You hook the water up and the power. Yeah. So, built that's --

MR. BUBLITZ: Mark Bublitz, New York Blower. For our edification, can you describe what comes out of a 430 test to get, if you wanted to do a single curve, for the system effects, wouldn't you need to map a whole range --

MR. SMILEY: What you get is similar to what you get from 210. You get a map.

MR. BUBLITZ: For, for one speed or?

MR. SMILEY: No.

MR. BUBLITZ: You did a whole series of?

MR. SMILEY: No. If, if, if you had, if people still printed the catalog, you'd have a fan map with variable speed or various constant speed curves, constant
horsepower curves and lines of constant efficiency, sort of. You know, I mean, you know, usually you don't take speed and diameter until effect of changes to efficiency. Well, speed, I mean. But the same sort of rules at, at 210.

MR. HAUER: I feel, I think it, it's Armin Hauer speaking. I think 430 doesn't have the wire to air aspect with that.

MR. SMILEY: No, it's fan brake horsepower. So you use a calibrated motor or you use a torque meter.

MR. HAUER: Why is it's not accelerated?

MR. SMILEY: Pardon?

MR. HAUER: Why is it not accelerated? Because there is some savings potential --

MR. SMILEY: Accelerated?

MR. HAUER: The development of the AHRI 430 to have the wire to air metric.

MR. SMILEY: Because what motor, that air handler has four motor options. Okay? So, if you want to take the wire to air power, you have to specifically define what motor that is. Well, we've got other motors we'll sell you with that unit. We'll sell you an ECM motor. We'll sell you a premium motor. We'll sell you a high efficiency motor. We'll sell you an inverter-duty motor. What motor do you want? We'll sell you a motor that's twice as big as what you need.
MR. HAUER: But the customer, the electric utility, they are interested in the power consumption. They are not interested in horsepower.

MR. SMILEY: Right.

MR. HAUER: So, how, how do you do the modeling in the, for your building, and aren't you modeling if you don't have the wire to air metric?

MR. SMILEY: The, when we design the units, we don't do building modeling for that. So if you, if you know the motor you want, I can apply that motor efficiency to the fan brake horsepower. Or, you have a default motor drive control value that you'd use. You know, I mean, it, you can't test every configuration of every fan and every motor that you could put together for this type of equipment any more than you could do that for a standalone fan. Now you guys sell a fan and a motor combined. You can do that. So if you had five different motors, you could sell with that fan, it would be a little bit tougher. It would require more testing, more some, some calculation method.

Where's Ashley? So, I got one just like that for fan coils if you're, if anybody's interested.

UNIDENTIFIED FEMALE: No.

MR. SMILEY: And I've got another one for testable configurations. And then I've got another one for --

MS. ARMSTRONG: How about a break?
MR. SMILEY: -- this fan versus that fan.

UNIDENTIFIED MALE: Yes.

MS. ARMSTRONG: Thanks.

UNIDENTIFIED MALE: All right. Yes. Break. It's almost not needed.

MR. SMILEY: You need that stuff?

UNIDENTIFIED FEMALE: No.

MS. ARMSTRONG: Thank you. Put your next one down.

UNIDENTIFIED MALE 1: Let's take like a 15 minute break.

(Whereupon, a brief recess was taken.)

MS. ARMSTRONG: Anyway. But yeah. Okay. We're going to start back up here.

UNIDENTIFIED MALE: All right, people. Back to your seats, please.

MS. ARMSTRONG: So I do want to make one announcement before we move on to our third presentation. And I meant to do it this morning, so it was an oversight on my part and I apologize. So, we do have a new member of the Working Group, because we had somebody drop off. Debra Miller dropped off. She was one of the ASRAC reps. So we now we still have two people from ASRAC on the committee, but she dropped off because she couldn't, couldn't commit to attend for the rest of the meetings and follow, a lot of
schedule, conflicts, et cetera. So, we had a 26th person that had previous applied that wasn't able to join the Working Group previously, so we have added them as a formal voting member. There sitting behind you from Regal Beloit, Paul, he's representing NEMA as a motor guy. So good vision. We welcome you. You will, you noticed my e-mail last night had him on it. So now if we work off my latest group e-mail, it has his additional e-mail address as part of the group. So, welcome.

MR. LIN: Thank you. Thank you.

MS. ARMSTRONG: And with that, passing it to Laura.

UNIDENTIFIED MALE: If he wants to (indiscernible) on that.

MS. PETRILLO-GROH: It ends with LPG.

UNIDENTIFIED MALE: Are you going to get a copy of this presentation, Laura?

MS. PETRILLO-GROH: Yeah, I'll send this all out.

UNIDENTIFIED MALE: It's in the record. Right?

MS. PETRILLO-GROH: Kind of hard to see the screen. Did you pull it off my computer? Can you make the file names bigger?

UNIDENTIFIED MALE: Yes, ma'am.

MS. PETRILLO-GROH: No, that's not it. Oh, does, that could be it.
UNIDENTIFIED MALE: Are we also getting the other presentations?

MS. ARMSTRONG: Yeah. So --

UNIDENTIFIED MALE 1: Because last there were some presentations on this computer.

UNIDENTIFIED MALE 2: Yeah, I talked to Tim and I --

MS. ARMSTRONG: Oh, Tim's. I have Tim's. I can, yeah, we'll send them all out.

MS. PETRILLO-GROH: Did you, did you pull two off that, the key drive?

MS. ARMSTRONG: They also have to go in the docket, so.

UNIDENTIFIED MALE: Could I just get that?

MS. ARMSTRONG: Sure. Yes. Thank you.

MS. PETRILLO-GROH: It ends with LPG.

UNIDENTIFIED MALE: No pictures of the family vacation.

MS. PETRILLO-GROH: I haven't even started yet.

UNIDENTIFIED MALE 1: That's not an illness. The last two days, that was enough.

UNIDENTIFIED MALE 2: Is this it?

MS. PETRILLO-GROH: Yeah, there we go. Hi. So, I'm Laura Petrillo-Groh from AHRI and we've put together just a short presentation to sort of go over some of the
equipment that's impacted by this regulatory, this
rulemaking and sort of talk through some of the issues that
we see, both legal and non-legal. And you know, as much as
we can discuss the resolutions. We've also included that in
this presentation. You can go to the next. Thanks. So
one, we've got two buckets of equipment really that we've
been focusing on. One are fans and EPCA covered equipment.
And we have that listed on our screen. And then we've got
fans and non-covered equipment. So to start off with some,
you know, covered equipment, we've got the packaged unitary
equipment category and we look, we looked at the different,
you know, common names for this type of equipment. We've
got several different classes of equipment even within the
packaged unitary class, including packaged terminal units,
mini-splits, multi-splits, VRF. We've got water source heat
pumps, single package vertical units and then your
traditional packaged ACs, heat pumps and rooftops and split
systems. On a, you know, as we've heard in earlier
presentations, all of those fans definitely have a supply
fan. And depending on the manufacturer, the type of product
it's in, it could be any of these type of fans. So any of
the centrifugal housed or un-housed, axial housed, mixed
flow or crossflow. So some of them are more common than
others, but we have, you know, there are cases where we're
seeing in some of the data collection that we're doing and
feedback from the manufacturers, that these are all fans
that could be represented in each of these unit types. We
also have some fans on the condenser, condenser and
evaporator and those are typically axial panel fans. And
then if you're using a return fan or an exhaust fan in the
unit, it could be one of the types of units, the fans listed
on the screen.

And to go along with what Bill was discussing,
depending on the type of unit that you're using, you could
be using a completely different type of fan and you would be
using an, something that looked similar but was being used
for another application.

And from our testing, we know about these units,
the CFM, the unit input power and the external static
pressure. And we know it using, you know, the different,
the appropriate test of the unit. So, right here we have
one, two, three, four, five, you know, at least six
different types of tests that you would be testing each of
these different types of equipment to. So there's one
specific to the packaged terminal units. There's one
specific to the VRF units and so on and so forth.

But from these testing of equipment, using the
appropriate equipment test, we don't know a lot of things
about the, about the fan. We don't know the fan total
static pressure, the fan or motor input power, cabinet
effect, fan-only applied efficiency, end-use static pressure and CFM. And Skip really went over the cabinet, Skip went over the cabinet effect really well, but what we're talking about is the overall influence of surrounding components, structure and casing, which causes changes to airflow and pressure drop and influences how the fan can, the fan performance is and where it's going to operate.

So, we've also got another covered type of product. Commercial refrigeration equipment. And that would be in bucket, walk-in coolers or freezers, refrigerator display cases, reach-ins, et cetera. So we've got the supply fans which could be similar to what we discovered, packaged unitary equipment. One of several different types of fans and, but the heat rejection is typically the axial panel fan.

And for the test of the equipment, by and large, we know the fan or motor input power, the unit, and the unit external static pressure. But what we don't know are the fan CFM, fan total static pressure, cabinet effect, fan-only applied efficiency.

We've got several different types of heating equipment we've kind of grouped together just for this first slide. They include warm air furnaces, unit heaters, boilers and water heaters. And they have different types of fans than we've seen previously including the power burner
and the inducer draft fan. And some of these may or may not be included in the scope, depending on where we draw the line.

Can you hear me?

UNIDENTIFIED MALE: Yes. People are having a hard time on the phone hearing.

MS. PETRILLO-GROH: Okay. I'll speak up.

UNIDENTIFIED MALE: You have a microphone right there. It should be.

MS. PETRILLO-GROH: Can we ask them? Or ask --

UNIDENTIFIED MALE: You, you just need to speak louder.

MS. PETRILLO-GROH: Okay.

UNIDENTIFIED MALE: Or use the microphone.

MS. PETRILLO-GROH: All right. Is that better?

So we also have axial panel fans and centrifugal housed or un-housed fans in this type of equipment. For the boilers and water heaters specifically, we know the unit power consumption by testing the unit and we don't know anything else related to the fans.

So for air handling equipment, which is not a covered product, we've grouped a bunch of different types of equipment into this, into this category, including room fan coils, unit ventilators, fan-powered terminal, terminal units, constant volume or variable air volume, fan-assisted
chill beams and then we've also got what you would typically think of air handling units. It's central station air handling units, custom air handlers make up air handling units, outdoor air handlers, and dedicated outdoor air systems. And the blower coil and low pressure air handlers as well.

And the supply fan, we also see that same variation of different types of supply fans in, that can be embedded in this type of equipment. And for the return fans, again, centrifugal housed, un-housed and axial housed. Exhaust fans, we also have the addition of the axial panel fan that you could see and these type of air handling applications.

For the air handling equipment, we typically know its CFM, the fan or motor input power in some equipment, but not in all the type, types of equipment I listed previously, unit input power and external static pressure. We know this by testing the unit or fan or fan cabinet. So, as Bill described for the 430 test, while you could add a lot of other features that make the air handler specific to that application, in the 430 test, we're looking at only the fan in the box with the coil. But we, and, and that can be predicted to some other configurations, but we, you know, typically do that using some variation of fan laws.

We don't know the fan total static pressure,
cabinet effect, fan-only applied efficiency, fan or motor input power in some types of equipment, end-use CFM and static pressure. And Bill really covered very well the variability of custom air handling units makes it difficult to define and test. So the port, the world of central station air handling units and what can be tested and what can be certified through the air, the air, the AHRI program is much smaller than the world of air handling units that is currently out there. While the custom air, air handling unit manufacturers are very small businesses, they're regionally located.

Now, to the chillers and condensers and heat reject, and heat rejection products, these are also not covered products. They're typically called air cooled chillers, air cooled condensers, evaporative condensers, and we also have hybrid or adiabatic condensers. And their fans are typically limited to heat rejection and in the condenser fan they can use axial panel or centrifugal housed and unhoused fans for the, for that type of equipment.

And we know, what we know is the unit input power and the external static pressure. We know it by testing the unit and predicting that, that test to different, to other sizes and configurations. And we don't know the fan CFM, fan or motor input power, fan total static pressure, cabinet effect or fan-only applied efficiency.
For cooling towers, the common, this is not, also not a covered product. We have packaged cooling towers, packaged evaporative condensers and field-erected mechanical draft cooling towers. We've got CTI representing on that later today. So, the typical fan types, again as, as, as is written on every side, these fans can be single or they could be multiple fans. But we have the heat rejection fans will be axial or centrifugal.

So for the cooling towers we know the motor output power, the unit external static pressure sometimes, fan CFM, fan total static pressure, fan or motor input power and motor efficiency. We know this by testing the unit and predicting the, that testing to other configurations and also through modeling. And we don't --

MR. HAUER: Laura?

MS. PETRILLO-GROH: Yes?

MR. HAUER: It's Armin Hauer speaking. So you do know the fans CFM on such a large cooling tower?

MS. PETRILLO-GROH: Yes.

MR. BURDICK: There is, there is a predicted value or there is a, a modeled value for it.

UNIDENTIFIED MALE: Please identify yourself, Mr. Burdick.

MR. BURDICK: Larry Burdick, SPX. There's a, there is a model, there is a number for the fan CFM that we
use in our prediction model.

MR. HAUER: Only in prediction. Okay. That's how you know by your prediction.

MR. BURDICK: Right.

MR. HAUER: Okay. Thank you.

MS. PETRILLO-GROH: And we don't know the fan-only applied efficiency for the cooling towers.

For the energy recovery ventilators, commonly known as ERVs, they have, they use their fans for heat recovery. And they can be axial panels, centrifugal housed or un-housed, axial housed or mixed flow fans.

They know the fan CFM, fan or motor input power, energy recovery effectiveness and unit external static pressure. They know this by testing the unit and predicting the test data to other unit sizes and configurations. And they don't know the fan total static pressure, cabinet effect and the fan-only applied efficiency.

Amy's going to step in here.

MS. SHEPHERD: I'm going to join Laura at the podium, but for the record, no one in my life has ever told me I need to speak louder. So you listen to her.

UNIDENTIFIED MALE: But you also need to identify yourself.

MS. SHEPHERD: And that was Amy Shepherd from AHRI.
UNIDENTIFIED MALE: Thank you.

MS. SHEPHERD: Okay. So basically for covered products, we think that the approach that DOE articulated in the framework document is the right one. And again, this is for covered product. And that is that those fans that are a component and regulated commercial products or covered products under EPCA would not be within the scope of this. And this is for both sort of practical, real world, the issues that have been described and also for legal reasons. So sort of talking about this in, in the real word practical application for these plan fans as they are applied in these systems, the system energy for these covered products is subject to a DOE efficiency standard or DOE has the authority to develop one. And that covers the energy use of that system. And EPCA is about energy savings. So that is within that. To the extent that metric or that test method does not adequately cover something that DOE feels it needs to cover, DOE has the authority to remedy that through the notice and process common in rulemaking. And as we discussed earlier today, the components affect the performance of other components in the system. So, you know, we think that as these fans are applied and that's, you know, the universe that we're talking about here, it's not going to be the same result. It also avoids difficult issues about double counting of energy savings in separate
rulemakings for one system.

Now we know yesterday there's a different negotiated rulemaking going on that's been referenced. And dealing with the same function or the same issue in two separate rulemakings with two separate test methods, with two separate economic analyses and technical justifications, is very complicated. And we think a lot of these practical reasons are why EPCA legally is set up that it's set up. So, what this does, it would allow DOE to look at the entire system when it's doing this and recognize the energy use within that system, rather than having to coordinate multiple rulemakings to get at the use of that one system.

It also avoids multiple testing of the covered equipment. So, there is a testing burden. Any test procedure that DOE develops under EPCA can't have an undue testing burden. So that's something else that's addressed by the exemption of a product that uses applied in covered equipment. Because there's a test procedure and a test that's run on that system to develop an energy metric. And something that underlies the entire statute is this idea that what matter is the energy savings and there's a metric that's developed for that, and a standard that's developed to that. And then it's up to the manufacturers to look at the technology that's feasible, their customers, their market, their expertise, you know, their, their
marketability to compete and develop the optimal design for that system at the cost that is the lowest. So, all of that is baked into the statutory framework and that's important and it's something that you lose when you go in and start to regulate these components of the covered product. And that's why EPCA avoids that, which we'll talk about on the next slide.

And then the last point is that because you're talking about a system and the system's energy use, regulating the components are not going to promote energy savings because of the bullet we just discussed where manufacturers have to adjust all the other elements to get those energy savings while minimizing costs. So all of that is factored into, I mean, the basic premise of EPCA. And those are very practical reasons that led us to the regulatory structure as it is.

So, I know you all want to move on to the real legal side, so let's do it. All right.

So we believe that EPCA allows one standard for covered products and DOE also articulated this view in 2009 in the Federal Register when it was talking about, it was commercial equipment, commercial warm, warm air furnaces, I believe. But it talked about the fact that the DOE is authorized to establish a performance standard or a single design standard. And therefore, a standard that had both or
that had multiple design requirements was beyond the scope
of DOE's legal authority. We agree with this statement and
we think that's why the framework approach was correct,
because it's, it's in accordance with this. And I think,
you know, as I mentioned, when you look at EPCA and you look
at the fact that it's designed to set these energy savings,
it's designed, the idea behind is that you give
manufacturers the goal of this energy savings and you say,
let the market work it out at the lowest cost to reach that.
And the need to have the technology and the design
flexibility to do that. And that's why there is this one
standard.

Now, covered equipment is also, when you look, I'm
not going to bore you with, I could have lots of slides too,
just like Bill. But there's different sections of EPCA and
they talk about things like energy standards, energy use,
energy metrics, covered products and they're all singular.
Sorry, I know that's boring. That's what lawyers do. But
it talks about one of the following types of equipment and
it talks about a performance standard, which is why DOE
concluded in the rulemaking before that, that's what we're
talking about. And so everything is singular and when they
do, when EPCA does address components, there's a very
specific language in the statute that addresses component
regulation. And again, there's several places in there that
does that. But there isn't a general presumption that DOE can regulate all the different components of a covered product or these specific sections that talked about the regulation of components wouldn't be necessary. But where that has occurred, for example, on the residential side with the fan furnace efficiency those, you know, those were statutory changes that happened in order to enable that.

So that's why we think if there's an energy efficiency standard for this covered equipment, you can't have additional design requirements on top of that. And we also think, there's another thing that runs through the commercial section for specific types of equipment for, you know, commercial package AC and heating, PTACs, heat pumps, warm air furnaces which is that DOE needs to follow ASHRAE 90.1 and that, when that is amended on those covered products, DOE evaluates that amendment and determines whether or not they're going to adopt it or whether they're going to go beyond it. And when they do that, they have to meet a specific statutory burden of showing clear and convincing evidence that they should do that. That's different than the standard they have on the residential side. So, that's something that's also built into the statute that DOE doesn't have the authority to just exceed ASHRAE without going through that process and making that showing.
So, those are reasons why we think for covered equipment DOE has to meet its statutory obligations and that's where, that's where we think DOE can do that.

Any questions or thoughts?

UNIDENTIFIED MALE: We're on day 6 of meetings and we're still talking about whether we should be doing this? I need to make my flights for the next set, so I mean, it --

MS. ARMSTRONG: The Working Group can have that discussion about whether to continue.

MS. PETRILLO-GROH: Well, I think we need to hear from DOE if DOE has a different opinion than what it has stated on this issue.

UNIDENTIFIED MALE: Or, or do we need a vote from the working group to exclude covered products?

MS. PETRILLO-GROH: I mean, so this is our position and we're basing it both on our reading of the statute and what DOE has said.

MR. COCHRAN: Yeah, this is Pete Cochran from DOE, General Counsel's Office. We have a different reading of the statute in this.

MS. PETRILLO-GROH: Than the one that was in the Federal Register?

MR. COCHRAN: The Federal Register I don't think is a reading of the statute. I think that was a position. Are you talking about the 2009 or --
MS. PETRILLO-GROH: Yes.

MR. COCHRAN: -- or the 2013 framework document?

MS. PETRILLO-GROH: I'm talking about 2009.

MR. COCHRAN: Okay.

MS. ARMSTRONG: 2009 stated that it had, and just to clarify for Pete, because what it actually did, it, it talked about how DOE considered a standard for a single --

MR. COCHRAN: Yeah.

MS. ARMSTRONG: -- covered product. Just to make that distinction, because it is important.

MR. COCHRAN: What I think that, I think we're making a distinction. You're saying that this would be two standards for one product, where DOE's position is we had the authority to regulate fans and blowers based on the statute. We also have the authority to regulate the regulated products based on those provisions. We're not looking at that as we're taking two standards under one product.

MS. PETRILLO-GROH: But it's a component.

MR. COCHRAN: We're taking separate --

UNIDENTIFIED FEMALE: It's a covered product.

MR. COCHRAN: And I think all that is, if you want, maybe when we get into that, maybe if you get into more of the testable configuration where you're defining it.
And that's stuff that the Working Group has to work through. But from an authority and statutory position, DOE's position is, we have authority to regulate fans and blowers. We have authority to regulate the other products. This Working Group is going to work through all the details and I think at this time, I guess, our opinion, if you guys --

    MS. PETRILLO-GROH: But there --

    MR. COCHRAN: -- come back with a more detailed position --

    MS. PETRILLO-GROH: -- you know, there's, there is specific language and within, in the statute of the commercial provision that talks about regulating covered product components if they're components of residential equipment.

    MS. ARMSTRONG: So I --

    MS. PETRILLO-GROH: There's nothing that talks about regulation --

    MR. COCHRAN: Uh-huh.

    MS. PETRILLO-GROH: -- components of commercial equipment. So, we're really asking DOE for its statutory opinion. Like on what basis, based on the language that's in the statute is DOE concluding this?

    MS. ARMSTRONG: So, I think Pete articulated DOE's authority position. We believe we have the authority to cover fans and blowers. DOE did not set up a Working Group
to discuss its authority. We set up a Working Group to negotiate definitions, task procedures and standards and scope of those potential regulations for fans and blowers. So I, I think that's where we are at this. I mean, the authority is something that the Department has articulated and it will articulate it further as it moves through the process. You join the Working Group to negotiate aspects of those potential regulations in good faith. But fundamentally arriving and questioning DOE's authority was not within the purview of this Working Group and really is not why you were nominated to be on it.

MS. PETRILLO-GROH: I fundamentally disagree. DOE can't take an action in a rulemaking that exceeds the scope of its authority. And I think that, that, that is our position and I think even putting that position aside, we think that the fact that these products are covered equipment and that they have a standard or DOE can develop a standard is the right approach. As we say in the previous light, it avoids a lot of the complexity, that you capture the total energy use of that system and we think that in terms of enforcement that, you know, we can come up with something that, that works in terms of allowing DOE to identify abuses of any exception for things that are components of cover, covered product. And we, we don't have that fully fleshed out yet, because we're thinking about it
and we also need to get a little bit more information I think about the distribution chain here. But I think we have, we think that there are some lessons that can be learned from what happened on the residential side with regional standards for air conditioning. Because we had a bit of a similar issue there where manufacturers are, were allowed to produce basically two products. Some are compliant in one installation and some are not. That's different because that specific statutory provision has language that addresses things further down the supply chain and this doesn't. But one of the key facts for that was labeling and we think labeling can work here and we just need to think about the best way for DOE to identify that, which we're still doing. And we recognize that and we're, you know, we're looking at the options there. So, that's one thing that, that we're looking at to recognize this. But -- uh-huh.

MR. FERNSTROM: This is Gary for the California Investor-Owned Utilities. It seems to me there are two issues here. One is the debate between you all and DOE about whether or not DOE has the regulatory authority to address this. DOE says it does. You say it doesn't. Now I don't think that's something the Working Group can address. My opinion is that we have to presume that DOE is correct and the Working Group then will go from there with respect
to its development of a recommendation as to whether unitary equipment should be covered or not, with respect to the fans, of course. I think we need to look at the data that is being collected in order to establish that recommendation and at least speaking for the California utilities and perhaps the environmental advocacy group within this Working Group, we're not convinced at this point that the fans utilized in unitary equipment should be exempted yet. So, I would propose that we go ahead, gather the data, look at it, understand the energy savings and then the environmental representatives in this Working Group can make a decision as to whether it wants to agree to exempt this equipment or not.

MS. SHEPHERD: Well, and I think as Laura mentioned, you know, we are gathering that data, but I think that what we wanted to flag it, I, I do not believe that this issue is clear, however, I mean, you don't necessarily have to get to that point if we can agree and we reach a consensus that this exemption is, would work in terms of energy savings.

MR. FERNSTROM: So, so speaking for the California IOUs, we are not prepared to agree to that at this point until we see the data and I believe that the other environmental advocate representatives in this Working Group have a similar view.
MS. SHEPHERD: Right. And I'm not suggesting that, that we're looking for your agreement on this today, obviously. I mean, we recognize that there's additional, that there's additional information that can be informative on this issue.

MR. FERNSTROM: Well, we keep coming back to this point over and over and over again. And both sides have made their positions quite clear. So, why don't we proceed with the process of looking at the data and then we can make a decision?

MR. WINNINGHAM: This is David Winningham with, with Allied Air. Gary, I appreciate your, your position on this, but the prior two days we have been negotiating in a similar forum on commercial packaged equipment group, equipment, which at the present time is taking into account fan energy use in ventilation mode outside of the current test procedure and in an applied manner well beyond the current test procedure. So, we need to, from a manufacturer's perspective, we need to account for that performance in one place. And if we are going to be held to that in multiple situations, then I think that is very problematic for the manufacturers.

MR. FERNSTROM: This is Gary. I understand that.

MS. PETRILLO-GROH: And I think that there's another, there's another issue too that if, for, for Dave's
point, if you have that being accounted in two places, your
fan has two standards. It has a fan standard and it has the
standard that's being applied as it's, as it's applied to
the covered product. And you can't have two standards for
one covered product. So, I, I think that, that, I mean,
that's exactly why this interpretation of EPCA that, that,
you know, I, meaning is clear from the statute and the fact
that there are specific provisions that talk about component
regulation. And even a component has to be a covered
product before it can be regulated as a component.

MR. FERNSTROM: So this is Gary. You said we
can't have two standards for a covered product. Do we not
have standards for electric motors?

MS. SHEPHERD: There's an entire statutory
 provision for that.

MS. PETRILLO-GROH: That's Caroline Davidson-Hood.

MS. SHEPHERD: Yeah, AMCA was amended so that that
could happen. And that's different than fans.

UNIDENTIFIED MALE: Well, yes.

MR. FERNSTROM: But it is a situation.

MS. ARMSTRONG: Okay. So, I, I'm just going to
reiterate. This is, the, the Working Group should not be
discussing, it is not within the purview of the Working
Group to discuss DOE's authority and interpretations of the
statute. That being said, you're well within your right to
submit comments outside this process whatever. That was not
what ASRAC charged this Working Group to do. That's not in
the scope of the, the ground rules that we negotiated at the
beginning. That was not in the scope that ASRAC asked you
to do. So that being said, I'm going to bring back the
discussion to kind of scope of, we're talking about
standards. We're not talking about authority. That's off
the table. We're talking about standards and what's
potentially in and out and whether we should report. And,
and at this point it goes to Gary's comment that he just
stated that he would like to see data before he is in a
position as a Working Group voting member to vote. I don't
know how other people around the table feel, but that's
really where we are. I mean, for someone to vote on scope,
they, they're asking for more information to better inform
them, to better inform their vote. Talking, you know, the
authority is just off here.

MS. PETRILLO-GROH: Ashley, I fundamentally
disagree with that. You can't consider options that, that
you can't consider options that DOE doesn't have the
authority to do. And I, and I don't want to, I don't want
to belabor this point. I think we can move on and get, and
move to the data and talk about other things, but
recognizing that in the, in other ASHRAE negotiated
rulemakings, they are discussions about what DOE has the
authority to do and what not. And sometimes, you know, when
we did it last summer, the attorney for DOE would have to go
upstairs and confer and come back and said that's not going
to be on the table because we don't have the authority to do
that. So, I, I think that is an issue. It's a fundamental
issue for us. But again, as I said, I think that we can
have other discussions about options and this still I think
can be a very viable option regardless of whether we address
that issue directly.

UNIDENTIFIED MALE: What I'm basically hearing is,
you know, from there is this issue that's being raised about
authority. I think DOE is being fairly clear that the issue
could relate to scope and that, that's what this group was
chartered to look at was scope. And that although, you
know, authority might be an issue for people as they
evaluate scope and it's not really a direct issue for the
Working Group itself.

MS. PETRILLO-GROH: It, it is a direct issue for
the Working Group in the sense that we can't reach consensus
on something we think is outside DOE's legal authority.

MS. ARMSTRONG: The Working Group is not allowed --

MS. PETRILLO-GROH: I'm not going to speak for all
the manufacturers. That's just AHRI.

UNIDENTIFIED MALE: Yeah, I --

MS. ARMSTRONG: -- to work on this, on, the
Working Group, it is not in the ground rules for the Working
Group to discuss DOE's authority as it relates or, or vote
on a position about it. So, to the extent somebody wants to
discuss the applicability of potential standards or how
certain types of equipment should be tested, that's well
within the purview. But it was definitely in ASRAC's
charter, nor was it in the ground rules.

UNIDENTIFIED MALE: Yeah, AS, ASRAC committee was
chartered under the Negotiated Rulemaking Act and the, the
other statute. That Negotiated Rulemaking Act and the, you
know, and FACA, yeah, and they can't sit around and, we
can't negotiate the law. The law, the statute's the
statute.

MS. PETRILLO-GROH: But isn't it important for
everyone here to know that there are limitations on DOE's
authority when you're moving forward and you're making
decisions on what this regulation is going to look like?

UNIDENTIFIED MALE: But they're, that's --

MS. PETRILLO-GROH: I mean, it's important for
you --

UNIDENTIFIED MALE: -- that's for a different
board.

MS. PETRILLO-GROH: It's not, I mean --

UNIDENTIFIED MALE: Well, I can't argue with you
now.
MS. PETRILLO-GROH: -- these people need to make a decision about, you know, what this rule's going to look like and if it's going to have legal problems, at the end of the day that's an important factor to consider.

MS. SHEPHERD: But I, I, I think that the key decision here is that for, it is extremely difficult for us to agree to something that we feel is beyond DOE's legal authority.

MS. ARMSTRONG: So but --

MS. SHEPHERD: And --

MS. ARMSTRONG: -- I go back to Trinity is, I think, point about, should we proceed with the working group. I mean, that's essentially what he was asking and that's something that's within this Working Group to decide. Should be keep continuing to meet if you're, I mean, what I'm hearing and, and I hope this isn't the case, because I think the last meeting we were making pretty good progress and I thought this morning we were making good progress, until we got here. Was the fact that we were talking about, you know, the details and those types of things or what potential regulations might look like and, and how that things might be tested and the details that are within the scope of the Working Group. But it really comes to the heart of, you know, if you're telling us there's a subset of this Working Group that believes that they can't proceed
without articulating or voting on opinions of DOE's authority --

MS. PETRILLO-GROH: That's not what --

MS. ARMSTRONG: -- and I think we're at the point of, of try, having a discussion about do we proceed or not? And that's really, you know, this Working Group can ask ASRAC to suspend.

MS. PETRILLO-GROH: That, Ashley, that is not what we're asking. What we're trying to do is explain our position. And this is our position on the issue of covered products and exemption for covered products. We are not asking for a vote on whether DOE has legal authority. We understand that is DOE's determine to make, determination to make. What we are saying, we're trying to explain our position on this particular issue and we think that practically, as we talked about in the previous slide, this can be a working resolution that works very well and maintains the flexibility and avoids this issue. So, that's, that's what we're talking about. And we do think that we can move over be, forward because this is an option. And we want to further explore this option and put it forth in front of the Working Group for consideration with further information. And there's a, and this is just for covered products that we're talking about. We're not talking about non-covered products, which is what we talked about this
morning.

MR. FERNSTROM: This, this is Gary. A recommendation for process. Maybe we ought to vote on this recommendation now and set it aside. So that is, is the willing, the Working Group willing to take off the table fan coverage for those fans that go into unitary equipment?

MS. ARMSTRONG: Okay.

MR. FERNSTROM: If we vote on that now, we'll have a resolution. We can, we can go ahead either developing more information and retaining this possibility on the table or we can just take it off the table. But it, it will mitigate the need for continued discussion of this. And I suggest if the group is willing to take a vote on that, we need to have a little caucus ahead of time.

UNIDENTIFIED MALE: That's over lunch?

MS. ARMSTRONG: I'm fine with taking a vote. Others?

MR. FERNSTROM: Yeah, get a, get a very clear written resolution put together --

UNIDENTIFIED MALE: How long a caucus do you want Gary?

MR. FERNSTROM: I think it'll take the --

UNIDENTIFIED MALE: Want to do the caucus?

MR. FERNSTROM: -- environmental crew maybe two or three minutes. To all be on the same page with this.
MS. PETRILLO-GROH: So what would be the out, so if, what are the alternative outcomes? So if, if we had this vote and it came out one way, what would be path forward and on the other way what would be the path forward?

UNIDENTIFIED MALE 1: What's the resolution?

Let's --

MR. FERNSTROM: Gary. The vote, the --

UNIDENTIFIED MALE 1: -- just be very --

MR. FERNSTROM: -- vote would be can we take fans that go into unitary equipment off the table now --

UNIDENTIFIED MALE 1: Regulated.

UNIDENTIFIED MALE 2: Current, currently regulated products.

MR. FERNSTROM: Will you forget currently regulated? Or, or we don't.

MS. ARMSTRONG: They're not all regulated on that slide.

MS. PETRILLO-GROH: They're covered products. That's what listed. That was pulled from the DOE website.

MS. ARMSTRONG: They are not all regulated.

MS. PETRILLO-GROH: They're, are they covered products though?

MS. ARMSTRONG: The way you have them, generally speaking is that --

MS. PETRILLO-GROH: This was, I pulled that off of
the, you know, the part of the EER website that says commercial?

MS. ARMSTRONG: Fine.

UNIDENTIFIED MALE: What other sites were used?

MS. PETRILLO-GROH: That's so, that's where it came from. Right there.

UNIDENTIFIED MALE: What other (indiscernible) --

MS. PETRILLO-GROH: Sorry.

MR. FERNSTROM: It doesn't matter to me whether, this is Gary again, whether we address covered products or regulated products. I think the outcome of the vote's going to be the same either way.

MR. CATANIA: Gary can I offer a suggestion before you caucus here. Tom Catania. Couple of thoughts. You know, to me the more significant vote is, is whether or not AHRI's position is that if these products are included, that they cannot vote in favor of, of any proposed regulation. Because to me, that's much more important. You know, it would be a very quick vote. My sense is of whether these products should be excluded and it would fail. But so, then the question becomes, does, does the process go forward in bad faith if you're going to take the position that any agreement that includes covered products you will vote no on?

MS. PETRILLO-GROH: No, I think that the, the key,
I think the key concern are the practical issues that we outlined. So I think there are --

MR. CATANIA: No, no, no. We didn't hear practical issues --

MS. PETRILLO-GROH: Yeah, it was the slide before the --

MR. CATANIA: -- we had --

MS. PETRILLO-GROH: -- the legal one.

MR. CATANIA: Yeah, it, it was but the dispositive issue are your fundamental legal position --

MS. PETRILLO-GROH: No but we think --

MR. CATANIA: -- that they can't be covered.

MS. PETRILLO-GROH: Okay. But we think the, what, what we think the benefits of this approach are, are those things that are listed there. So I think there are other, there are other paths and I honestly think that we would have to go back and decide whether or not at this point on that particular issue that's something that, that we could say right now. But I think that there are other, in terms of the definitions, and, and things like that, there are other things that can get us to the same results or that we may be able to be comfort, comfortable with.

MR. FERNSTROM: So this is Gary again. Tom, I think AHRI is saying, listen to our recommendation and make a determination on it. And I'm just calling for the
determination now.

MR. CATANIA: Well, the, the determination is just on the point of whether the products should be excluded and it fails, we're back, we're back in exactly the same place.

MR. FERNSTROM: We are, but I think it will preclude AHRI coming back again and saying over and over again, listen to our proposal.

MR. CATANIA: Well --

MR. FERNSTROM: Which is what has been happening for the past two or three meetings and gets to Trinity's point about where we go from here. Now where AHRI goes in the future, that's up to them. But at least it will resolve this issue now.

MR. WHITWELL: So this, this is Bob Whitwell from Carrier and I think I'm speaking, I hope I'm speaking for the rest of the AHRI members when I say, really what we're looking for is exemption of the condenser fan and the supply air fan on covered products, because those are included in the efficiency metric and they already have for, for this, this equipment. It's included in the, in the EER or the IEER metrics that exist today, or the EER that exists today and the IEER metric that we're negotiating currently in the other rulemaking process. And in fact, if you look at the energy savings that, we, we, we have each, the manufacturers and the energy advocates presented positions yesterday.
We're, we're narrowing in on an agreement, I believe, in that other rulemaking and there's a significant amount of energy savings with this, with the proposed vote positions. A good portion of that energy savings is due to the fan energy. And it's, it's the fan energy during the cooling operation, within the heating operation and during the ventilation operation. It's (indiscernible).

UNIDENTIFIED MALE: Okay. And all the implied static.

MR. WHITWELL: And, and that applied static is all in there. So, what we're looking for is exemption of the supply air fan and the condenser fan in those covered products because it's built into the energy metric that we're already, that we're certifying and will continue to certify to DOE.

MR. CATANIA: So, can I ask a clarifying question in response to that? Tom Catania again. So of the total horsepower that we were looking at in the original kind of broad conversations, there was about a 50, 50 split between a gross look at fans and covered products and not. You know, it was a few million on each side. The exemption as you just more narrowly describe it, how much of that horsepower are we talking about?

MR. WHITWELL: I, I don't know the answer to that. But I do --
MR. CATANIA: (Indiscernible).

MR. WHITWELL: -- I, I --

UNIDENTIFIED MALE: I do.

MR. CATANIA: Well, if it's covered.

MR. WHITWELL: But --

MR. CATANIA: It's counted. I'll answer the question. The connected load, right? Just back of the envelope calculation, of AHRI regulated products is above one horsepower or one horsepower and above is about two million horsepower. And below one horsepower is about two and half million horsepower. Put that in perspective, the fan products, if you will, that are represented by the database that we produced, which includes some embedded fans, is about 3.6 million horsepower. So basically you've got four and a half million horsepower in regulated equipment and you've got three and a half million horsepower in unregulated equipment. So it's not a small amount of connected load.

MR. WHITWELL: So let me add one other aspect of this, this is what's going on, on the commercial air conditioning side.

MS. ARMSTRONG: Hold on one second. With what you just said though, I don't think that equates to what Bob's saying either. Right? I mean, he's talking about --

MR. CATANIA: That's the, that's the, that's the
fan power at the wire. That's the connected load in BHP --

MS. ARMSTRONG: But not all AHRI parts to me. If I am understanding you. And perhaps I'm not. You're asking, if you're just talking about that other rule, you're asking small, large, very large condenser fan, other size fan for air cooled only and only for those?

MR. CATANIA: Supply air fans.

MR. WHITWELL: Well, certainly for those I think the other --

MR. CATANIA: My, it was my --

MS. ARMSTRONG: I mean, that is very different than --

MR. CATANIA: Are you asking him or are you asking me?

MS. ARMSTRONG: From behind you.

MR. CATANIA: Okay.

MS. ARMSTRONG: That's very different than what's on this slide. I mean, what you're arguing with the other rule is limited solely to, greater than 65,000 all the way up to bare wires, so 70 some tons, 70 tons-ish. Air cooled only, split and packaged.

MR. WHITWELL: Yeah. That is the, that's today.

MS. ARMSTRONG: That's what the other rule --

MR. WHITWELL: That's, that's the other rule.

MS. ARMSTRONG: -- I mean, if you're using that as
your argument, that is what the other rule is. And if
that's your ask, I think that's a very different ask of the
people around the table that --

MR. WHITWELL: Okay. Well, let's start --

MS. ARMSTRONG: -- would split everything on the
slide by way.

MR. WHITWELL: -- let's, let's, let's start with
that part. Okay? Let's start with that part. Because
that's what's going on today. Now what's going to happen in
the future, I expect that we're going to see the other
products move to the same type of metric. Right? I would
expect that, that's the direction that --

MS. ARMSTRONG: So, do you want some time to think
about what you're asking the group to potentially consider
voting on?

MR. WHITWELL: I, I guess I would like to make
sure that I'm in line --

MS. PETRILLO-GROH: Well, we'd like to caucus.

MR. WHITWELL: -- with the rest of the AHRI
members. But --

MR. CATANIA: And can I, can I --

MR. WHITWELL: -- but I --

MR. CATANIA: -- just some other things about
that?

MR. WHITWELL: -- sorry, I just, I'm sorry. I, I
just wanted to make --

MS. ARMSTRONG: I, I think your argument for that is very different than this one.

MR. WHITWELL: -- I just wanted to make one other comment about what's going on in the other rulemaking. So, so part of maximizing or improving the energy efficiency with the IEER metric, driving the products that have staged indoor, inner, staged indoor fans. That's, that's coming out complete, and as the IEER metric increases, it's also in the, it's in ASHRAE 90.1. It's in California Title 24, as requirements to have staged fans in order to comply with those standards. So as you move to the lower fan speeds and part load, the efficiency of the fan is much less important. Right? Because the, the energy used goes with the, the cube of the, of the speed. Right? So, you can argue that the IEER, increasing the IEER is doing more for saving energy than a, an incremental improvement in the energy efficiency of the fan itself. So it's just another thing to consider.

MS. ARMSTRONG: But that argument is limited too. Greater than 65, small, large, very large, air cooled, split and packaged. That's a very different ask.

MR. WHITWELL: Okay. That's great. Okay. We're going to talk about that.

MS. ARMSTRONG: Okay.

MR. CATANIA: Okay. So I guess, this is Tom
Catania again, I guess if I was going into your office, one of the things I would be thinking about is that at the highest level, the DOE's authority to regulate safe energy here and the desire on the part of the people who regulate power generators around the country, is very broad. And you've experienced as an industry watching the salami get sliced multiple times and the minute it's made the statutes, to cover things where opportunities for savings have been missed and then identified subsequently and oh, we're going to either have to change the test procedure or the authority or something like that. That's what's going to happen again if there are millions of, you know, horsepower that in the real world are increasingly detected as not being safe. So, it's do you want to do it in a comprehensive process that, that considers in the proceeding you just described in this proceeding an optimization of this, or do you want to fight trench, legalistic trench warfare and have, you know, difficulty predicting your capital investments and research and that spending as the salami keeps getting sliced as people go back. Whether it's the advocates or the Department directly and says okay. If it'll require us to tweak our legislative authority a bit or our interpretations and our rules a bit, but this is a big pile of demonstrated energy savings opportunities sitting there that's not being taken advantage of. And that's the way I would think of it
if I was trying to do capital spending plans and investments looking out decades where these things get fixed later and you guys have had it happen multiple times. Mike.

MR. WOLF: This is Mike Wolf, Greenheck. So I just have one question here before we break for a caucus here. First of all, I, I guess my interpretation of what I have heard, is that what Amy --

MS. ARMSTRONG: Uh-huh.

MR. WOLF: -- said, and what Bob said, they sound like different things to me --

MS. ARMSTRONG: They are.

MR. WOLF: -- so I think it would be good to get that --

MR. PETRILLO-GROH: Yeah, and I --

MR. WOLF: -- cleared up. I'm not looking for a response. I just want to get this off my chest today.

MR. PETRILLO-GROH: Yeah, go ahead.

MR. WOLF: And then the second thing is for every action there's a reaction. So let's assume for a moment that I'm just going through my head here, that we take some of the stuff off the table. What will happen then? I'm, I'm guessing the process will go on. We'll have AMCA, you know, I know my, my initial comments to the NODA. I, I suggested the ASRAC process because I'd probably get more, excuse me, more people involved and we'd end up with a
better rule. Now, to Trinity's point, it's getting a little frustrating coming up to Washington every couple of weeks and feeling like we're spinning our wheels. And my guess is that if we take some of these things off the table and said, all right, you know what, they, they don't apply. We're going to go back to what we were doing before and, you know, time will march on and the, AMCA group or the advocate group will just continue on with what we've developed and that's what will get probably adopted if it's legally okay to do that. And again, I'm kind of thinking ahead in the house market, I think, again, it would be better that we include all the fans, you know, the manufacturers that, that are applying fans, rather than just this kind of relatively narrow view of, of AMCA and, and advocates. So, you know, you, I don't know if that's a question or a statement. I guess I'll ask if the question could actually, if the ASRAC were disbanded --

MS. ARMSTRONG: Yes.

MR. WOLF: -- what, what would be the future stage of this process?

UNIDENTIFIED MALE: Statutory.

MR. WOLF: Can you answer that or not?

MS. ARMSTRONG: Yeah. So, I can, I mean, I'm not going to do it from a statutory authority side, but just how this will work, more as a process kind of thing. So if this
group votes, we would have to vote to disband. We would ask ASRAC to disband us, because ASRAC is the one that chartered us. So we would have to do that. ASRAC would then disband the committee. They would tell DOE it was disbanded and why and DOE could march on with its own rule. I mean, at that point in time it becomes its normal rulemaking process. We would go through our proposal development process and then put a proposal and notice and comment. I mean, we've already stated a couple of them that we intended to do so for fans. So, it would just go through our normal rulemaking process that doesn't afford as many of the back and forth opportunities with all of us in the room to deal with some of the stickier issues that we have been talking about. So, but that's what would happen if we disband.

MS. SHEPHERD: And this is Amy --

MS. ARMSTRONG: And at that point what, in terms of what's, you know, it's informed by the comments we receive. It would be informed by the discussions we've had to date, but ultimately DOE would be deciding and putting out a proposal for comment.

MS. SHEPHERD: And this is Amy from AHRI. I mean, our intention in presenting this was to just give you the, the, explore this as an option and tell you why we thought it was a good option. That it, it wasn't our intention to bring this to vote today. That's what I said to Gary. When
we know there's more information coming. But what I think
we just want to do is continue to explore this as an option.
Our intention here was just to give you an explanation of
what we think the basis for the option would be. And that's
it. I mean, I, I think there's definitely a benefit to
moving forward and just continuing to consider this as an
avenue for these types of products, or some variation on
this as we have discussed.

MR. FERNSTROM: Well, well, this is Gary. Amy, of
course, this would remain an option as we move forward as is
consideration of the work that's going on with the Unitary
Working Group. So, you know, what outcome we ultimately
come to is dependent on a couple of things. Getting more
information about this market and seeing how it may or may
not be treated and other ongoing working groups.

MS. MAUER: This is Joanna. Bob, I just wanted to
push back a little bit on what you said. I, I think I heard
you say that fan energy is already captured in IEER. And I
agree that condenser fan energy is captured. Supply fan
energy is captured to some extent. I haven't been involved
in the discussion on unitary equipment, but my understanding
is that there have been discussions in that working group
about how IEER really is not adequately capturing fan energy
and there are different ways that, that can be addressed.
IEER could be revised to better capture fan energy. But I
just wanted to --

MR. WHITWELL: Yeah. So --

MS. MAUER: -- point that out.

MR. WHITWELL: -- okay, so let me expand on that. So, the condenser fan is 100 percent covered. When the compressor is on, the condenser fan is on and it's --

MS. MAUER: I think that's what I said.

MR. WHITWELL: -- captured 100 percent.

UNIDENTIFIED MALE: Yes.

MR. WHITWELL: The supply air fan is captured when it's running in cooling operation. When the unit is running the heating operation, it's actually helping to heat so it's, it reduces the heating, the heating requirement for the heat pump or for the electric heater or for the gas heat, because it, it's, the inefficiency is adding heat to the air. Okay? And that's a small part of that total operation. The, the ventilation energy is not captured in the metric, although it is being captured in the analysis and the savings that are being included in the analysis for that rulemaking. Furthermore, there was an, an ask or some discussion and the industry members need to go back and think about this. To consider a revision or tweaking of the IEER metric to include ventilation. So that's something that we can consider as part of the ongoing negotiations.

MS. MAUER: I think that's one component in my
understanding. The other significant component is that IEER test is using unrealistically low external static.

MR. WHITWELL: The IEER test has external statics that are representative of statics that can be applied in applications. I mean, the range of applications is so broad. Right?

MS. MAUER: Right. I understand --

MR. WHITWELL: And --

MS. MAUER: -- but I don't know that it's --

MR. WHITWELL: -- and, and in --

MS. MAUER: -- representative.

MR. WHITWELL: -- the energy analysis that's being done, statics higher than the test statics are being used. So, the analysis is looking at something that's higher than what the test standard is, is based upon. So --

UNIDENTIFIED MALE: Because?

MR. STARR: Yeah, this is Louis. I mean, that's kind of a lot of where I have the heartburn. They're using .3 static inches for it, so think of all the ductwork systems and the tab guidance beat that. How many of them actually hook up and only have .3 inches of static pressure loss in the pressure return. And that's what they're using. It's owner analysis, they, the consultants went back and used what they considered a more realistic number --

MR. WHITWELL: .75 and 1.25.
MR. STARR: Yeah. Depending on the size of the equipment. And so that bumped the savings quite a bit. But the test procedure itself still is very low --

UNIDENTIFIED MALE: Uh-huh.

MR. STARR: -- static pressure and so that's why when we're talking about the IEER being more representative, using a higher static pressure and it would be one. And then the other things that Bob mentioned.

MR. WHITWELL: Yeah. So I mean, the test procedure is a test procedure to compare different products. Right? The, the energy analysis that's being done --

UNIDENTIFIED FEMALE: Prepared by a condenser company.

MR. WHITWELL: -- is, is looking at what, you know, a higher static pressure. So, you know, we're getting, we're getting a comparison that's helping us to determine, you know, it's giving direction on determining what the final level is going to be that's based on higher static --

MS. MAUER: This is Joanna. Yeah, I understand that the analysis is attempting to reflect actual field energy consumption, as it should. I think the, the concern is that if the test metric is not appropriately reflecting field energy consumption, then it's not adequately kind of incentivizing fan energy improvements.
MS. WINNINGHAM: And, and, this is Dave with Allied. Joanna, I completely understand what you're stating there and that has been asked too. But we are accounting for that energy as it's applied, kind of per our discussion, beyond what the test procedure, and we are making our decisions based upon that, that energy, that energy. What we are, what gives us heartburn is we have, we have done that and that has significantly changed the fan power in that discussion. I mean, it, it has, it's probably --

MR. STARR: So, Dave, the, the concern is not so much about the most recent. What's in the future, if you have a metric that's not really gearing it toward, I mean, to make it a more concrete example, let's take like a dryer or a washer where you, you, the, the test product was all handkerchiefs. Now how many of us, you know, go there. So it's, in other words, if you're applying the test procedure around something that's not realistic, it, it designs them to, design their equipment around them, and that's what really the concern is, not so much is the, the snapshot of how much the savings are. But moving forward, are we on the right trajectory to get where we're trying to save energy in the field?

MR. WINNINGHAM: Understand, and I understand what the test procedure is and how we're, how we're doing that analysis and I think the debate here is, okay, if we're
going to account for that energy there, then we can't account for it here.

    MS. MAUER: So this is Joanna. I don't, I don't think the analysis is accounting for the analysis is sufficient, because in order, what we care about is real low energy savings, not, not --

    MR. WINNINGHAM: That's what the analysis is attempting to end --

    MS. MAUER: And I, but I think that --

    MR. WINNINGHAM: Go ahead.

    MS. MAUER: -- the problem is that you can have two products at the same IEER that may have significantly different real world energy consumption due to, to fan energy, and I think that's a problem now, so.

    MR. STARR: That's the part that we're trying, would like to get it fixed at some. The question is, is how do you fix that.

    MS. ARMSTRONG: So can I ask you a question? I mean, this is just a question.

    MR. STARR: No.

    MS. ARMSTRONG: If the ask then for, for potentially, I mean as part of your, as for a lot of people here but, Bob had the, I know the Bob again, because you're the new spokesman. Uh --

    MS. SHEPHERD: You fired me, I know.
MS. ARMSTRONG: No, no, I didn't fire you. I'm just not talking authority. So I, so, if, if your ask is to the group for us to potentially consider taking off the table at this point, small, large, very large, greater than 65,000, um, air cooled split package, air conditioners and heat pumps because of all the aforementioned reasons, um, are you willing to also commit to a metric and test procedure provision as part of that ask.

MR. WHITWELL: So again, I think this is the part of what we've already --

MS. ARMSTRONG: I mean, just wondering.

MR. WHITWELL: This is what we've already been asked in the other working group to consider. So, I mean this was yesterday. So we need some time to think about this, and, and develop a response. But I think, Joanna, to, to answer your concern, I mean if we were to include in the, say as Harvey put it yesterday, to link the IEER test procedure to include ventilation, the fan and the fan powered during ventilation, I mean I think that goes a long way to eliminating the concern that, that you guys would have as far as the IEER test procedure. Right?

MR. STARR: Well, I think the static pressure, uh, for me is probably, you saw the analysis that jumped a factor in amount of energy he test --

MR. WINNINGHAM: I, I think that's part of the
MS. ARMSTRONG: So, so can I make a suggestion?

MR. STARR: Yes.

MS. ARMSTRONG: At this point, it sounds like people need to caucus. You need to think about what your ask of it is. We need to think about what we may be willing to give or whatever with our respective each little groups. And clearly you've heard the discussion with regards to data, the test procedure changes, metric changes, different things, what is your actual scope? This is very broad. And I could argue against your fans for a lot of these with regards to test procedures and regs right now. So I think you need to really figure out what your ask is of this group. And with that, who wants to eat.

MR. BOTELET: I have one comment. Can I make one comment and here?

MS. ARMSTRONG: Yeah.

MR. BOTELET: As a, as a --

MR. STARR: Please identify yourself.

MR. BOTELET: Oh, I'm Rob Boteler, I'm the Chairman of the Electrical Motor and Section Energy Management. Yeah, thank you.

MR. STARR: Thanks.

MR. BOTELET: We've been regulated for about 20 years now, so we have a little bit of experience here.
MS. ARMSTRONG: And they keep coming back for more.

MR. BOTELER: We keep coming for more, and it's all because of you and now you bring the kid back. Oh my gosh.

MS. ARMSTRONG: I didn't bring the kid back.

MR. BOTELER: Oh, okay.

MS. ARMSTRONG: Who's to clarify that one.

MR. BOTELER: I would just, I'm not going to be part of the caucus, but I, I would just mention that, it was mentioned that motors were regulated as a component. And if it goes into a piece of equipment, it can also be regulated. And that's, that's probably not by accident. One of the issues that you're going to face under regulation is a fan manufacturer' enforcement. And Ashley and I go back and forth on a regular basis for enforcement and issues we have with enforcement. And if you think that the market is not going to challenge you at every corner and try to take advantage of lower cost and get around the regulations, you are sadly mistaken. I have examples. We have a small motor rule. I got a call the other day from one of my sales people. One of his manufacturers is redesigning an entire product line, moving millions of dollars' worth of motors to another product that's not covered so he can avoid the regulation.
So I think when you look at something like this, and I understand the issues, you know. If it's covered, it's, and you're double counting it, that is definitely an issue. But if you're a fan manufacturer and you're creating a situation where you regulate not at the point of manufacture, but at the point of application, you've created a situation where the market is going to take advantage of it. So that's, my worse, my worse of what, what occurs in the market.

MR. WHITWELL: I, I know we're holding up lunch, but I, I don't, I'm not sure I quite understand that, because how does it, you're saying it creates a problem, creates a problem for who?

MR. BOTEKER: As a, as a manufacturer of the regulated equipment, whatever that component is, if it can go in two different directions, it has a different regulation depending upon the application, then the market will see that and, and take advantage of it, and try and purchase that product that's not regulated.

MR. WHITWELL: But you're talking about a, let's say, a, fan blade.

MR. BOTEKER: Right. If there's a fan blade that could go two different directions, you will find at some point that there's a, it would never happen here, but the manufacturer from Southeast Asia somewhere would suddenly go
to one of your competitors and find that they're building
air handlers with some piece of product that, we find motors
that have no nameplates.

MR. WHITWELL: So you're talking about a, an end
use product that someone would go to China and buy, say like
an air handler. They would buy an air handler --

MR. BOTELE: No. I'm talking about your
competing air handler manufacturer here in the U.S. is
buying those components from somewhere that are not, not
compliant.

MR. WHITWELL: But, but, so I think that problem
exists here anyway, because as I've sat in on the last few
meetings, I understand that I will be the fan manufacturer,
because I'm taking that fan and I'm putting in the housing.
So --

MS. ARMSTRONG: I don't think we've determined
that per se --

MR. WHITWELL: That's right.

MR. BOTELE: But that's the discussion.

MR. WHITWELL: That was the question on the table.

MS. SHEPHERD: Okay, I think you may have made
your point --

MR. BOTELE: Okay.

MS. SHEPHERD: That, that any solution has to be a
solution --
MR. BOTELER: I just wanted the fan manufacturers
to understand that.

MS. SHEPHERD: Yeah, I think everyone has a point
that a solution has to cover all the problems.

MR. WHITWELL: Well I think, if I think about the
motor correlation, I mean we have to rearm. I'm not sure
that we can go buy a motor from somewhere else and use it in
our equipment if it's not, if it doesn't meet the DOE
regulatory requirements, because I believe any motor that
comes into the, into the U.S. has to be, has to meet that
requirement, right.

MS. ARMSTRONG: Oh, I'll, I'll give you --

MR. WHITWELL: And that, that's his point.

MS. ARMSTRONG: So I'll give you an example,
right. Do you remember a couple of years ago when I was
like this, like crawling around the room --

MR. BOTELER: Yeah, baby number two.

MS. ARMSTRONG: -- because I was about to have a
baby and we were talking about what, you know, we got to the
point where it was, well what kind of motors are you guys
using in your HVAC equipment. And there was this big
discussion. And all of a sudden some people are just
slapping this thing on them, calling them air over motors,
because they happen to blow air. And those all of a sudden
don't have to meet DOE standards. And they don't have a
nameplate, because they're not subject to standards right now.

So you have a situation where, what I think Bob's trying to explain to you is that people, no one in this room, but there are people out there in places that go to extreme lengths to find the little avenues to get their products in here. And while we do have an enforcement team, we do have a very good enforcement team that is, is very active and, and engaging them, you know, there are legit problems. And what he's trying to tell you is, be careful of the loopholes and unintended consequences.

MR. WHITWELL: Yes, yes, okay.

UNIDENTIFIED FEMALE: Yeah.

MR. BOTELER: Last week, last week, last week it was 50 hertz motors. The deal with regulations, the dealer had 60 hertz last, last week.

MS. ARMSTRONG: Last week, that just came in my email today.

MR. WHITWELL: We had, we had 50, 60 hertz.

MR. BOTELER: No. Well, 50, 60 is covered. Okay, we know that. We were smart enough to figure that one out. But we said, well we won't cover 50 hertz, so we have a manufacturer from India importing equipment and all the motors are 50 hertz, labeled 50 hertz and they have no anomaly efficiency, don't meet anything. And they said,
well we didn't have to comply because it's a 50 hertz motor.
Of course, we're going to run it on 60 hertz.

MS. ARMSTRONG: So this goes along with the self declarations also idea. Right, these all go hand in hand.
So, all, all we're trying to say is, think through your ask.
The Committee is willing to listen, but think through your ask, what it exactly it is you're asking. What are all the different aspects that are potentially unintended consequences that they have had to deal with for a really long time and are banging down my door to fix all the time.

MR. BOTELE: Yeah, yeah, further to that, you know, our first regulation was we, our, our methodology was, have the narrowest equipment class you could possibly have, you know. We, we sell between 40 and 50 million connected horsepower a year. Let's try and narrow it down and regulate the least amount. Well, that opened up the door that we've regulated general purpose product, but we didn't regulate definite special purpose product. So, wow, here's a door where I can call it something else and avoid the regulation coming up a year from yesterday. And in June of 2016 essentially covers all those. We, we learned our lesson as we say now, almost, almost.

MR. DELANEY: They're others still out there.

MR. BOTELE: Yeah, yeah. They're others still out there.
MR. LEONARD: Dan Leonard, working on that.

MR. BOTELER: Wade, Wade, we're working on this commerce presentation.

MS. ARMSTRONG: Anyway so, and, and with that, I think what we're just saying, as you go eat lunch, do we have a variety of options down in L'Enfant Plaza, think about all the different aspects of your ask. And then we come back in an hour, perhaps you can then articulate what your ask really might be.

MR. FLY: I, I think there's one subtle thing that we ought to point out though. A motor hut does not believe your regulated point of operation. And in the fans, what we're proposing is regulating point of operation. So if somebody buys a 145 motor and runs it at 10 horsepower, that doesn't necessarily change whether that's a covered motor or not a covered motor. So I think that's one, one thing that we need to consider as we look at these metrics is that they can build a fan that can be rated, that would be a legal fan at one point, and I can apply it a different way, and it's all of sudden not legal. And for those of us that are in the equipment business of applying fans, that is a little frightening.

MR. WHITWELL: Yeah, and I, I worry about it. That's, that's right. I worry about the regulatory burden here, because we're already certifying to DOE our cooling
performance. We're certifying our heating performance separately. Now we're looking at we're being faced with certifying the performance of all the fans that we have, which could be five fans in one piece of equipment, different fans. And we're going to --

MR. FLY: With five different motors --

MR. WHITWELL: With different motors. We're going to have to certify all that to the, to the DOE. I mean, I'm, I'm just, I don't know that we can manage all that.

MR. FERNSTROM: Okay, let's go for lunch.

OFF THE RECORD.

ON THE RECORD.

MS. ARMSTRONG: We're going to go on the record now. You ready, all right. So welcome back. I guess I will give it, the floor over to Bob, since he's the other person standing across the room from me, kind of like --

MR. WHITWELL: Yeah. You're looking at me like you want me to say something, so I will.

MS. ARMSTRONG: So I, I think this is, you know, continuing discussion of where we were with regards to the, ask of what you want the Committee to consider, and having that. And then we'll move on to the, the rest of the presentations for the, this afternoon usually, but let's, let's hear from you guys.

MR. WHITWELL: Okay, so yes, Bob Whitwell,
Carrier. So AHRI members spoke over lunch and we're not ready at this point for a specific ask. But what we, first off, let me say, we do want to work the process and we want to get to some kind of consensus, okay. So Ashley, do you want to get to a consensus.

MS. ARMSTRONG: Actually, I want to get there too, Bob.

MR. WHITWELL: We, we would like to come back and we want, we're hoping that we can get agreement on a concept. Okay, and the concept is that if the fan energy is included in, in an energy metric on a product that's already regulated by DOE, that that fan can be exempted. Okay, so what we, what we need to do. We, we want to have some more time and what we'll do is we'll go through that list of products that you saw up there and we'll identify where those products, what our ask is as far as what would be exempted. For example, I spoke earlier about the negotiations that's, that's going on. And parallel to this on the, uh, commercial unitary small, large and very large equipment for those that, you know, that covers equipment from six tons, up to 63 tons, or actually up to 760,000 BTU problems, so a lot of roof tops and split air cooler equipment. And on those products, the condenser fan, we are moving from an energy metric EER, which is a full load metric to a part load metric IEER. The part load metric
takes into consideration the energy at different load points, 175 to 50 and 25. And as the fan stages the compressors and the fan stage down for those part load points, you get the credit for less energy used at the, at the part load conditions. And those equipment, on that equipment the condenser fan is on when the compressor is on. It's off when the compressor is off. It's 100 percent covered in the energy metric.

The fan energy, the, the supplier of fan energy is in the metric today when the unit isn't cooling, which is about half of the time. Then it spends some time in heating, and then it spends some time in, in, uh, ventilation. The ask, as I mentioned before, yesterday during the discussion of levels that we're at in that, in that, uh, rulemaking is for us to look at tweaking the IEER metric, so that it would include the energy, the fan energy during ventilation. And we agreed that we would take a look at that.

The, the discussion in that rulemaking was that, that test procedure would be worked over the next, I don't know, maybe it takes a year or two years, and would be adopted for the next round of rulemaking, which is going to be sometime in the future. Not, not the levels that we're talking about right now, but it'll be some time in the future. But we, we, the ask is, has been for us to commit
to changing the AHRI procedure. And I think that's going to happen, but as I said, was just yesterday and we've got to consult with the rest of the, uh, AHRI members before we can 100 percent commit to doing that.

So for that equipment, I think it would be reasonable then to say that we would exempt the condenser fan and the supplier fan, understanding that the exhaust fan or the return air fan or other fans that are in the equipment that aren't part of the test procedure, would be, would not necessarily be exempted, like this. There would be have to be a separate case made if those are going to be exempted. So what we'll do is, over the next, before the next meeting or about the, or say by the next meeting, you will come back with that list of products that are covered by DOE and say specifically what we're asking to be exempted. Yes?

MR. SMITH: I have two questions. The first is --

MR. FERNSTROM: State your name.

MR. SMITH: I'm sorry, this is Wade Smith. Do you have a proposal for some physical description of a condenser fan that would be exempt, rather than, uh, an exemption that ties to the application, the use in a particular piece of equipment? Or is it some physical description that you can use to ask for an exemption of all panel fans that are of this, that meet this description, whatever it might be?
MR. WHITWELL: We, we can come up, I'm sure we can
come up with that. I mean, I --

MR. SMITH: I think that's, I think that's
important.

MR. WHITWELL: Yeah, I, I would say that, I can't
say there are all panel fans, but I, you know, they, they
definitely, the majority would be panel fans, zero static.

MR. SMITH: And then, and then, uh, I, I would
just say that, uh, in our deliberations, uh, when we, uh,
settle on a pro forma consensus, right, uh, one horsepower
and I'll cover one horsepower or another.

MR. WHITWELL: So is that, I mean that's one of
the things that I am little frustrated with is, what is the
scope? So --

MR. SMITH: Let me finish. If the scope were one
horsepower, and I guess the question is, would, would the
condenser fans in these units represent 760,000 BTUs be
exempt or not? And if not, if we tweak that horsepower
unit, would that solve the problem?

MR. WHITWELL: It might take care of the condenser
fans. Uh, most of them would be under one horsepower.

MR. SMITH: So, so that's all. Maybe in the
future we'll all do it, you know. So that, that's, that's
the seat of the cockpit. I think you need to come back and
make a suggestion in terms of how those are, if they want to
be exempt then they have to be defined tied into the problem.

On the supply fans, can you share with us, is there full consideration for the cooling mode in the economizer operation?

MR. WHITWELL: The, unfortunately --

UNIDENTIFIED FEMALE: No.

MR. WHITWELL: I mean we've been talking about economizer mode and these, this equipment is not part of the test procedure, so we are not getting credit for the energy that is saved during the economizer mode.

MR. SMITH: And consumed.

MR. WHITWELL: And consumed. But the, what I've talked about, as far as the ventilation energy, that's economizer mode or just pure ventilation so that would be our position, and --

MR. SMITH: So the operating hours --

MR. WINNINGHAM: The operating hours are in there. The consumption is there. The credit is not.

MR. WHITWELL: Yeah.

MR. SMITH: I got you there, yeah.

MR. WHITWELL: Yeah, so.

MR. SMITH: Okay, well I, I think that's important because, uh --

MS. ARMSTRONG: I don't know whether I agree or
not.

MR. SMITH: The fan operating hours when the compressor is running, the fan operating hours when the heater is running, uh, are clearly covered by the IEER.

MR. WINNINGHAM: Well, okay, so let me, let me correct this.

MS. ARMSTRONG: So there's a difference. You're talking about the analysis versus IEER.

MR. WHITWELL: No, no, no, no.

MS. ARMSTRONG: Well they're, they're different things.

MR. WHITWELL: So on a heat pump, the fan operation is included in cooling and heating. If it's electric heat or if it's gas heat, the fan energy in heating is not included in the metric. Therefore, I said earlier, that in heating it's, it's not zero, but it's, it's, it's a, maybe negligible because the inefficiency is going into heat, so even though it's only at COP1, it's going into the air stream, so it is not wasted, okay.

MR. SMITH: Right, so what I'm getting at, is if the compressor, if you're in cooling mode and the thermostat satisfies the compressor in the locked, it'll be on in five minutes, but it's off right now. Is that fan only in operation part of the --

MR. WHITWELL: That'd be part of the ventilation.
MR. SMITH: Okay, that'd be part of ventilation. So the operating hours that are here are tied into the fan, include that at the end of the operation.

MR. WHITWELL: That's right.

MR. ERNST: Potentially all operating modes.

MS. MAUER: Not today in the metric.

MR. SMITH: It's not in the whole load metric today.

UNIDENTIFIED FALE: Well that, that, that's in the ask, that's in the ask of it.

MR. WHITWELL: And it's not, it's not totally in the IEER metric today, but we have been asked to look at including that in there. So what that would mean is it's the change in the test procedure. It's going to be a different metric, right. It's, we can't call it IEER, because --

MR. SMITH: And not in this rule?

MR. WHITWELL: Not in this rule.

MR. SMITH: At some future date?

MR. WHITWELL: It would be for the next generation.

MR. SMITH: Like six years from now?

MR. WHITWELL: Yeah.

MR. CATANIA: I have a question.

MS. ARMSTRONG: Who is that.
MR. CATANIA: Yeah --

MR. WHITWELL: Yeah, well, who knows when it is, right. I mean it could be sooner than, I mean, I mean. I mean the other issue we have that we're struggling with, is we got a, a refrigerant change coming on down the road. We don't know when, right. It depends on when the, the safety standards and the building codes are modified to allow the low GWP slightly flammable refrigerant.

MR. CATANIA: Very slight.

MR. CATANIA: Tom Catania. You know, one thing I think we all need to collectively think about as you're going through these decisions about both the timing of the rule and the aggressiveness of it and so forth, is that it's so tempting to focus on the stick element of regulation and ignore the potential current opportunities. And if some combination of changing of the test procedures, uh, updating them as well as new standards are done well, you know, Gary's clients and their sisters around the country are already spending billions of dollars incenting more rapid adoption of these more energy efficient products. And, you know, if regulation want to indeed survive, and even the dozens, the projections that I've seen from people who want to know these things, does, those numbers that are already large today double in the next two years. The extent to which some of these advocates here, people like Gary's
clients, see real world real energy savings as a result of
the work that's done here, the potential for carrot and
incentives for these products getting into the market more
quickly is going to be profound.

I mean, and I saw it happen in the appliance
industry and it was huge. So you guys are not unfamiliar
with these things, but this is, you know, this is a
different way to think about how we want to push forth the
pace of this and the substantive real world observable
efficiency benefits as we make these changes. So I just,
you know, that's been animating a lot of the fan industry's
communications around this.

MR. WHITWELL: So we understand the carrot, and
then we have, there are incentives for higher than basis
efficiency levels and, and most manufacturers, and many
manufacturers have multiple tiers. We have three tiers of
product. We have good, better, best.

The industry overall has been moving, I mean
ASHRAE, we, we're involved in the ASHRAE 90.1 process and
that is continuing to push for higher energy efficiency in
buildings, which includes HVAC equipment. If you look at,
and we just presented some of the statics to the group the
other day, one of the things that the industry has done on
its own, we initiated this IEER metric started in 2010.

Too, and, and for the IEER metric, in order to
move up in a higher IEER metric, as I mentioned before, one of the important things is to reduce the fan energy during part load, specifically in part load when you can cut back on the fan speed. You don't need to deliver as much for staging compressors, when staging the fan energy.

And if you look at the data that, uh, and I, I, I'll, I may have this wrong, but it's the right, in the right range, is in 2011, which is one year after we, after the ASHRAE, the IEER metric was adopted by ASHRAE 90.1, something like six percent of our equipment from over 65,000 BTUs per hour to 760,000 BTUs per hour had fans that were not just a single speed. So those would run constant, full speed year around, right. So it was six percent at, at variable or staged fans, or variable they're buying.

2014, that number was up to 20 percent, so a significant move that industry has moved to different technology, reducing fan energy, saving a lot of energy for, for consumers, so we understand the carrot part. Uh, and as an industry, we are working there, continuing to work outside of the regulatory, that the federal regulatory arena to improve the efficiency of our equipment, and provide for, for our customers, so. Yes?

MR. SMITH: Right, so, at this point I just want to interject a little pitch for the metric that was developed in the MCO which the science of maximum horsepower
to any and every operating point, which on the surface seems like an undue burden. But it has a few very important and attractive attributes, especially during manufacture that bear pointing out here.

The first is that, the great frustration of fan manufacturers who care about efficiency is that they can make a fan that has a 90 percent efficient potential and see it applied in the field of 30 or 35 percent. And that, you know, this isn't like going from 90 to 72. This is, it's been going from 90 to 30. And the, the step back from 30, viewed from 30,000 feet, is that the actual fan efficiency varies dramatically, depending upon how the fan is applied and how it's liked. And so, so dramatic is this very ability, that it has the unwelcomed consequence of being able to overwhelm other things they might do to improve fan efficiency.

Sell a little larger fan. Sell a more efficient fan. Did it cost a little more? Our, our expectation is the market will respond by compensating and, and selecting a less efficient, less expensive fan. So the savings that we could produce by taking that approach, by tying the performance to valuation or regulation to particular test bumps, the savings was very uncertain and the fear was that it would be nonexistent. So that if we went into the utility rebate business, so to speak and promise the utility
a gain, I'm not sure that we would deliver.

So we went instead to something which is much more
deterministic, uh, and is, on the surface, much more fair.
It says, you know, at every operating condition you're
efficiency is defined by this formula and the maximum points
card you'll find that this formula and that creates for you
are compliant in the local operation. And if that envelope
of operation is adhered to in the field, then the savings
from this rulemaking get a nice step up. And the use of
that metric becomes really, really powerful when you sell
your rebate programs, because the only utility rebates in
anticipation of a boosted efficiency it's going to happen,
okay.

So the doubt and the statistical evaluation of
what are the savings 100, you know, I'm going to lose some,
I'm going to win some, no. In this case, you're going to
win exactly what you expect. So those are all the benefits
from an efficiency standpoint, savings standpoint. For the
manufacturers to produce that savings, in many cases they
need to make zero investment, because they already make the
products that are more efficient. And because they already
made the products that are more efficient, it's not
necessary to develop new, more efficient products.

The problem that this metric and this approach
resolves is it resolves the problem that people aren't
buying the more efficient products. It's not that they're not available or that, we have to sit down with pencil and paper and develop them. It is that people aren't buying them. And so, by using an approach that encourages people to buy the already better more efficient products that are on the market, it reduces the financial and, and human resource burden on fan manufacturers to produce the savings that are implicit in the rule.

And if we had to produce that same amount of savings, by instead taking products off the market, absolutely, positively this fan is coming off the market. And it'll have to be replaced by one that is reasonable. Then to produce the same savings that impact our, our member companies would be far, far greater. And so, there is a real benefit to the manufacturers in this, in, in this approach.

There is also a challenge in that it's a bit more difficult to evaluate, right. And so, you know, those, those of you who, uh, sell products with embedded fans, just, just need to go through the evaluation. But if you do that and you compare the savings and the investments that you have to make in order to comply with a reasonable efficiency level as proposed, and then back up and say, no, I'm going to use a different metric and a different approach that'll actually cause the least efficient products to come
off the market, by God. And that's the only way to generate savings. And then that begs the question, how much savings did I generate and how much did I have to invest to get it. You're going to find that this approach is really attractive. It's attractive if your motive is to save energy. It's attractive if your motive is to sell more efficient products that you've already manufactured.

And honestly, the jury's still out. You all haven't decided exactly what you want, or where you want to go with this. But this is my pitch with the approach that we took, and I should say also that this isn't where we started. You know we started with the single point or a multi-point metric, that was defined test scores. And we took that way down path. We had a consensus. We had a handshake. We even had bargaining authority approved by the AMCA Board of Directors to go into these discussions.

And when we created the database and tested that approach and compared it to the approach that we are now advocating, we very quickly shifted, in part because, especially in some products, the de-linkage between the savings that we could calculate and the metric itself was so great that it was, it was a real credibility problem, even for our own. So the membership just took a long pause and deep breath and went a completely different direction.

And the more, the more our membership became
familiar with it, uh, and there were some adjustments.

There were adjustments to the pressure, to the pressure
constant to accommodate the exhaust fans we talked about
this morning on which, you know, our members make an awful
lot of exhaust fans that aren't necessarily inside package
units. They're sitting on the roof. But there's an awful
lot of low pressure fans and we had to make an
accommodation, because they are entirely inefficient as you
pointed out. And you can't drive it to the peak, because
you come up with a huge, huge diameter, which is totally
impractical. So we made the accommodation and --

MR. WHITWELL: Okay, so, so that was a very, very
nice advertisement as you put it --

MR. SMITH: That's what, that would --

MR. WHITWELL: But, I mean, you talked about a lot
of things that we haven't gotten to yet. You talked about
levels. You talked about certification. You talked about
enforcement and, and we've got a long ways to go, I think,
in this discussion before we really understand what the,
what that full picture is going to look like. But we're
willing to take that road and see how it goes. But we're
not there yet.

MR. SMITH: Yeah, and I wouldn't expect you to.

MR. STARR: This is Louis of NEEA. I'm just
mentioning I was talking to one of the fan manufacturers at
lunch that also gets air handling equipment.

MR. WHITWELL: But by the way, based on my understanding, we are all fan manufacturers.

MR. STARR: Oh, yeah, yeah. Oh I mean, more thought as a traditional, just, uh, a fan manufacturer, but they, they make some of the air conditioning products too. They did this on their product line, because obviously here in the market, they were concerned about what they found is that they didn't have a problem with their, uh, air handling products, which you might find that there's a problem with the, it may be, it may be something you want to do, rather than, I mean I understand the double regulations and why, I mean, I would keep that up and explain why they don't like that. Oh, I understand that very much, but it may be a good option.

MR. WHITWELL: Yeah.

MR. STARR: I think that's what, so it's just getting that.

MR. WHITWELL: I don't expect that we're going to have a lot. I mean I don't know. I, I don't know, but I expect as you would suggest, that most of our fans are going to be okay. I mean there, there was an example we saw last time of this, this bare forward-curved centrifugal in this box and how that was a bad fan selection and there was, you know, there were ways to, by changing the fan selection,
that could be greatly improved.

I don't think on the HVAC, you know, if you look at the age of our members, I don't think that's representative of what we have. So I don't think that we are going to have fans. I assume, based on what I'm hearing from the AMCA people here, that we're not going to have fans that are going to be regulated out of the market at least for now.

MR. SMITH: Straight talking, right?

MR. WHITWELL: No, what?

MR. SMITH: Great.

MR. WHITWELL: I don't know what's going to happen down the road, but still there is a lot of burden that's going to be put on the, on the equipment, the fan manufacturers who are equipment manufacturers, to test, to, that test things that we don't normally test, because it doesn't add any value to our customers as far as what they, information they need to apply to the equipment. And then certify to DOE on an annual basis, right. So, yeah.

MR. BOTELER: It's unknown.

MR. WHITWELL: Yeah, it's, there's just a lot of uncertainty about that. And, and if it was something, and, and if, I mean, if I compare it to the motor.

MR. SMITH: Let's compare it to the motor.

MR. BOTELER: Yeah.
MR. WHITWELL: So the motor rule, unfortunately, the burden for you guys, because the burden is really on you guys, right?

MR. BOTELER: That's right.

MR. WHITWELL: We buy the motor and it is, it's --

MS. ARMSTRONG: Not exactly.

MR. BOTELER: The magic is in the motor.

MR. SMITH: Well then that's, and that's, and that's an option for you.

MR. WHITWELL: And, and that, if we can figure out a way to do that, I think that's something that we would be very interested in.

MR. BOTELER: Wade, this is Rob Boteler again. Electric Motors, again, I'm sorry. We were talking a little bit, well I was talking about this young lady, I forgot your name, but you haven't gotten to the point to defining basic models and what your test --

MS. ARMSTRONG: You didn't bring that up last time, did you?

MR. BOTELER: I did. Do you want me to (indiscernible).

MR. WHITWELL: Well actually that was discussed.

MR. BOTELER: Oh, sorry.

MR. WHITWELL: That was discussed some at the last --
MS. ARMSTRONG: You love it. Other industries that are subject to (indiscernible) have not embraced it with the same love that you do.

MR. BOTELER: Let me tell you why we love the basic models.

MS. ARMSTRONG: We're getting there.

MR. BOTELER: We love basic models because we as motor manufacturers make thousands of models, but we actually identify the minimum product on, on each, on each frame size and, and, and, uh, speed and enclosure. And that's what we report to DOE, okay. So we report 113 basic models, okay. And then from that, we make electrical changes and as long as those electrical changes improve efficiency, we do it. We put efficiency on the nameplate, but we don't have to report it back to DOE, because we've already given them the, the minimum. We make mechanical changes. We do that.

We have different equipment classes, which I don't think you guys have discussed yet. We have things like fire pump motors that we hold separate from some of the other parts, and we treat it a little bit differently. And I think there's options like that, that as you get into the ASHRAE, you can, you can maybe address some of these issues by putting them in a different equipment class and classifying, and we don't call them basic models, whatever
we want to call them.

MR. WHITWELL: Yeah. No, I mean --

MR. BOTELER: And treating them differently.

MR. WHITWELL: As, as equipment manager, we like basic models too, because I mean actually how many different models do we have? Do you remember?

MR. BOTELER: Many.

MS. ARMSTRONG: Oh, carrier alone?

MR. WHITWELL: Yeah.

MS. ARMSTRONG: If my memory serves correctly, one trillion.

MR. WHITWELL: Six, six trillion, six trillion.

MS. ARMSTRONG: Thirty trillion?

MR. WHITWELL: So we have six trillion possible models, right, but you look at all the options that we have. So we love basic models, because we can certify a small fraction of that to DOE. So we, we like it.

MS. ARMSTRONG: One more time.

MR. WHITWELL: For the record?

MR. BOTELER: I want to, at this time I --

MR. WHITWELL: So, so, but, uh, sorry. No go ahead. I lost my train of thought.

MR. BOTELER: Well I was just going to comment on Tom's, Tom's comments about, you know, some of the incentives out there. The utilities right now have $9
billion in their war chest that fund high performance products. We have an initiative through ACEEE, fan manufacturers, pump manufacturers and compressor manufacturers are all working on identifying the product and how to label that product, so that the utilities can use that in those incentive programs.

Pump manufacturers, as a matter of fact, are on the Hill today. They come to Washington en masse to go to the Hill and talk about these issues with, with their, with their Congressman. Paul and I are going to be on the Hill on Friday. We have legislation (indiscernible) that incentivizes extended product, and a fan and, uh, motor and control is categorized as an extended product, so we have that.

The last thing we're working on is 111(D) which is the regulation that will allow the states to take credit for energy efficiency savings through the use of industrial and commercial, uh, incentives and products, in which this kind of an extended product would fit into.

MR. FERNSTROM: So this is Gary. I, I'd like to make a comment following up on Rob's and Tom's and Wade's. And that is, if the efficiency savings attribute isn't in the metric, we can't take credit for it. We can't get incentives for it. And I think, uh, Wade and AMCA have come up with a very clever approach to a metric that recognizes
the system-related savings through the appliance regulations that we have not previously been able to recognize. And from an incentive's point of view, we will all be so much better off if that metric moves forward.

MS. MAUER: Bob, this is Joanna. If I can just ask a clarifying question about what you said. If I understand, commercial unitary manufacturers may in some cases be buying a fan that would be considered to already be in a testable configuration. In other cases, it may not be, uh, in a testable configuration until it's actually integrated into the equipment. Are you asking for an exemption in both cases?

MR. WHITWELL: Uh, okay, so that's a question I haven't really thought about, but I would say yes.

MS. MAUER: Okay.

MS. PETRILLO-GROH: If it's covered in the --

MR. WHITWELL: If it's covered in the metric.

MR. SMILEY: Well, it's Bill's Smiley of Trane.

MS. ARMSTRONG: Well, so --

MR. SMILEY: If, if the fan energy consumption is covered in the entire unit in a, in a heat consumption, it's already counted. It doesn't matter --

MS. ARMSTRONG: Okay, well --

MR. SMILEY: -- where the fan came from or what it is.
MS. ARMSTRONG: Do you want to do it, or do you want me to do it. We're going to get to the point where, you know, we dive away to clearly distinguish it to, to get, and the reason why I've asked about specific design characteristics. I mean, I, I think I said this to a number of you individually, but the way DOE looks at this is, if I am on, standing on a dock, hopefully looking at a wonderful beach, but I happen to also see in my view, you know, a cargo ship load of fans, how do I know whether they're going into your equipment or not.

MR. WHITWELL: So --

MS. ARMSTRONG: And how do I know if that energy used is accounted for by my test procedure. I mean, maybe I would know, but realistically, I'm not looking at them. And, and so I think this gets to my point from day one, which is how do you distinguish and I'm not sure that's something that, that's actually been answered yet.

MR. WHITWELL: So, so let me, I, I may be totally confused about this whole thing, but and, and, maybe this is not the way it's going to turn out, but the last meeting when I was here, I was told the fan that you see in the dock is not a fan. It's not a fan until it's connected, it's on a shaft with bearings, motor and in a, in a housing, right. So that fan it may or may not comply, but you don't know, there's no way of knowing until somebody takes that and they
connect it to a motor and put it in a housing and, and, and
test it.

So that fan may be good when it's put in one
application and may not be in another, but unless I totally
am off base with what was being said the other day, I don't
think you, that's not a regulated component.

MS. ARMSTRONG: Oh, I think it depends and this
gets to our testable.

MR. WHITWELL: So, so please, help me understand,
because if I misunderstand this --

MR. SMITH: The fan that she's, the fan that she
sees in the dock is a testable fan.

MR. WHITWELL: So what is that fan then?

MR. SMITH: It's a fan.

MR. WHITWELL: Okay, well --

MR. FLY: Does it need a motor to be a fan?

MR. SMITH: It's not a wheel. No, it doesn't have
to have motor. It has to have a structure. It has to have
a wheel. It has to have bearings. It has to have, it's a
fan. Not a fan wheel.

MR. FLY: But if she sees --

MR. SMITH: It is not a fan component. It's a
fan.

MR. FLY: But if she sees an impeller, this is
Mark Fly with AAON. If she sees an impeller on the dock,
that is not a fan?

    UNIDENTIFIED PERSON: No, it's not a fan.

    MR. WHITWELL: So it's not a fan that she sees on
    the dock.

    UNIDENTIFIED PERSON: Still no fan.

    MR. SMITH: Never was a fan. It was an impeller.

    MR. FLY: So it's not a fan until I put a motor,
    until I put it on the shaft.

    MR. WHITWELL: So Wade --

    MS. ARMSTRONG: So this where, this is where that
    has the whole configuration. See, we're getting to why we
    did this. Right?

    MR. WHITWELL: But, but if it's a testable
    configuration, sorry --

    MS. ARMSTRONG: This is why that, on the dock.

    MR. WHITWELL: If it's a testable configuration on
    the dock, then it needs to comply, right.

    MS. ARMSTRONG: Regardless of whether, whether,
    what happens downstream.

    MR. WHITWELL: Right.

    MR. FLY: Right.

    MS. ARMSTRONG: You agree with that?

    MR. FLY: I do.

    MS. ARMSTRONG: Because that's different than what
    you just asked the part for.
MR. FLY: Uh-huh.

MR. WHITWELL: Okay, so I. Yeah, okay, so maybe that was a leading question. Okay, so, so I would, let me rephrase my answer.

MS. ARMSTRONG: See how this works?

MR. WHITWELL: I would still ask for the exempt, even if we buy a fan and it would meet the requirement. I would say, I don't have to certify that to DOE because if, if it's, if it's exempted in that application. Okay, that's what I would say.

MS. MAUER: So that maybe the person they're --

MS. ARMSTRONG: Because --

MS. MAUER: -- that's a different buying issue from has already been manufactured.

MR. WHITWELL: Yeah, right, right, right. And I could use that and I don't have to recertify it, right..

MR. ERNST: Well let me, let me suggest something. There's, there's two analogies I think. One is, in unitary. This is Skip Ernst. There have been unitary equipment, some unitary equipment's exempt from 13 SEER for certain reasons and they've gotten exemptions from the DOE. Well if a fan is going to be exempt, it needs to go through the same process and it might be that it's because it's being used in an already regulated product.

MS. ARMSTRONG: Can I talk to you about that list
of equipment you think is exempted from 13 SEER?

MR. ERNST: I don't make it, but you can try it on the Website. You see, it's exempt.

MS. MAUER: This is Joanna. I mean I think the difference is, I don't know what you're referring to, but whatever it is, you can look at it and say this is exempt. I think in the case of these fans, Ashley is saying, she'd look at it and it would --

MS. ARMSTRONG: It may have been.

MS. MAUER: It may be exempt, maybe it wouldn't.

MR. WHITWELL: Yeah, yeah.

MS. MAUER: But depending on where it's going, I think that's what the problem is.

MR. WHITWELL: Yeah, so did you understand my clarification of what I was, I mean, if, if it's a testable configuration on this fan, we would, you know, it should already be certified, right. So we would put it in, but if it's exempt in that application, then I would say we don't need to recertify it, right. It's already certified.

UNIDENTIFIED MALE: Prove it.

MS. MAUER: That's helpful to understand.

MS. ARMSTRONG: Well, so --

MR. WHITWELL: Yeah, that's, that's what I was talking about.

MR. SMITH: Suppose it's a, goes into a product
which is not certified?

MR. WHITWELL: Well then it, then it gets certified when it goes into the product.

MR. SMITH: Why?

MR. JOHNSON: It does not need to?

MR. SMITH: No.

MR. WHITWELL: It's not exempt and it's not --

MR. SMITH: But it's already certified.

MR. WHITWELL: Well, if it's already --

MR. SMITH: When she, when she draws a circle around the fan --

MS. ARMSTRONG: This is what they understand.

MR. SMITH: Your fan is approved. It has the (indiscernible).

MR. WHITWELL: You know, wait, I mean, you're asking questions that I think I need to get answered, but I don't know the answers to those questions.

MS. ARMSTRONG: Well, one of the --

MR. WHITWELL: It's already figured in this --

MR. SMITH: So this is Wade. I just want you to understand that there is more than one answer. And one answer that I think would work is an answer that says, I make a box. I buy a fan. The people I buy the fan from certified it to DOE. I receive the fan. I make no certification to DOE. That's an option.
MS. ARMSTRONG: That is what you're, okay --

MR. WHITWELL: Yeah, but I don't want to buy, I
don't want to buy a testable --

UNIDENTIFIED MALE: One person at a time.

MS. ARMSTRONG: Just to be clear, as we are asking
DOE to consider that it is not necessarily how our regs work
today.

MR. SMITH: I, I, I, I understand, I understand
that that's --

MR. WHITWELL: Can I ask a clarifying question?

So in that case, Wade, would that always be a testable
configuration?

MR. SMITH: Whoever makes --

MR. WHITWELL: Or, or could it be just a blade?

MR. SMITH: No, no.

MR. WHITWELL: Yes, so --

MR. SMITH: Whoever, whoever assembles the fan,
the first point at which it's in a testable configuration,
that entity would have the responsibility to certify it to
the DOE.

MR. WHITWELL: Yes, so that's a choice
manufacturers could make. They could make the choice to do
that.

MR. SMITH: They could either do it or not do it.

MR. WHITWELL: But, in a lot of cases that's not
going to be the most economical approach.

MR. SMITH: Well, okay.

MR. WHITWELL: So --

MR. SMITH: But, but that's an option.

MR. WHITWELL: And so, I, I mean it's, it's always an option. I mean, we can buy a complete unit from somebody and resell it. That's an option too, right, so.

MR. WINNINGHAM: What I think the point is, this is Dave with Allied, that many of these are going into parts that are already regulated. And we all had a discussion about, you know, incentives. There are already incentives out there for the products that we make. There are ones for SER, EER, you know, IEER. And, and to make a case that just because I have good fan efficiency, means I'm going to save all this energy when you have multi-variables. We have a refrigeration system in your moving air, you can push that power from one place to another. Just because I have good fan efficiency doesn't mean I have a good system efficiency.

MS. ARMSTRONG: I think we acknowledge that on day one to a certain extent, although they don't necessarily go one in one. There are other aspects that affect the system efficiency. Having a more efficient fan whether that be a different category of fan doesn't necessarily hurt though, either. I think what we're asking of you is, you're asking the Committee to consider not analyzing or studying
standards for a subset of the market. So we're really asking, what would that look like?

MR. WINNINGHAM: That's why we're --

MS. ARMSTRONG: And, and, and so in terms of definitions, how would you tell? How would you distinguish it? What is the scope we're talking about in terms of receiving numbers, shipment numbers? I mean, back it up with data and what that regulation would look like and present it to us to understand. I mean, is it everything? Is it a subset of everything? Is it, those that are just embedded when they come in or if they're manufactured domestically? If you're otherwise bringing in, fan, testable fan configurations and then inviting them on equipment, that's a different issue. You know, all these things have to, are details that impact the magnitude of your ask.

MR. WINNINGHAM: Okay. Okay.

MS. ARMSTRONG: Where are, where are we? Are we going to talk about motors?

MR. BURDICK: Well, we're going to have a CTI presentation.

MS. ARMSTRONG: Sure, you can go next.

UNIDENTIFIED PERSON: The CTI?

MR. BURDICK: And so, this paper, first of all, I just appreciate the opportunity to be able to make comments
and certainly CTI Group is interested in participating in, you know, in this discussion, interested in finding, you know an equitable solution and that type of thing. But here in this presentation, want to identify many of the issues that we have for our industry, to be able to adopt it. And, you know, recognizing too that there are probably, there are definitely better ways to identify energy savings, rather than just with a pure efficiency number, or a fan efficiency application point efficiency type situation. And so, there's a calling to --

UNIDENTIFIED PERSON: That should be up there.

MR. BURDICK: Yeah, I think I see it. And so, I have a colleague here on the line too, Paul Lin. And I don't know if you'll be able to open the mic for him for that type of thing in case he wants to interject something here that I miss or don't state properly.

So this graph was presented in the CTI Position Paper that's posted on the DOE Website. It's been there maybe since the first of January or so. And what it's showing is the amount of energy that is attributed to cooling tower fans shows kind of lower left there, one percent is what we're seeing, well, you know, based on this published data for energy consumption on building HVAC use.

And something that I'd like to clarify too right off the front, I don't have as many nice pictures as some of
these other folks do. I can add those on later and you can
look at the SBXCooling.com, Baltimore Aircoil Website, the
Gapco Website, you know, and start to see, you know, some of
the configurations, you know, that are possible with these.
There's really quite a wide variety that's possible there.
But anyway, so this part or the part that's significant
about this is that, this is not, we're not dealing with air
that is circulating through the building. We're dealing
with air that is solely, its sole purpose is drawing from
the ambient and rejecting heat to the ambient.

It doesn't circulate through the building. Type
of a situation. So, I wanted to make sure I clarified that.

So again, one percent figure is, uh, what we think
is substantial about that. Then here, talks some more about
some of the takeaways from the previous slide. Outdoor heat
rejection equipment, six to seven percent of the total, fan
energy. Outdoor heat rejection equipment includes eco-
condensers, evaporative condensers, open and closed cooling
towers. It's very important here that a very small unit
efficiency or unit improvement can be obtained with
increments in fan efficiency.

The input power affects very small product energy
than talking about this last few meetings here, uh, product
ergy efficiency is much more affected by the heat
exchanger size of the design. And the pressure drop through
the unit. Yes?

MR. PERSFUL: Trinity Persful here. When you say efficiency, are you talking about a, like BTU efficiency or --

MR. BURDICK: Exactly. I think the next slide gets into that where it's, uh, uh, in actually 90.1, for example, uh, opening, open, uh, cooling towers have a figure for, uh, gallons of water cool per horsepower applied. Uh, and so, the GPM figure there is gallons of water cooled, GPM, uh, cooled.

MR. PERSFUL: Okay.

MR. BURDICK: Uh, and so basically, it turns into a situation of, uh, kilowatts of heat rejected, BTUs of heat rejected, relative to the kilowatts' consent. And, uh, like I said there before, uh, the fan efficiency is, uh, uh, far from, uh, one of the leaders in being able to improve overall system efficiency. We're actually having energy, uh, savings, uh, possible.

And so, this talks about, uh, heat rejection equipment, the metric, uh, BTUs per hour, the horsepower, uh, minimum efficiencies are mandated in, uh, 90.1 and IECC, uh, you know, uh, maybe, uh, some folks think that's not, uh, uh, necessarily enforced everywhere, but it is something that's, uh, completely adopted by our industry. Uh, we, uh, publicize it, uh, in everyone's, uh, selection software.
It's, uh, identified, uh, as a parameter of interest. And, uh, folks can make a, make a buy decision, you know, uh, based on that. Uh, I've also mentioned at other times too, where you can maybe achieve 20, 30 percent energy savings, uh, by sizing, by proper sizing that the heat exchanger, uh, for, uh, you know, a four or five percent, uh, incremental, uh, product cost. Got a question from Louis?

MR. STARR: So, on the, uh, I'm not that familiar with that. These particular things you're talking about here.

MR. BURDICK: Okay.

MR. STARR: Does, so the first one, the, the metric that measure the heat injection supplies that energy input, so if you had for let's say a really efficient motor, that's going to show up there.

MR. BURDICK: No, well it, it'll be in the system. Yeah, this, this, uh, this metric is about the whole system.

MR. STARR: Does it drive people, for instance, to use an ECM motor or a, uh, cooling tower? Does it drive people to use a VFD?

MR. BURDICK: Uh.

MR. STARR: Some measure of, of regulating your motor based upon outside air conditioners rearranged in there.

MR. BURDICK: In probably more like the last 10
years, that I've been involved with the industry, just about
every type of one of these units that I've seen is been, uh,
connected to a VFD, because they recognized, uh, they don't
need the capability of the cooling tower full speed year
around. And they can always capitalize on VFD by, uh,
saving energy.

MR. STARR: So one thing for you to consider, if
they can find a fan, that's being all of those things, a, a,
uh, propeller, the motor, the drive --

MR. BURDICK: Yeah.

MR. STARR: We had a metric around that, if, what
you would sell more of. Your BFD and better motors, so I
mean, in other words --

MR. BURDICK: Still you can, you know, even on
motors, uh, you know, you can have a NEMA premium and, uh,
uh, you know, uh, the next better grade or next lower grade.
Uh, that's not going to mean dollars per year, you know,
that somebody's going to take advantage of this, because it
doesn't run at that main type horsepower, very, a very high
percentage of the year.

MR. STARR: But it --

MR. BURDICK: Pretty low service factor, a duty
factor on, on --

MR. STARR: VFD mighty woes.

MR. BURDICK: Yeah, some --
MR. STARR: Some guys were, what's the word, interested in it because of this, is what I would suggest, so.

MR. BURDICK: Okay.

MR. STARR: It's more, like it's more of your products. If you think about it, you have a customer who's interested in paying the absolute lowest dollar for everything he can. He won't make the best decisions about whether he should have bought that VFD, or whether he should buy the more efficient fan, and you know, so it's get a little tricky with regulation, but I would just encourage you to --

MR. BURDICK: Yeah.

MR. STARR: There could be an upside is what I'm what I'm getting at.

MR. BOTEKER: Your box is due.

MR. BURDICK: I, it --

MR. LIN: This is Paul Lin. Do you hear me?

MR. BURDICK: Yes, go ahead, thanks.

MR. LIN: I thank you. I would just add that, uh, in addition to influencing the cooling tower business toward compliance, uh, the, uh, by customers, uh, with the, uh, minimum efficiency per cooling towers, 90.1 also influences adoption of VAV on cooling tower systems. What Larry said, just a few minutes ago about the very high percentage of use
of VFD's, uh, for cooling towers on HVACs, uh, it, it's really because of, of 90.1 and IETT, and the strong trend, uh, if not complete trend by the, our tech engineers that do these buildings and leaving contractors to use 90.1 as a standard of care for system design.

MR. MCNEILL: This is Donald McNeill. You might think about that whole industrial market. It doesn't have to comply with 90.1. It's about how it might affect the sales.

MR. STARR: Right.

MR. LIN: On that side, the industrial market is different from HVAC, because the, the applications tend to have multiple fans and it's very difficult to justify VFD when you have 10 steps of fan control with, with multiple cells. You know, industrial cooling towers are much bigger than HVAC in general. And things are accomplished by using two-speed fans in step-wide control with multiple cells. So, uh, VFD is not cost effective.

MR. BURDICK: Now, and --

MR. FERNSTROM: And so, so this is Gary for the California IOUs. There's a lot of industrial refrigeration that falls into the agriculture and food processing markets, which isn't, is a large industrial scale that you mentioned. And in those markets Beta Culture, for example, there's a really good opportunity for VFDs, because we're back down
into the commercial refrigeration size equipment again. And they don't --

MR. LIN: I'd agree with that.

MR. HALL: Solomon Hall speaking. I have a question about the definition of horsepower in this case. If you cut out the horsepower, does it mean you all must use as a general purpose motor that is regulated and that you use 100 percent, or are you using a service factor and maybe auto motors or a special duty motors?

MR. BURDICK: In this case, horsepower, you know, could be translated into kilowatts power or that type of thing instead. Horsepower is just a term that's used here, but, uh, it's the, it's the, uh, connected horsepower of the motor, because it's nameplate.

MR. MORRISON: Frank Morrison, Baltimore Aircoil Company. By definition, it's the nameplate, motor nameplate in that equipment.

MR. HAUER: What was the horsepower output (indiscernible).

MR. MORRISON: Nameplate.

MR. BURDICK: Nameplate.

MR. SMILEY: The motor, motor, this Bill Smiley, the motor output at design point of motor, that's the nameplate.

MR. HAUER: But what prevents people from using
service factor? You can use, if it looked in NEMA, MG-1, in many motors you can use the 1.5. So you can declare

MR. BURDICK: Again, VFD, VFD usually takes care of that, but it's connected to a VFD. In fact, they're always programmed to not allow, uh, consumed kilowatts to go above the nameplates, you know. They're limited on an (indiscernible) volt to, uh, prohibit that. Uh, it is necessary sometimes, uh, actually we still install 115 service factor motors for situations when you're in very cold climates and you run it year round. But typically you're able to modulate that with additional number of cells or maybe sometimes you have, uh, half speed or so on.

MR. HAUER: So that's just, just a good practice, but it's not standardized. Does it meet that standard?

MR. STARR: I mean, this is Louis, and I was just thinking what would I mean, I'm sure you guys don't sell it out though, but keeps someone else from doing that. I mean best practices are good, but people could sell less horsepower and get the job as opposed to, you know, selling, you know, get with the program.

MR. BURDICK: Well, it, it, it, it's evaluated on every job. You know, on the industrial jobs even. It's often evaluated, you know. What does the client, you know, uh, uh, what does the EPC value most? Does he value most what was possible cost that he can turn over to the utility,
you know, three months from now. Or does he value, you
know, uh, what it's going to mean to the owner, uh, in the
long term.

MR. MORRISON: The first one.

MR. BURDICK: Yeah.

MR. HAUER: That leads me to the question. Is it
then always, uh, the general purpose motor that's regulated
by NEMA or, uh, other motors used in the cooling tower?

MR. BURDICK: It's, it's, uh, it's, it's a NEMA
compliant motor. It's always a NEMA compliant motor. Could
be premium, could be whichever, whatever grades are
available and that are legal.

MS. ARMSTRONG: Is it always DOE regulated?

They're not, right?

MR. BOTELE: They will be June 1st of next year.

MR. DELANEY: But they could be a, it could be,
could be advanced technologies too.

MR. BURDICK: Right, yeah.

MS. ARMSTRONG: We have, we have a combination of
motors that --

MR. DELANEY: Variable speed.

MS. ARMSTRONG: -- maybe will be regulated by DOE
in the next year. We'll, standards all accounted, or more
advanced technology motors, variable speed, (indiscernible),
et cetera, et cetera, are not regulated by DOE right now.
MR. BOTELER: Or above 500 horsepower.

MS. ARMSTRONG: Right, or about 500 horsepower, which are not regulated at all. Does that help?

MR. HAUER: So basically it proves that the metric is not really solid with regard to horsepower.

MR. BURDICK: All right, so moving on to the bottom part of the, the page here. Uh, example of product performance included in, uh, including the 90.1 operating point is covered and published by CTI certification, uh, through open and close cooling towers, evaporative condensers and, uh, programs in, in progress. Or actually, I guess the evaporative condenser programs in progress, open and closed cooling towers are already in place. And it's verifiable, uh, via public, uh, CTI Website as to which models, uh, are, uh, certified.

And then, uh, issues with fan efficiency focus. Uh, I think we've talked about this. A lot of the same comments that you've heard before with embedded fans is what's important is what the system does to, is what, uh, the entire, uh, system responds to, uh, with the fan application. And one of the issues with our industry is there's relatively low volume of sales. You know we're not making 100,000 fans a year or putting out huge numbers of products here.

The implications of certification for every fan,
that has a big number of fans that we make for ourselves.

You don't go to Grainger and buy these. They have to be resilient to the ambient effects when you have a 36 foot diameter fan. And it's on your product. You kind of have to take ownership of the structural reliability of that thing spinning around at 120 miles an hour on the tip, that it's not going to fall off, hurt somebody, kill people, cause other extraneous damage.

There are lots of implications about, you know, being able to withstand tornadoes passing by, storms passing by, other things that, you know are important for the people that are buying them and using them that they have to meet these criteria. So they are quite unique. Not something you can buy just anywhere. Wide variety of models and fan types on the market, there are other situations where there are low noise requirements. Those take a special type of air flow that have kind of a different efficiency profile than what a maximum efficiency capability type can be. You know, where it's wide forward swept blades. You end up with big tip clearances. You end up with, with other inefficiencies in the system in order to be able to run it really slow.

The talk about the application there a bit with the large tip clearance safety being able to withstand the sphere of duty that it's in. This might be a geothermal
power plant where the circulating water is highly corrosive, needs to be a high degree of stainless steel, high degree of, uh, corrosion resistant materials. fiberglass parts, uh, you know, since some of these, uh, big fan blades on a 32-foot, uh, fan that we make. It's got about a, uh, 14-foot long blade, that's a hollow fiberglass structure, specifically designed for, for this application so that, uh, water impingement drops, you know, don't bother it. It's able to withstand the sunlight, the U.V., the storms and so on.

So, you know, quite specialized equipment, very expensive to release new product into the market or change a characteristic about it.

MR. LIN: Larry --

MR. BURDICK: Yeah.

MR. LIN: There's a slide that was skipped.

MR. BURDICK: Sorry, this one?

MR. LIN: Yes.

MR. BURDICK: Oh, okay. Sorry about that.

Imposed changes to fan efficiency would, and redesigned with, uh, smaller heat exchangers to manage cost and, uh, higher actual energy usage. So there's a discussion about that, uh, probably in that table, uh, there toward the back. Uh, there is some too. Uh, the, the, uh, again, this leads to the system approach. It's not always best just to have
the biggest fan in and, uh, uh, sometimes, uh, uh, you need
to do, uh, you know, a complete system evaluation where, uh,
sometimes the smaller fan is better, but, you know, as
opposed to maybe some of the traditional thought that the
larger fan is always better and the larger fan is always
more efficient. Uh, it depends on how the air is entering
the, the, uh, fan opening and whether or not you're able to
fill out the blade tips, uh, or get, uh, optimum air flow,
uh, through the unit.

Uh, so heat rejection equipment amounts to only
five, five to 10 percent of the total, uh, energy in a
typical system, you know, relative to the chiller or the
pump in an HVAC system. The, uh, fan requirement or the fan
energy requirement for the, uh, cooling equipment, uh,
fraction, you know, low fraction of, uh, what that, uh,
power consumption can be. And then actual energy
consumption is well below, uh, design on annual basis.
Again, here, we're talking about it's not always a 80
(indiscernible) of outdoors where the atmospheric heat
exchanger equipment is designed to be able to take, is
capable of doing that. You know, you don't want to leave a,
a hospital, uh, in a bad situation, uh, on a hot day, uh,
because your cooling tower isn't big enough. It has to be
big enough from day one, so that it can always hit the peak
days, always meets the cooling demand for peak days. But,
uh, at other times, well they're able to capitalize on turning off other cells or going with a VFD arrangement. And, uh, so that's the, uh, bottom point there. It talks about the VFD.

Okay, then, Paul this is something that you put together for, uh, the, uh, uh, consideration of a, uh, a met or different scenarios with a highly efficient smaller diameter fan relative to base size, uh, and so on. I don't know if you want to talk about any of that. And then the other thing that I prefaced that with, is that, uh, this group wasn't involved with, you know, the original, uh, uh, AMCA, uh, brainstorm or, uh, the other, you know, the other committee work that was done on this. Uh, we tend to use total efficiency in our industry, uh, for an evaluation. I would like to keep in mind that the exit velocity out the fan is important to us, so that we don't recirculate the heat that we rejected from the heat exchanger. Uh, but, uh, I think, uh, others here, Wade's mentioned, uh, uh, concern about this, uh, uh, when you look at it from the static efficiency point or the static efficiency prospective.

Paul, anything else there?

MR. LIN: Uh, not from me. Frank Morrison might have some comments.

MR. MORRISON: Yeah, I just encourage folks to go look at the, example on the, that's posted on the DOE
Website. But basically, it shows where an unintended consequence of actually meeting the, uh, higher efficiency with the fan actually lowers the performance of the cooling tower. It requires more fan energy to do it, but we comply with that, you know. Comply with one requirement that actually hurts you in another. So it, it gets very complicated, because these cooling towers range from about as big as the podium that Larry's standing at all the way up to four or five times the size of this room, 36 --

MR. BURDICK: That could be the plain area of this building.

MR. MORRISON: Yeah, you know, and, and you have a 36-foot diameter fan, so it's a real challenge for an industry our size to handle it. So we're not as, as, uh, complicated as, as a carrier with six trillion when I think we only have a few billion possible combinations of, you know, accessories, low sound fans, unit size, and tubercle axial.

MR. BOTELE: You need a basic model.

MR. BURDICK: Yeah, yeah.

MR. MORRISON: But it is a challenge, especially for an industry of our size. So that's why, you know, this is, we want to make the sure the group is informed of, you know, the challenges that we, we face and, uh, take that into consideration.
MR. BURDICK: All right, Wade has his hand up.

MR. LIN: The other, the other point that's, that's significant here is that, the discussions that have, have taken place, uh, in the, uh, working group meeting here pretty much been around commercial and, and what we call light industrial type applications. Uh, the way the rule is actually written and the way this definition is set up, it would also apply to the fans that we use on, uh, power plant size cooling towers, which could be a thousand foot long and have 30 plus fan cell on each at over 200 horsepower. There aren't very many of those around the country, but the thing that's important to keep in mind, is that each and every one of those field direct cooling towers is custom designed. They're not standardized products. So there is no way to pretest what would be in the tower, uh, for, for field directive service. They're custom designed for like a big building. It gets designed for each individual application. Um, and the fan gets specifically applied to the customer-specified demo performance duty.

There's an optimization process that we go through to, to match up the right size heat exchanger and fan, uh, to give the customer the most economic combination of, and those customers do evaluate fan power for the most part. Um, so, um, with all that in mind, I think it's really important that we're very, very careful with how the scope
is written and the definition, uh, because this could
accidentally include a lot of products, um, not just cooling
towers, but also air cool condensers, air cool speed
condensers, um, for power plants which use big fans. Uh,
uh, air cool heat exchangers that are used in, uh industrial
processes, these are thin tube heat exchangers that do
everything from condense propane to, um, you know, all sorts
of applications in refineries and petrochemical plants and
all that

Those products all too, also would fall under
this, um, in this bucket. And they are, they, again, are,
um, custom designed for each and every application.

MR. BURDICK: Okay, so Wade has his hand up.

MR. SMITH: Uh, I have a couple of comments and a
question. The first comment is that the efficiency column
on this chart speaks to fan total efficiency and, uh,
unintended consequence of driving fan total efficiency up,
in this case, is an increase in fan housed. And I, I, I
point this out only because this demonstrates why, um, this
type of fan we rejected the use of total efficiency. If
this chart were redone in the column where static
efficiency, you would find that the static efficiency rating
of each of these fans would follow the horsepower, so that's
the first thing is, if you use static efficiency, the
statement that you use a more efficient fan that consume
more horsepower is no longer true.

Um, the second thing is to say that, um, AMCA members who make fans, um, make fans for, uh, all applications industrial and commercial, and many of those applications are custom. And, you know, part of the debate inside AMCA was, where do we want to cut this off? And our answer, which we proposed, is to cut it off at 200 horsepower. And I presume that that would eliminate, if that went into effect that would eliminate a lot of cooling, large, very large cooling fans that were, were described.

Um, so those are the two comments. The question that I have is whether or not the metric that was proposed would have any impact on your business. Do, do, do you test any of your fans against that metric to determine whether any were noncompliant?

MR. BURDICK: I've evaluated some of, uh, uh, them, uh, the axial fans. I, I, I'm thinking that the axial fans are fairly okay with, if I'm using a 58 number, I don't know what number we're using, it hasn't been publicized, you know, what the targets are or what all of the criteria is. No, sir, I, I, I can't state that.

MR. SMITH: But at a 58, you didn't have a problem?

MR. BURDICK: Uh, there are some points with blowers, uh, that don't meet that. Uh, you know, and, and
actually, uh, EU327 has different figures for forward-curve versus axial. Uh --

MR. SMITH: And so, and so, and so --

MR. BURDICK: Oh, and I'm not aware of that. I don't know what those numbers are.

MR. SMITH: Well, there's two numbers proposed. One for ducted and one for non-ducted.

MR. BURDICK: And blowers and axial are different?

MR. SMITH: Uh, well, uh, yeah, if they don't have a duct.

MR. SMILEY: No, it's just ducted.

MR. BURDICK: It's just ducted and non-ducted.

MR. SMITH: Ducted and non-ducted, but if all the propeller fans --

MR. BURDICK: Okay, um, on some of the --

MR. SMITH: If all the propeller fans, all propeller fans --

MR. BURDICK: Well --

MR. SMITH: -- are non-ducted and have a different metric based on static efficiency, then housed centrifugal fans which have a different requirement and metric based on total efficiency.

MR. WHITWELL: Unless they're unducted.

MR. SMITH: No.

MR. SMITH: No, no. All housed centrifugal fans,
the proposal is, to treat them as though they were ducted.

MR. WHITWELL: I, I thought, though, sorry Bob Whitwell from Carrier. Sorry for interrupting the discussion, but I thought at the last meeting there was a discussion about different classes for forward, forward curved centrifugal, or centrifugal fans, whether they're ducted or non-ducted. That was a, that was a recent proposal and I thought it was, there were definitions, were --

MR. SMITH: Well now the problem, well we can talk about definitions, but the problem is that when you make a fan, you don't know whether it is, could be ducted or not.

MR. WHITWELL: Okay, but when I make a fan I know whether it's ducted or non-ducted, right, based on the discussion.

MS. ARMSTRONG: But whether, but I think we're trying to move to this testable configuration idea. It might be --

MR. WHITWELL: Yeah, so I'm sorry for, I'm sorry for, uh, hurting the discussion.

MR. SMITH: Well, uh --

MR. WHITWELL: But I just to --

MS. ARMSTRONG: How does it work and vary on a high level, before you get into details before Wade does.

MR. SMITH: Yeah, the proposal, the proposal is
that all housed centrifugal fans are --

MS. ARMSTRONG: Go where you go.

MR. SMITH: -- based on a standalone version, I mean total efficiency.

MR. SMILEY: And that's, Bill Smiley of Trane, and when we say, oh, okay for standalone fans, that's okay.

MR. SMITH: Okay.

MR. SMILEY: But for our applications, centrifugal fans can be, housed centrifugal fans can be applied non-

duct.

MR. WHITWELL: And in most cases, for this, I'll say, most cases are.

MR. SMITH: Now, I would just encourage to evaluate the proposal and then propose changes if you don't like the results.

MR. SMILEY: We are and that's what we're talking about.

MS. ARMSTRONG: No, I, I think it's just like any other rating is what you're saying, Bob. I mean what we are proposing as first, for a given equipment cost, we are going to, or a given category of fans, we are going to tell you how it should be tested and rated.

MR. WHITWELL: Okay.

MS. ARMSTRONG: And that wouldn't include, um, you know, necessarily a look. At least what we discussed to
date, wouldn't include a declaration by the manufacturer about whether it's intended for it to be installed with a duct or not. We would normalize that across as part of the test procedure. That makes sense?

MR. WHITWELL: Well, I guess, I'm, I'm, I'm not sure it does, Ashley, but I guess one of the issues that I, that keeps coming up is that there's some discussion about, that it sounds like things are already determined.

MR. SMITH: No, it's just there's a proposal.

MR. WHITWELL: And, and then, again, things are still moving, so I, I just get real confused about what's, what's been agreed to and what isn't.

MR. SMITH: Okay, so this is, this is a coolant in presentation now, and I suggested.

MR. WHITWELL: Yeah, I, I know, I'm sorry for diverting you.

MR. SMITH: And I, and I suggested that you. The question --

MR. LIN: Excuse me, Wade --

MR. SMITH: No, no, no --

MR. LIN: This is Paul Lin, for --

MR. SMITH: I asked --

MR. LIN: There's just one more key point about the, uh, cooling tower presentation. We apologize that we didn't put any pictures of what they look like in this
presentation, but, um, but one thing to keep in mind is
that, uh, the product in the housing, uh, and with this
product the, there is never a fan in a testable condition in
its life, uh, from the manufacturer of the impeller to the
installation of the impeller in the unit, uh, to the sell to
the customer, it is never in what you would call a testable
condition.

MR. DIKEMAN: The whole time?

MR. LIN: So that, that's something that's going
to have to be dealt with here. It's not a panel fan.

UNIDENTIFIED MALE: He's right.

MR. MORRISON: This is Frank Morrison with
Baltimore Aircoil. Just to understand the cooling
technology is to, also represent air cooled and water cooled
equipment, and pneumatic equipment. So, you know, what, a
lot of our comments, they get complicated when you're
dealing with, uh, evaporative equipment, because you have to
deal with the water aspects of it, but a lot of our comments
also apply to the air cool side of it when I mention air
cool steam condensers and, and things like that.

MR. SMITH: So, so my question to you was, whether
or not you evaluated the metrics in our proposal? And do,
do you, um --

MR. BURDICK: I think there're some blowers that
are, that are going to be an issue.
MR. SMITH: I would give you encouragement to do that and to base it on what's proposed, which is different for centrifugal fans than it is for axials, that's all.

MR. BURDICK: Okay.

MS. ARMSTRONG: Um, so, in addition to that, I would say, you know, if I go back through your slides and, um, I just want to say thank you, because I think some of the information that we were seeking help in form our decision, like shipment. It's like usage number is actually in your presentation has been on the record. You submitted that before, um, to help us come up with, you know, potentially the, what we've been asking for, a variety.

One thing I think I was going to ask of you is that, um, of the fans that we're talking about, um, in heat rejection equipment at least the subset of fans we're talking about are subject to your presentation, um, how would you differentiate them, similar thing here, um, from other fans on the markets? That's the last piece, because what you, when you ask for an extension and you provide the qualifying data in terms of, you know, at least I would think that would be helpful for the advocacy community to determine impact on, if we were to, then it comes down to differentiation. How can we tell your fans apart from the broader population of fans? And that's a piece I think that it's still outstanding in my mind and that might be because
of my lack of expertise in the fan industry as a whole, but
I think we would welcome that discussion.

MR. BURDICK: Right, and, and, and maybe that's a
bit about labeling. Uh, maybe, maybe that's, uh, one of the
methods is that --

MS. ARMSTRONG: That's a hard sell for DOE. I'll
just tell you that right now.

MR. BURDICK: Okay.

MS. ARMSTRONG: We're looking for discrete design
characteristics, you know. What types of fans, what are the
discrete design characteristics? If I walked into your
facility as compared to Sam's facility, and his are not for
those applications, but yours are, how do I tell the
difference? Are they identical or not. Um, you know,
labeling is a good tool to help. It is not a necessarily a
differential, a third-party differential factor. Um, that's
not to say DOE is not open to a label, but I think what we
try to do when we draw lines between things, especially if
we draw line between things that are subject to standards
and those that are not, it is design characteristics. It is
not a self-declaration. It is not the presence or not
presence of the label. Um, we are really look, seeking
design information for you to see, anyone for that matter,
to be able to draw a line between that for which may be
subject to standards and that for which may not be. Um, so
think about that.

MR. BURDICK: Okay.

MS. ARMSTRONG: I do acknowledge that you did give us a lot of helpful information as well. Thank you.

MR. BURDICK: Right.

MR. FLY: Ashley, just, just a question and I won't try to distract us too much, but you said you don't want to do labeling, oh, well, let's --

MS. ARMSTRONG: Exclusively, let's put it that way, right, and how that we don't, um, and it's not that we won't consider that. And if you guys come back with your proposal, I see where this is going, so I'll just go ahead, address that right out the gate.

MR. FLY: Well, well I don't want you to. Let, let me finish, then maybe you'd get it. So you're standing on the beach looking at the whales and you see fans come up on the dock, right. Um, how do you know what that fan is? Are you just looking at it's physical characteristics?

MS. ARMSTRONG: Well, it's really easy. All fans are in, right.

MR. FLY: I mean is there --

MS. ARMSTRONG: You're asking me to divide that, so I have a lot easier position from DOE's side of things, that everything's in.

MR. FLY: But does it have to have a model number
on it? Does it has to have some kind of label that says what it is?

MS. ARMSTRONG: It depends, right?

MR. FLY: Are you going to go up with your ruler and say, uh, I see this is coming from so and so and it looks like it's about this wide and --

MS. ARMSTRONG: Generally speaking, we like definitions to be very clear and unambiguous so it's very easy to tell which models fall into our scope of standards, right. For commercial equipment, we do have the authority to issue or consider labeling rules where for (indiscernible), the only one we have so far is for motors. They really like it. Um, we have declined to do it for other places, um, for a variety of reasons. It, it is a tool. It is a tool that help for compliance and enforcement, but like the motor's guy would tell you, that's not how we differentiate if something is subject to standards or not.

The presence or absence of a label is not part of the definition that says I'm in. I'm not in. It is the characteristics of, um, the motor itself.

MR. PERSFUL: This is Trinity from Twin City Fan. Maybe another way to ask it is, how do we, how do we keep my, my buddy, Nick here, how do you, when we compete in the marketplace, what's keeping him from saying, oh, no, this is
a cooling tower fan? I'm outside. Like or what's keeping 
me from labeling every one of my fans that I make a cooling 
tower fan? And so however that's defined, if you could say, 
you know, cooling tower fans have this special 
characteristic, whatever it is.

MR. BURDICK: Yeah, we rely a lot on, on labeling 
in, in CTI, uh, actually. There are, uh, stickers, 
certification stickers, uh, that we place on the products, 
you know, to advise, you know, whoever might be walking by 
or that type of thing, that it has a sticker. But it's also 
posted on public Website and if that model number is not on 
the public Website, uh, it's fallacy or, or, uh, it's 
inaccurate, uh.

Frank Morrison, Baltimore Aircoil. I think to 
your point, you know, one of the things the cooling towers 
is to do, is deal with basically 100 percent humidity air 
along with some droplets of, of this drip that fell off the 
fill pack or, uh, it's a back condenser or closed circuit, 
off the coil, that the fan has to deal with. And Larry 
talked about the blades have to be protected from erosion 
and things like that. So, so I think there's things that we 
could work on to, to make those definitions, uh, clear to 
everybody and run it by the group.

MR. BURDICK: Okay.

MR. FLY: Uh, I'll tell you where I was going,
was, you know, their cooling towers, my package equipment all have a label on them, because they bear the safety label, because if we're required to put some kind of label that have a model number and certain safety information, because under the rules of, of, uh, UL ETL listings --

MR. BURDICK: Uh-huh.

MR. FLY: -- you have to do that. I buy a lot of fans and some of them come in. If, if they don't, if they're not an assembled product, I guess I'm asking, do those all have a label on them? The stuff, I generally buy fan components and none of them have a label on it.

MS. ARMSTRONG: Right.

MR. FLY: So I don't know how you recognize, I mean, I may be buying a 21, 20-blade fan, and a 21-blade, and are you able to count the blades and figure out which model it was and whether that one's actually listed or not. They'll take a drawing I think, you know. I don't know how we avoid labeling on something.

MS. ARMSTRONG: Right. And, and I'm not saying that we necessarily avoid labeling. The labeling may be a good tool for a variety of, of topics, not only for compliance-related, but something that, what Tom mentioned, for utility and rebate-type purpose for market differentiation purposes.

MR. FLY: Right.
MS. ARMSTRONG: And perhaps that carrot that he was speaking of, that's another tool in that toolbox. I mean, labeling we will leave the plan on the table to talk about within this group. I'm just saying, it's also not the end all, be all. That's not how we, um, I would, that's not typically how we write regs to differentiate, um, standards applicability. That's, uh, in --

MR. SMILEY: (Indiscernible).

MS. ARMSTRONG: So I mean, that's just my ask --

MR. SMILEY: Yeah.

MS. ARMSTRONG: -- if, if you don't go back and think about that, um, I you, you know, you gave us some helpful information.

MR. SMILEY: Understood.

MS. ARMSTRONG: Potentially inform our decisions and I think that's an ask of, of you.

MR. SMILEY: This is Bill Smiley of Trane. I have a question, ma'am. In other regulated things, whatever they may be, how do you distinguish both?

MS. ARMSTRONG: Mostly by characteristics.

MR. SMILEY: Well, uh, give me an example. I don't understand, because they, it, it's blue or green.

MR. SMITH: About an air over motor?

MS. ARMSTRONG: That is like the worst example.

MR. JASINSKI: It doesn't have a fan.
UNIDENTIFIED MALE: It doesn't have a fan cover.

MR. JASINSKI: Or furnace.

MS. ARMSTRONG: Yeah.

MR. JASINSKI: If, if it's a fan in a furnace that has a condenser in it, you can identify a secondary heat exchanger, so you know that one is subject to the standard for the condenser, not, you know, the, the, uh, non-weatherized condenser on a stand rule, standard --

MS. ARMSTRONG: I mean --

MR. JASINSKI: -- as opposed to if there is no secondary heat exchanger, you know that the fan and that non-condensing furnace is subject to the non-condensing furnace fan standard.

MS. ARMSTRONG: Yeah, I mean for clothes washers, it is something as simple as, um --

MR. SMILEY: Where the door is or what?

MS. ARMSTRONG: Where the door is, is it differentiating feature for, for discriminating a standard, but for discriminating applicability with our models and its size, so certain top loading up to a certain cubic size is in, so that's when it gets back to the point of, um, that Wade was making earlier, you know, one of, one of the pillars, I guess, of the, and for discussion to date for the Committee to then think about, the working group to think about, is the one to two, four hundred horsepower. And
that's pretty easy to figure out. One to two hundred horsepower. I mean, it could be a little more, it could be a little less. Whatever we decide to go with it, that's up for discussion. But that's a discrete characteristic that doesn't require a label, that, you know, that's one --

MR. SMILEY: Well, only if there's a motor incentive. I mean that's a, that's a counter-example. We'll get to that.

MS. ARMSTRONG: But you see what I'm saying, I mean that's where we're, we're going for a discrete characterization, so that you can do it the same as Sam, as myself. Um, if somebody else wants to come look at it that they can figure it out. And, and it, a label can be an important tool in that, in helping that, um.

MR. SMILEY: I'm just having a hard time trying to picture what it could be.

MS. ARMSTRONG: Exactly why we're here.

MR. SMILEY: And I think, well the first thing that comes to mind, of course, is a label, because everything you buy has labels on it that define something about it.

MR. LIN: This is Paul Lin of NEMA. So we've, we've had a lot of discussion the past few days and actually passed, uh, passed meetings and so forth, and a lot about exemptions. We haven't even allowed the process to work
out, even to talk about what is included in this, in this
general work, working group. So we're asking for exemptions
to things that we don't even know what's included. So let's
let the process work out and then if you need an exemption
within that, that, that definition, let's put it in there.
So if it's a 200 horsepower limit to, to the fan, then let's
put that in there. We just haven't, I mean, we're, we're
sitting here arguing about things that we don't even have
the time to find a definition for. We're just wasting time.
Let's let the process work it out.

MS. ARMSTRONG: With that, do you want, do you
want to switch the stage?

MR. LIN: Let's do it.

MS. ARMSTRONG: Sure.

MS. ARMSTRONG: Um, so we're going to move off of
scope discussions. I think there's a variety of people in
the group that have some homework. We'll send out a new
homework sheet, um, at the end of tomorrow. Um, with that
being said, we're going to a little bit about motors. One
of the things we talked about at the last meeting, um, had
to deal with nominal efficiencies and full load efficiencies
and nominal values. And if I don't test everything in the
wired air configuration, um, how will I then get my full
system efficiency based on nominal buckets. And if I do it
that way for rating purposes and DOE were to test wire to
air and they get a different value, kind of what happens, so I don't think Dan's going to address the what happens part, but he's going to shed some light on the, uh, motor kind of nominal of system approach and, and maybe help all of us better understand where the motor regs are based on and then if it, how that may translate to this nominal calculation approach that I think would be really helpful to you guys, so that you don't have to test every configuration.

So Alex, can you switch us up. It's the presentation that --

UNIDENTIFIED MALE: Yeah, that starts with NEMA.

MR. DELANEY: So I'm Dan Delaney, Regal. I'm representing NEMA. I'm one of the Section Committee Chairmen, okay.

So we put together a list of topics here. Uh, these are topics apparently we missed, um, an opportunity, you ask me, were some good discussions on motors. I think a lot of good questions. So I think, I think we got most of the slides in. If not, just feel free to interrupt with questions again. I'm sure Rob will, as he likes to say, pontificate at time to time, and add some more, uh, key words and I'm, I'm sure I'll miss.

But anyway, the three topics that we thought, one of them is the concept of a metric that combines this motor and control together. Um, so we'll go into that. That's an
involving standard. Some of you may be aware of that going on in IEC. NEMA membership is active, very active in that development, but it addresses a long time issue. We'll talk about what we did, um, supplying data to the pump, uh, ASRAC Committee, and maybe how we can do something similar like that too for, for the fan side here, fan blower.

And then lastly, a key topic we're going to talk about a lot, air over. The key topic has a lot of these points of data. Clearly, it is direct drive fan or air over products, so we'll talk a little bit about that.

So the first thing we come up to here, uh, this is, um, uh, an image that we've been using for some time in, um, the IEC. We'll we put boundaries around different things. Uh, this term, extended product, came about, if you go back, um, right to the very beginning when motors got regulated, uh, we were no different than anybody else at the table. Hey, you really should be looking at the driven system. They're the ones that really are more, uh, efficient, right. Keep pushing down that way. Well we finally got our wish and here we all are, right.

So, um, so what we now are finally talking about is this driven equipment here on the far right hand, uh, side of that slide. But we've been regulated as a motor since '92. It was the first EPCA legislation. Really '99 is when it fully came into compliance. We've been through
multiple revisions, noting June 1st, 2016 will be in our, our latest one. Well essentially, really cleans the slate, as, as Rob pointed out earlier, have a lot of issues with compliance. Massive amounts of issues with enforcement, so our goal in that last regulation is to simplify as much as possible.

Basically, you got a very short list of excluded, if it's not on the list, it's in. It's very simple. Uh, but leading up to that point was very complex. Um, so when we did a look back, what we're trying to do here with this extended product approach was to develop a system. It could be variable speed, which more likely it typically is. But it combines a, a CDM, a complete drive module in this motor. So together they make up this power drive system. This is a terminology that was developed, um, by the Europeans.

Um, some of you might be familiar with EN 50598. That standard is a satellite standard. The European standard was developed for the pump regulation 547. And what that was done, is, is to develop a, a system where the motor and the drive, uh, can be put together. I won't go into details here on the bullets, but could be put together, uh, to give a nice little package. So there's default losses that can be determined, as well as it can be tested if you're greater than those and you want to take the benefit of the higher PDS system. So maybe you have a less
efficient pump or fan, you can take the benefits of the higher PDS system. So we'll go into detail on a few slides on that.

But it also, it's, it's a robust enough system that allows, that's, let's say, just a straight across the line start type product. So at the bottom, you see motor system, you know, uh, drawn around the PDS. It can also evaluate a straight across the line system against a PDS too, which is a nice option, because sometimes a straight across the line, uh, fixed speed system is adequate enough. But it takes into account the losses of that other system as well too.

So obviously, on the far right where we've been today, um, you know, with fans, there's a lot of metrics going on. We don't mess with them, because this is what's nice about our system. We give you a nice little package that you can pick up, you can use for any, any metric you come up with, uh, whether it's an index, whether it's a straight, uh, input/output method. Whether it's power, static, total, um, it, it allows it to be independent, giving you guys the data that's necessary.

So I talked a little bit about the history, um, talked about the second bullet.

Third bullet, now what's nice about this system, it's a defined set of test points. So we do an output/input
test method. You don't have to do that, but obviously many
manufacturers, if we have, let's say advanced technologies,
improved efficiencies of what you buy off the shelf it makes
sense that we or the controller or maybe even US
manufacturer would want to do that testing to prove greater
efficiency. It allows those same base set test points. Um,
and then next, you guys probably aren't going to really so
much care about the specific test points. You're going to
care about your performance point.

So it has a defined interpolation, extrapolation
equation. One that everyone uses to get to points you're
most interested in, right, to do your own evaluation. And
then --

MR. BOTELE: Technology neutral.

MR. DELANEY: Um, that is technology neutral. So
this obviously can be variable speed induction. Certainly,
it can be PMAC motors, uh, ECM, switch reluctant,
synchronous. Anything we can dream up in the future, um,
it'll be in there, because it just evaluates performance at
the set points, and then can be obviously interpolated or
extrapolated to the key points you want.

And then lastly, it does have what's a big benefit
in ADM method. The Europeans were very much against, uh,
the concept of a math model for many years. It just, their
concept of it was, uh, just test it if there's a question.
You know, we validate that it meets the levels and you just test it. Well they got, I started to understand this basic model concept when you have proof of product line, you're not going to test that, right. You use a math model to validate, like everyone in the room. If you're six trillion and our, I, I guess an infinite number, because there is, somebody's always coming out with another product, you slap on a motor a vibration sensor, a chaff seal, so, um, infinite numbers. So in the motor industry, creation of models happens obviously, hundreds even a day can occur.

Um, so let's talk a little bit about a couple little details of these.

So the test points, um, on the left here, you see the EN standard. I didn't mention this before, but the EN standard obviously is based in 50 hertz, who support pump regulation, euro pump, picked it up. They used it for the MEI metric, uh, that's regulated. Now they're in their second phase of their, um, of their index level now. But they have eight points. And they had, uh, um, a crane manufacturer, a guy who made, made cranes and he wanted three zero speed points, right, so, because he does constant torque type of applications. We don't. We're not looking to use that in, in the U.S., or I should say with the IEC version. So obviously, we've harmonized that to include 60 hertz efficiency levels reference tables. But we've also
taken away those zero points, um, and given a random
sampling.

Um, we have a gentleman. His name is Mark
Dipplebuyer [sp]. He works a university in Germany, uh, but
he used to be with, uh, a motor manufacturer and he did an
extensive, uh, statistical evaluation between 20 points and
all the way down to at least five points and found literally
no difference in the end value interpolation/extrapolation.
So, um, a lot of, a lot of information and work was put into
validating these five points are good, are accurate and can
be extrapolated, interpolated, uh, with good accuracy.

Um, as I mentioned before, obviously, both
methods, um, allow for you then to take that with a defined
equation, that would be provided in a, let's say, a set
Excel spreadsheet, a locked out Excel spreadsheet. Anybody
can take the number, put your values in, pop out those
performance points that you care about, uh, for the
reference losses. And then obviously manufacturer can
provide, let's say, if you wanted to test a higher PDS
rather than the references losses that are given in a
standard, that can also be done there as well too.

MR. HAUER: Hello, Dan.

MR. DELANEY: Yeah, sure.

MR. HAUER: I'm Armin Hauer.

MR. DELANEY: Yeah.
MR. HAUER: What's in the graph there, the X-axis and Y-axis. That is the torque or the?

MR. DELANEY: The speed torque. Yes, speed torque, yeah.

MR. HAUER: Not constant power or anything?

MR. DELANEY: That's correct, yeah. Yeah, so it's just, it's just points, points of operation on a speed torque, correct, yeah. What I wanted to mention before, this isn't the first time this has been developed back in, um, I guess somewhere around 2007, uh, '06. At CSA, we developed a standard that had 20 points. And the concept there is, let's not do interpolation/extrapolation. Let's just do 20 points or the closest, using next closest, um, and basically, if you look on the left, 20 points across the grid, right. For every low point, you had five points across. Well you had four points across, five different, uh, points.

Um, so the concept here is let's reduce the burden of number of tests and just use interpolation/extrapolation since they use a mathematical version. So basically, you get the same result, whether you test 20, 30 points or you test these five.

MR. HAUER: I'm bringing that up because I've got to a seven we have that's based on constant power, so there'll be a X-axis or a Y-axis for the power into the
torque.

MR. DELANEY: Okay. Yeah, this has, this has been
torque speed from beginning. This is, um, I'm trying to
remember if this is in the 61800-9-2. So that's the, that's
the new name of the standard. I don't think I mentioned
that. I do here, right here. Um, but, yeah, it's always
represented in a torque speed relationship like this, but
obviously depending on, obviously what you see on the right
is more of a, let's say, variable torque relationship.
Obviously, that's a points of concern for a pump and a fan.
And on the left there, on this, on the zero axis of, of, uh,
speed it's a constant torque application.

MR. FERNSTROM: And this is Gary. For those of us
that aren't familiar with it, what do you mean when you say
torque speed?

MR. DELANEY: Yeah.

MR. FERNSTROM: Those are two different things.

MR. DELANEY: Yeah, yeah. So, so when we, as
motor guys, we talk in relationship. I should probably just
brought a, a typical, but I'll just use my hand here to, to
demonstrate.

When we talk about the characteristic of a motor,
right, from its locked rotor, it's up here high on its zero
speed, up here. So it's in locked, or when it first starts
or gets in locked or a situation that's very high, it
usually dips. And there's a breakdown point. That's where you guys really care about, making sure your fan point is within that knee of the curve that we typically talk about, so that we're always operating within the performance torque of the characteristic and it drops off.

So when we talk about the characteristic of a motor, we're talking about how the envelope, uh, works. If your operating point's outside of that, you can't run it.

MR. FERNSTROM: So, just let me.

MR. DELANEY: Yeah.

MR. FERNSTROM: You're talking about a graph where on one axis, its torque, and the other is speed.

Uh-huh, uh-huh, right.


MR. SMILEY: Here's what, here's what it fits in a motor curve looks like.

MR. FERNSTROM: Yeah, I, okay, I understand now. Thank you.

MR. DELANEY: There you go. Thank you.

MS. MAUER: Dan, this is Joanna. I just try and understand kind of where you're going with this. Do you have concerns with the NODA approach in terms of --

MR. DELANEY: Yeah.

MS. MAUER: Are you looking for --
MR. DELANEY: That's a good question, yeah.

MS. MAUER: -- default values or --

MR. DELANEY: So, so what, on the motor, I'm sorry, on the pump side it was concern that, look, they're going to go ahead and, they recreated this for us now, so whether it was, um, with PNNL, essentially used this EN50598 as the, as the version. You see AMCA and others try to recreate this. It's done. What we're trying to tell you, it's done. We'd like you just sit there and adopt this.

MS. MAUER: And you say it's done, um, do you fault --

MR. DELANEY: Here we go. We got a couple of more stuff, yeah, a couple of more slides, you'll see, see what I'm talking about here, okay. So yeah, the, the whole point of this is to introduce this power drive system, this motor and control. They don't really want, um, the fan groups or anyone else to start redeveloping something that's already done for you, define losses. Now we understand the issues of, of efficiency and try to use that. So what are we talking about in really reducing kilowatt.

MR. SMILEY: Dan, this Bill Smiley of Trane. This, this assumes a specific type of inverter or speed control variable frequency drive and a specific type of motor combination, correct?

MR. DELANEY: No, not really.
MR. SMILEY: Or is this based on kind of an average of everybody in the world's inverter and everybody in the world's motor and you get a real wide banner of data.

MR. DELANEY: Yeah, let's just look at that. Let's just, yeah, exactly right. So that's what, that's what these two tables are. So the top table here, um, is, is just taking the, we've already defined that, right. We already have international efficiency levels. No reason to survey that. It's already defined for us. We're regulating that in the United States and Europe and others. So we already know the defined motor losses. You can pick any motor up today, IEC 36 hertz equal a NEMA, premium 12, 12 tables on and on, right.

So we can, those are set for us, right. So that's not terribly difficult. Uh, down here though, drives never have. So drives did go together and did collect data and did define a minimum loss, reference loss for the drives.

MR. SMILEY: Okay.

MR. DELANEY: Yes, so that was really a, a big development on that side.

MR. PERSFUL: Trinity Persful, Twin City Fan, when you say, or when you talk efficiency, are you, you're talking minimum efficiencies or nominal efficiencies?

MR. DELANEY: Good, good question. We're not talking about efficiencies anymore. We're talking about
basically index levels and losses. So we're no longer talking about efficiencies in this metric, because what we're trying to do with variable speed systems, we're trying to reduce kilowatts, right. That's the whole goal of this program, is to stop talking efficiency, right, and start talking reduced kilowatts. So in all this is loss, so it's kilowatts of loss, okay. Let's back up for a second.

MR. PERSFUL: So is that, okay, and maybe another way to ask the question.

MR. DELANEY: Yeah.

MR. PERSFUL: Trinity Persful, Twin City Fan.

MR. DELANEY: Uh-huh.

MR. PERSFUL: The actual loss or nominal loss.

MR. DELANEY: So we'll, we'll get to that. We'll get to that, okay. So, so basically --

MR. DIKEMAN: Are you talking to Ashley.

MR. DELANEY: You guys are trying to, uh, to, uh, gang up here, aren't you. We're going to get, we're going to, we're going to, let's, let's hold off on nominal, because I got that in the air, air over and some of the other slides. Because it's, it's important. I do want you to understand that. It is, it is a little more complicated to somebody who obviously, where you don't read nominal or you do it the first time you assume that that's one number. There's test method of banding. There's a lot of things
that go into it, rather than just a point, right. So we'll, we'll get into that when we get through this, and then we'll come back to that.

MS. ARMSTRONG: Let me make a point.

MR. DELANEY: It is a testable configuration for Ashley.

MS. ARMSTRONG: That you get a point.

MR. DIKEMAN: It is a point.

MR. DELANEY: We'll, we'll come back to it. The calculation method, this is one way to look at this. So I found my motor manufacturer. If I'm a drive manufacturer, I don't make a motor. I don't make a drive. You're a fan guy. I can pick up the set defined loss tables and I can put together a system, a PDS. That's definable loss. If that's acceptable to you with your high efficiency fan, you're set and ready to go. You already got your defined loss tables.

Now if you need more. Let's say you're pushing the limit of that fan. You want to keep that fan market, you may want to go to manufacturer and decide can I get a more efficient PDS, right. So that's an option. So this system allows you to say I can use my default losses for motor control. I don't have to talk to a motor guy. I just got to know that those products are those default reflective losses of that product, or I can go to a drive manufacturer
or motor manufacturer and have them provide those points and get a more efficient PDS that's necessary.

MS. MAUER: Points that are certified to DOE?

MR. DELANEY: Points that are defined for a test standard that obviously would need to be accepted. Just like Sara Widder did in, in the pump rulemaking, they did their own definition. She has the exact same similar points that we have in, within this method. This is, think about what was done in the pump --

MS. ARMSTRONG: Direct measure is not necessarily. It depends on what type of motor are we're talking about, because not all of them are --

MS. MAUER: Right.

MR. DELANEY: Well let's just back up for a second. Nothing is regulated in this market, because this is an unregulated market. This is variable speed motor control product, right. So this is unregulated period.

MS. MAUER: So we don't need a DOE test procedure in order to test.

MR. DELANEY: And we're saying when we have it, we want you to adopt it. That's what, that's our proposal here, is saying, well this is an international method that's being stamped by international. This is just a small, this is like 30 manufacturers of motors and drives here. Um, the, some of the largest would probably provide the list. I
think we've provided the draft to where it's at now. John?

MR. BOTELE: Let your mind, let your mind wonder to NEMA premium PDS.

MR. DELANEY: It allows, let's say, regional acceptance of this, and let's say regional marketing of that program like that too, right, because there's base levels.

It's defined standard. Now, we want to incentivize the premium. People over these defined minimum losses, right.

So it gives the metric for this PDS for the first time.

MR. BOTELE: So if Gary had a NEMA premium PDS, what would he do on it?

MR. DELANEY: Don't answer that, Gary.

MR. FERNSTROM: I'd probably punt on 4th down.

MR. DELANEY: So, well as, as we go back and we look at these defined losses -- yeah, oh, sorry, Bob.

MR. FLY: What does PDS stand for?

UNIDENTIFIED MALE: Power drive system.

MR. FLY: Okay, thank you.

MR. DELANEY: Yeah, yeah, so back, just, just, I, I know I throw these terms back at you again, inside the red, red circle, the motor plus that control, okay.

MR. FLY: Got it.

MR. DELANEY: Okay.

MR. FLY: Thank you.

MR. FERNSTROM: So, so this is Gary. What's the
association of electrical and mechanical imaging equipment manufacturers?

MR. DELANEY: That's our NEMA. They're selling their imaging greatest.

MR. FERNSTROM: Imaging?

MR. DELANEY: Yeah, yeah, yeah.

MR. BOTEлер: Yeah, that's us too.

MR. DELANEY: Yeah.

MR. BOTEлер: You're in medical, you didn't know that, huh?

MR. FERNSTROM: No.

MR. DELANEY: Yeah, sometimes we found that out two weeks ago. We said the same thing. Hey, how did they get up there? We should have a motor up there. Jumped ahead a little bit.

Um, again, the biggest, probably newest thing that's in the standard is this defined control losses, okay. Very set parameters, so if when they're doing testing, then let's have greater. Have less losses than this motor, than I have a defined set of setup parameters and test parameters. It's essentially a glorified input/output, because there's no better way to do that at this point, when you do a system. But essentially, um, that's what is being used as the reference losses mean, the minimum. You can count on your drive being more efficient than that, that
product when your manufacturer says, yep, you're good. Um, and that is, that is what you would use as your minimum losses.

MR. SMILEY: Dan, I have a, Bill Smiley of Trane. I have a quick question. Is, is that the drive inefficiency or the losses of the drive, plus the effect that drive has on the motor efficiency?

MR. DELANEY: So they are separate.

MR. SMILEY: Combined or are they separate?

MR. DELANEY: They're separate. They are separate entities.

MR. SMILEY: Because if you have a, if you have a--

MR. DELANEY: You would only see that when you do the PDS five point test. Then you would see the calibration. We're saying that the losses together it is, is really an individual item that can be paired together, yeah, yeah. There's no way to do this, we'll say, definable, um, uh, loss that has all the, let's say accessory items and everything in it. So it had to be, do it individually as it reference losses.

MR. HAUER: Armin Hauer speaking. Do you go above 60 hertz, 60 hertz speed on that induction motor?

MR. DELANEY: I'm sorry. Does it go above? No it does not. So that was one of the contentions that, so we,
we debated this. We wanted to include a, let's say, a constant horsepower, but unfortunately, we just ran, ran out of time, because we wanted this in 2016. We wanted a lot of things, right, but in order to get the standard out there to try to help influence all this system regulation, we really thought, okay, that's, we're going to immediately start adding things like constant horsepower above, you know, base, um, frequency. We were going to add, uh, an attached Excel spreadsheet that you'll be able to run your equations, defines. So you don't do your own Excel spreadsheet with your own equation in it, using it. You'll have one that'll attach to the standard, and you'll be able to use that as a referee method. Wade.

MR. SMITH: Well I, I thought I was tracking you until Bill asked that question.

MR. DELANEY: Sure.

MR. SMITH: I thought that this, I thought that you really, it was impractical for rate the performance of, um, variable speed drive, unless you couple it with a motor. And so that's what I thought this was.

MR. DELANEY: So --

MR. SMITH: But if you separate it from the motor, don't you get a different performance level, depending (a) on which motor you attach it to, and (b) on how it's configured?
MR. DELANEY: So the concept here --

MR. SMILEY: (Indiscernible) the harder it is.

MR. DELANEY: So, let me, let me tell you what our concept here is, is defining the worst case setup that you have for losses, so the whole concept is the worst case position that that motor and drive would produce. Now is it perfect in every case, no.

MR. SMITH: So, so if I were to test them all, the worst one is the one that's represented.

MR. DELANEY: No, no. The idea is, is a worst case setup on a drive and a worst case setup on a motor the least inefficient. Not, not how you repair this worst case, because, you know, many manufacturers, many and if you setup something wrong, it's going to give you a completely erroneous result, yeah.

MR. SMITH: Okay, forget about those setups.

MR. DELANEY: Yeah.

MR. SMITH: Don't different motors have different performance when coupled with a VFD?

MR. DELANEY: Yes. It, it, it definitely is the case. Now as one of the things that is a side project of this, is actually to develop a separate motor IEC standard that'll address the details.

MR. SMITH: A standard what?

MR. DELANEY: Uh, so this is, lives inside of the
61800 series, the, the drive standards. 61800 is the drive. 60034 series is the motors.

MR. SMITH: Tell me what you said before so I can understand that.

MR. DELANEY: 61800, that's the drive standards.

MR. SMITH: And before that.

MR. SMILEY: Before you start giving us the standards.

MR. SMITH: Yeah, I'm not interested in that.

MR. DELANEY: No, come back, come back to your question here.

MR. SMITH: My question is, aren't different motors, don't they behave differently, --

MR. DELANEY: Yeah.

MR. SMITH: - when coupled with a VFD?

MR. DELANEY: Yeah, so --

MR. SMITH: How did you account for that?

MR. DELANEY: Yeah, so the only way you can do this, you can do this logically from a base set of losses is a definable set of losses. So no one really knows what that is specifically. That's why there's efficiency level. So every manufacturer is still going to have to define that says, I have a losses that meet that table. You're going to still use that definable losses, if it still validate with them. Does your motor meet these losses at that I2, I3
table.

MR. SMITH: The manufacturer of the motor is going to tell us how their motors perform to the VFD?

MR. DELANEY: Yep.

MR. SMITH: And VFD manufacturers are going to tell us how their VFD performs with the motors.

MR. DELANEY: And that's done by our calculation, our, our, basically what we're saying, is we have an approved AEDM just like the Department of Energy does for this. The approved calculation method allows them to. Yes, those tests involved to calibrate it, but --

MR. SMITH: So if I, if I, if I, if I take those two numbers.

MR. DELANEY: Yep.

MR. SMITH: And it happens to be the particular combination that I'm shipping out today. I can calculate from those two numbers the efficiency of the PDS.

MR. DELANEY: Yeah.

MR. SMITH: The full, the full motor drive system. I can add that to the inefficiency or efficiency of the fan and get a wire to air.

MR. DELANEY: Very good, yeah.

MR. SMITH: And, and, and you believe that if I test them, the wire to air, that I'll get the same result.

MR. FLY: Or better.
MR. DELANEY:  You should be better, that the whole concept of this is the worst case losses, right. That you can count on, that if you test the PDS with the combination that you purchased, it should be there or better.

MR. SMITH:  And why should it be more better?

MR. DELANEY:  And the whole concept is the drives has the worst case losses and the manufacturers calculation method here is guaranteeing they have minimally that those losses are maximum those losses, I should say it that way, yeah.

That's the whole, that's the whole pretense of this. And it's, as, as you see from the standard, it started very thin. It's a very thick standard. It's a, it's a tough read at this point. It really needs a simplification. It's, it reads more as equation to equation. That's why the second revision is really going to take it down to a, let's say, a layman's working document that can be used almost as an Excel spreadsheet so you can run through the equation. But this first one is very technical.

MR. PERSFUL:  Trinity Persful, Twin City Fan. The, what's the order of magnitude from say this is the worst case to, uh, something that we may test? Is it, are we talking, is it five percent, eight percent, ten percent? What's that? Just not pulling anything.
MR. DELANEY: Yeah, um, I can't even talk in those terms because of the loss. I'd have to back work, you know, so I'd really have to give specific examples. We've done some test data. Um, man, it's tough without having, because you have a, you have a set of 20 points, right. And have a bunch test data, a bunch of drive data. We're comparing those. I don't know if we have a lot of, you know, uh, best cases. There isn't quite a few presentations that are out there, been done some, but --

MR. PERSFUL: It's, it's, the reason I ask, if, IF we're to consider using this, I would want to know what that is, --

MR. DELANEY: Yeah.

MR. PERSFUL: -- because if I'm also interested in testing and, and doing something better or more aggressive, I would like to know is the effort worth it at the end of the day.

MR. DELANEY: So, so what the problem that's most interestingly about this standard, um, which is, you know, it has the typical IC format. You got to the base. It has the tolerance limit there. The tolerance is, uh, pretty, pretty wide in this. It's going to be, it's going to be at 10 percent. It's at 15 percent I think below, um, 90 kilowatt. I think the 90 is where they picked the point for this one and above. Uh, it's 10 percent above 90 kilowatts,
uh, 15 percent below. It follows the same method that the, uh, the motor side does. So it's a pretty, that's your, that's your gap that you're going to play with. That's your tolerance. And you can count it being in that tolerance, right. You're not going to count on the high end of that tolerance. You're going to count it in the middle or down at the bottom of that tolerance.

For a manufacturer to hold it, we're going to have to have a nominal minimally in the middle of that to guarantee that tail never leaves the bottom end of that tolerance. So it's probably at least, uh, seven and a half to 10 percent tolerance probably within those numbers.

MR. CATANIA: So just to follow-up on that -- Tom Catania. So you said that the test is designed, um, to, to model the worst case, the worst result.

MR. DELANEY: So the test, the test is the worst case if the actual. The, the, uh, calculation method is the worst case, yes.

MR. CATANIA: So how does the calculation method, how is it affected by the manufacturing, or did it manufacture tolerance?

MR. DELANEY: I would say it this way. Um, just like any AEDM method, it, and again, this is an IC test method, so there is, today, you know, in the beginning there is no third-party approval. It's, it's a manufacturer.
It's, it's how Europe operate, right. It's, it's your, it's your, it's your name on the mark, right.

MR. CATANIA: Sound certification, no markets around.

MR. DELANEY: Exactly. That's our standard. What we're saying here when we put this inside the DOE and other things, that's the robustness. It gets added. It gets added as a result of the regulation, whatever it said on top of that.

MR. CATANIA: I'm just wondering if there's a, if the manufacturing tolerance applied at the bottom end of the range has a multiplier effect when you add, when you add equipment in.

MR. DELANEY: It's a good question. I'll say this. It's a little early for me to really give some good, good definitions, because what I have is, I have test data, uh, that I can speak to specific points. I can't talk about populations yet. It's still too early for me really to give you, say, hey, this is what. We're just still finishing the standard still. It's just actually, uh, it goes out for a vote, because it just got translation. Actually it just went out for a vote I think last week. Um, and that's two months, and then, um, September we'll come back with comments. And we hope to have, we can hopefully not have any major technical time that we have to revise the
standard. If so, it'll go for at least by December of this year.

MR. SMITH: Is this in the public domain where we can go find it?

MR. DELANEY: We can certainly, um, ask the convener, it's our NEMA, um, 1MGTC, uh, Chair. So I can certainly ask if we can post this and have it accessible to the, the whole ASRAC. I know we provided it to the Department of Energy, so we just have to ask to make sure we could provide that to the whole ASRAC as well.

MR. SMILEY: Uh, Bill Smiley of Trane. It would be interesting to see sort of a statistical distribution of what the true values are to show where you're locating the minimum.

MR. DELANEY: Yeah, yeah.

MR. SMILEY: So, so we, you know, I mean, you may be quite a ways from being able to get to that point.

MR. DELANEY: We have some, we have some charts that were done in development. I know, I remember it, yeah.

MR. SMILEY: But you could, you know, if we're going to pick something to use to represent a motor or a motor variable speed drive, I don't want to always pick the lowest possible that could never be any lower than that, because I might have to make up for that low value by adjusting my fan efficiency.
MR. DELANEY: So, so the whole key is that you guys can count on that as a minimum, right. You need to use the minimums, right. For, for the defined references you got to use the minimums, right? You might if you really want to say, well I think that's better and you're confident you have the ability to test, you'll have the data, you can extrapolate to the key points that, let's say, are the, you know, we have to negotiate with those test configurable points are. But those are the kind of points you would interpolate and extrapolate at those points that are key to you.

MR. SMILEY: Well the other problem that I might run into is locate and I've done inverters whose sole purpose is to reduce tremendously the amount of energy I'm using blowing air around, because I can take the diversity of the system and the requirements of the occupied space when blowing lot less air. But I'm going to start out at a disadvantage, because the components I use to be able to do that and use less and less and less energy starts out at a lower efficiency.

MR. DELANEY: Yeah.

MR. SMILEY: So, and, and maybe it's probably not really the right place to be talking about it, but I just want to bring it up, is we might need a little relief when talking about VAV create a variable speed system, because I
could have add a low efficiency fan --

MR. DELANEY: Yeah.

MR. SMILEY: -- with just a motor and not a VFD.

MR. DELANEY: Right.

MR. SMILEY: And, you know, that meet the (indiscernible).

MR. DELANEY: And you still might, and you still might be able to do it.

MR. SMILEY: Yeah.

MR. SMITH: The, the idea is to give an allowance --

MR. SMILEY: Yeah.

MR. SMITH: -- when these things are added, so that you aren't penalized.

MR. SMILEY: Right.

MR. SMITH: As he just described.

MR. SMILEY: Right, right.

MR. DELANEY: The question is what, what, what that allowance should be.

MS. ARMSTRONG: Wait a minute, wait a minute. Explain that?

MR. DELANEY: You, you --

MR. SMITH: It's from your charts.

MS. ARMSTRONG: No, explain that.

MR. SMITH: Okay, you got a fan shaft and the fan
meets the requirement. The fan meets the requirement with
default values from wire to air meets the requirement.

MS. ARMSTRONG: Yeah.

MR. SMITH: Because the default values are in the
numerator and the denominator, the fan meets the
requirement. The calculated wire to air meets the
requirement, right.

MS. ARMSTRONG: Yeah.

MR. SMITH: Right, okay. So the point is that in
that default values that get you wire to air --

MR. DELANEY: Yeah.

MR. SMITH: if you have a speed control, it's in
there, in the numerator and the denominator. It's not
material.

MR. DIKEMAN: It was --.

MR. SMILEY: Or you're saying, you're saying the --

MR. SMITH: No, it's, it's the efficiency
requirement is diminished by the default loss.

MR. SMILEY: You're adjust, you're adjusting the
target to compensate for the additional inefficiency of the
components.

MR. SMITH: Exactly, exactly.

MR. SMILEY: Because you don't want it discourage
the AD.
MR. SMITH: Right, exactly.

MR. DELANEY: Well, I'd say this. I'd say this. I'd say this. When you look at your metric, that's what you want to have your metric take account for. You want duty cycling in there, right. You want to have that ability, if it's variable speed you want to be able to count that. You'll have the losses. You can use them now, right. That decision how you want her to use in your metric.

MR. SMITH: Well, that's something we want to talk about.

MR. DELANEY: Yeah, back in the back, yeah. You have a question back there?

MR. MATHSON: Tim Mathson, Greenheck Fan. I want to ask a question about 360 hertz, so and you don't have that covered.

MR. DELANEY: Yeah.

MR. MATHSON: I'm assuming everything under 60 is like, you got a 10 horse motor, 20 horse drive, 45 hertz and only three break horsepower, you can tell what the efficiency is.

MR. DELANEY: Yeah, correct.

MR. MATHSON: And everything under 60 is losses.

MR. DELANEY: Zero, yeah, the losses is of each of those operating points --

MR. MATHSON: Below that constant torque curve,
everything below that can occur.

MR. SMILEY: What about 160 or 120 hertz?

MR. DELANEY: So, no, no. So nothing above base, nothing above base, but it'll be added. It'll be, it'll just have to go back. You have to create it, because it doesn't exist in the marketplace today. There's no efficiency level for that.

MR. PERSFUL: Trinity Persful, Twin City Fan. Would an EC motor be considered a PDS?

MR. DELANEY: So that's, that's one of those areas. Yes, so yes is the, is the quick answer. It wasn't designed around that, meaning we did not go to ECM, uh, type of manufacturers and get their losses, right, to determine those. So that is one area that the ECM market, um, and it, it varies all over the place.

As it goes smaller, it's gets, as it goes really small, it gets really difficult for some of them to get to those. They may have to always do the test. It'll differentiate themselves because their control may wag behind reference losses. So they may have to test as a result. So as a control gets really small, the inefficiencies reasonably pretty small, and that losses are there. I just don't want to say across the board, yes. Many of them will say yes. Be above and beyond. Because let's say, let's say, if I give you a generic number, such
about 95 percent efficient. That's pretty conservative for most drives. So that's kind of the drive. Now when you take that and divide the losses by the different points, it's about 95 percent efficient, give or take.

MR. SMILEY: Bill Smiley of Trane. If I used an ECM motor on a product, I'd have to test the motor in there because we're aren't going to have a usable default number to use.

MR. DELANEY: But you won't have to do it. You go to your EC manufacturer and say give it to me.

MR. SMILEY: It's got to be done.

MS. MAUER: That's in the DOE test procedure, right? And the tested according to the DOE test procedure?

MR. DELANEY: Well, of, of course, that's, that’s why we're proposing this in there, but, but even if it's, well something's going to have to be in there for variable speed, right. I mean, if we're going to have, we're not doing this at just fixed frequency right. We're saying variable speed is part of that. That's what we've been discussing. There has to be a test method. There has to be something that accounts for multiple points that will end.

MR. SMILEY: Well, Bill Smiley of Trane again. If, it got to be some encouragement to use ECM motors too, because they're typically more efficient than typical (indiscernible) motors.
MR. DELANEY: Especially at the below one horsepower, yeah.

MR. SMILEY: So if we don't have some mechanism that, uh, shows the benefit of that, you know. It could be you'll have a problem with it.

MR. DELANEY: Keep moving along here, um, following the model as the, the motor side, so obviously our European, um, I shouldn't say European, IEC counterparts, uh, developed IU. IU levels based upon the NEMA levels, uh, creating their own 50 hertz versions off a smooth curve. They used their 60 hertz versions for a step curve for pull counts. So there're identical to 60 hertz, um, but they've now created an IUL for inverters, what they call converters, what we call inverters or VFDs, right, on the left-hand side. And then translating that into a power drive system, you'll notice there's, there's a reference underneath on the equation, right. So greater than one would be the greater than, than, um, than the base reference losses, so that's what you'd be after if you did a PDS test the greater than one factor on that.

So those are defined. This will, will be released. That is pretty new to the standard you can see. It only does I-2 right now, so many drives just would normally just probably fall into I-2. There is I-1 drives. I don't want to say there isn't, but I'd say they're much
more specialty drives.

MR. PERSFUL: Two quick questions: One, I'm thinking about. This is Trinity, Twin City Fan. Thinking about the ECM motor piece, so not picking on Armin, but this technology where he has the, uh, the motor drive and fan are, are one unit, or --

MR. DELANEY: All integral, yeah.

MR. PERSFUL: -- are all integral. Would that, uh, would that be considered, you know, his, uh, where you draw the box.

MR. DELANEY: Yeah.

MR. PERSFUL: Would that be considered a, a PDS, or in your mind would, um, could him or one of his competitors use this? You know, let's say if this is, uh, he gets a better result than what he normally would. And I don't know if that would be the case or not. Could, would he, in your mind, would, would he --

MR. DELANEY: So he would have the same decision any manufacturer of a supply control motor think separately or an ECM motor with a fan, or any other situation. He would still have to decide, is my base motor and drive together, greater than those reference losses. Do I want to take advantage of that? Do I want to test that and give that to another guy who says, hey, my efficiency's great. My losses are less than, than the other ones. So if he
wants to compare himself to a PDS, because it, you know, he
can certainly use the full metric too. He could say wire.
You know, he could either one on that, depending on which
metric you're going to go to, right. Every, every corner of
the world has a little different metric on this, so he could
do either one or both. But yeah, yeah, it, take, take any
configuration. Obviously, it can be more difficult to
couple up, but you have to be at a, obviously, a low source
dynamometer typically.

MR. LIN: So, this Paul Lin with, with NEMA, so on
the pump rulemaking from the working group, they allow for
the default calculations. And then you also allow to test
it. Do you believe that your, your, your system is going to
beat that calculated method as well. So there's two paths
to that.

MS. MAUER: This is Joanna. I believe the
proposal if you're selling a pump with an ECM motor was that
you have to do a wire to water test, because of default.

MR. LIN: Because there's no default because of
that, so you always get a test option to, to, so that you
can show that there's differences in your efficiencies.

MR. SMILEY: This is Bill Smiley of Trane. Let me
ask, uh, think it was some question. I'm not trying to be a
troublemaker. But if you, uh, add a fan assembly with a
motor and drive and you test it, and it was a, it was
basically the motor and drive that was used to develop the
standard default metric.

MR. DELANEY: Okay.

MR. SMILEY: And your testing showed that it
worked better than the default metric, are you going to be
held to use the default metric, because the next top, the
next, uh, one of exactly those same things you don't test,
but the motor efficiency's a little lower or the drive
efficiency's a little lower. And that's what gets tested.
Are you going to get hooked for that, or what?

MS. ARMSTRONG: Let's table that discussion for
the next agenda item --

MR. SMILEY: Okay.

MS. ARMSTRONG: -- which is how do we come up with
ratings and kind of --

MR. DELANEY: Yeah.

MS. ARMSTRONG: I was thinking about discussing it
at more about high level.

MR. SMILEY: Okay.

MS. ARMSTRONG: But obviously, that, because I
want you guys to understand what we were, will require of
you and what the different components of that are. And then
opposite of that, kind of what it looks like on the back end
when we do starting doing some market surveillance type
things. And so let's have that discussion there, because it
might inform the options you want to consider for how you
test, how you come up with ratings, you know, the nominal
approach versus a tested approach. The, what I would call
manufacturing production line variations that a bunch of,
you know, so let's table that for a second and let him get
through this and then we're going to talk about it in a
broader sense.

MR. DELANEY: So, what's nominal about this,
obviously, it follows the same kind of method that's already
out there in the marketplace today, and allows the ability
to now, you know, let's say incentivize greater than, let's
say your, you know, let's say your default losses, which are
basically represented by IE-2 and IES-2 levels.

So most drives and most motors today that you can
buy on the market, European or U.S. regulatory, are going to
meet that level or greater. So you're going to feel pretty
confident, if you're buying, excluding the products that
we're going to talk about next, air over, right, you're
going to expect obviously that those efficiencies be
greater.

So to back it up, this is where we'll talk about
some of the NEMA nominal stuff, but as a part of some of
this discussion. So, as part of the pump ASRAC we supported
them with, some part load loss data. And pump's a little
different the way they run their set points. I think it was
75 to 100 and 115 to 125, I can't remember. So we supported them with what is part load loss data. They had some very old data, so we gave them some more recent data to update them. Basically, they were using pre-EPCA type data, pre-'92. We gave them, let's say, 2013-type data representing what motors today are. And that was two and four pole. That's really what they care about. Just at fixed speed, though. So this isn't variable speed type of information that's out here.

So we talk about how we come up with test data. We have a very specific test method. IEEE 112, method B. That's a segregated loss method, very different than the input/output method. Its accuracies obviously are very repeatable, even between laboratories, whether it's, you know, competitors or third-party labs. That's our methods used by the Department of Energy. Then 25 years mature, continues to keep going through revisions and improvements, through the years, the newest one will be out here in a few months.

But NEMA provides the metric. The metric being NEMA nominal, okay. NEMA nominal is a definition that says, the large population of motors, what is that? Well, it's kind of defined by that manufacturer. You build five of those a year, 10 a year, thousands, it depends, right. So the large population is really determined by what the
manufacturers determines as a large population, but that
population has to be within the nominal or what kind of,
what's, if you will, like an average.

Now, that doesn't mean, though, that they're all
within there. There's a band, okay. And just like any, you
know, average or statistical, you have standard deviations,
right. Well, NEMA has a 20 percent of losses, okay. So
there's, each band in NEMA, if you go to our table, is 10
percent of losses. So that that nominal 10 percent of
losses is one band, two bands being 20 percent. That's NEMA
a minimum guaranteed.

So you pick up a motor, you test that motor, every
one of those motors, if you ever found a motor that's below
that, then you have a motor that's does not meet regs. It
would be in violation. I would challenge you to find one in
the marketplace today. Maybe not with a reputable
manufacturer, but I would say, that would be very difficult.
I would say that would be very difficult, because if you
find one like that, don't get me wrong, they can exist,
right. Statistical anomalies can exist, but with --

MR. BUBLITZ: Time-out. This is Mark Bublitz with
New York Blower.

MR. DELANEY: Sure.

MR. BUBLITZ: What statistical process method are
you using to guarantee that the lower limit of that
manufacturing deviation is within that second band.

MR. DELANEY: So, a lot of that is obviously the manufacturer's experience.

MR. BUBLITZ: You'll find that with every single --

MR. DELANEY: Oh, no, absolutely not, of course, not. I mean, we're talking about thousands and thousands of motors a month. And, you know, to test a motor it's almost a day, you know, it's at least a day usually, to thermocouple and by the time you test it, yeah.

MR. BUBLITZ: So that's my question. How do you guarantee that distribution of product that's produced in some statistical distribution is guaranteed to be above a threshold.

MR. DELANEY: Well, our DOE did that for us. They defined what a ADM method is.

MR. BUBLITZ: No, you didn't answer the question. How did you do it?

MR. DELANEY: But if we want to go back to what each manufacturer does.

MR. BUBLITZ: I want to (indiscernible). You just said --

MR. DELANEY: Yeah.

MR. BUBLITZ: -- I can't find a motor in the market that is below that second band. Prove it.
MR. DELANEY: You, you mean the NEMA nominal, or minimum guarantee?

MR. BUBLITZ: I don't know what you just asked.

MR. DELANEY: Okay.

MR. BUBLITZ: But you, didn't you just say that there's two bands of error, there's a minimum efficiency or whatever loss is. And I cannot find a motor in the market --

MR. DELANEY: Yeah.

MR. BUBLITZ: -- that's below that.

MR. DELANEY: Yeah.

MR. BUBLITZ: How do you prove that?

MR. DELANEY: Well, but the, how do I prove it? You just go test it. I mean, I guess, you'd have to find it. But how do I prove it? It'd be a matter of, so every manufacturer have to have its tolerances.

MR. BUBLITZ: Why is this hard to --

MR. WOLF: Maybe you better rephrase.

MR. DELANEY: Okay. Maybe -- I'm not there to --

MR. WOLF: How are you so confident in that statement?

MR. DELANEY: So every manufacturer, it has typical, a calculation, but not every manufacturer. There are some that choose just to do tests, right. So I don't want to speak for every manufacturer, but most of us have a
calculation method. And you have to have a buffer of this calculation. Not only does that calculation have to guarantee that you're always within the legal requirement, right. But it also has to guarantee that you're within 10 percent of what you estimate. So it has to guarantee two things, okay, when you go through that.

Now, I'm not sure where you're testing motors --

MR. BUBLITZ: We're not, we're not even on the same planet, I mean.

MR. DELANEY: Okay.

MR. WOLF: Let me --

MR. DELANEY: Go ahead.

MR. WOLF: Mike Wolf, Greenheck. So, I think maybe what Mark is driving at is, how do you, how does that tie back to manufacturing tolerances and your testing tolerances to come up some statistical significance in your confidence, you know, 98 percent confidence level, 99 percent, whatever.

MR. DELANEY: So every manufacturer has a different method to ensure, but in the end that calculation by which is proprietary to every manufacturer, that what's responsible for them. Just like ever math model that's DOE-approved in the system, they come and actually evaluate your program with a number of tests and actual evaluation.

MR. WOLF: So, Mike Wolf, again, just because
Mark's probably still going. So it's really up to the
manufacturer to set their own tolerance levels.

MR. DELANEY: oh, absolutely.

MR. WOLF: And you're --

MS. ARMSTRONG: Can I cut in?

MR. WOLF: Sure, go ahead.

MS. ARMSTRONG: For a second. So the way that
(indiscernible) talk about. But, the way this works is that
DOE dictates the types of representations motor
manufacturers and, to that extent, other manufacturers must
meet. And the DOE system, I would argue, I might also take
issue with that statement, but that being said, the way this
in theory works is, DOE has confidence limits and sets up a
way that you are supposed to making representation of your
model's efficiency. One, so for example, let's just say
your motor --

MR. PERSFUL: They can't hear you right now.

MS. ARMSTRONG: Seriously, okay. I'm just going
to make numbers for a second. Say, I'm Ashley, and I said I
tested out at 10. And if I run typically DOE requires a
multi-unit sample to be tested to come up with a rating.
And say because of the rating statistics, the confidence
limits which will be influenced by the production variations
that you feel are appropriate for your industry, say I make
you de-rate to an eight, where consumers would favor higher
values. So I won't let you rate above an eight.

It is then your responsibility to make sure that the things coming off your line are that or better. So we make manufacturers, when they certify ratings, conservatively rate. We do it the opposite on enforcement. Enforcement, we put the burden on us. We make sure that we test a multi-unit sample, except there are some provisions that'll allow us to test the single unit sample for custom equipment. But we make sure we are absolutely certain that your product is non-compliant with standards. So when you're asking him, I mean this may not answer specifically your question, but we basically make you de-rate. And then from that, the production variances, which are within your purview, it's up to you to make sure your units, your population, we understand every unit may not, but that population coming off that line, that number represented by that model complies with the number actually that you generated.

MR. BUBLITZ: A hundred percent of the time.

That's interesting for a mass-produced manufacturing --

MS. ARMSTRONG: So I understand some nuances, which is why I wanted to start the discussion of how we do things and then let's talk about how it may apply to fans, because I get that there may be nuances. And to answer your question, we get, no, the answer is no. We understand that
every single unit doesn't always hit the rating, but if we pull a unit. I know this is going to, this is coming --

MR. BUBLITZ: It's got to hit the rating.

MS. ARMSTRONG: Well if we put, it doesn't always. Let's be honest. Every unit that I test doesn't always come up with the same number that's on the rating. In fact, it's probably, most of the units I test, of the hundreds I tested last year, most of them, they fall above, they fall below. It really depends on how, the manufacturer's strategic decision on how they rate. Some people rate very conservatively. Other's do not. They push the limits. We allow, within a certain range, we allow that to be the discretion of the manufacturer. That being said, if we pull a unit, and I'm not speaking necessarily for our enforcement team, but the way this in theory works is, we pull a unit and we have test data from a single unit test that gives us reason to believe that either your rating may not be quite what it's, you know, chalked up to be. We'd probably say, hey, we tested your product. Look at our test data, check yours.

Because you're required to maintain records and you're required to maintain your testing or your calculations or your AEDM or whatever the, the basis for your rating, you're required to maintain that and you better have those records if DOE asks.
MR. SMITH: So on the motors, there is the minimum and the nominal?

MS. ARMSTRONG: Oh, here we go.

UNIDENTIFIED MALE: Just think of it as banding.

MR. DELANEY: As banding. You have a minimum and you have a nominal.

MR. SMITH: Can I ask you a question?

MR. DELANEY: The motor's going to (indiscernible). Yes.

MR. SMITH: Thank you. So there's a minimum and a nominal. And the minimum you've already explained what that is and how that's enforced and, so that's what we can count on basically, right. Do you define what the manufacturer can say or represent as nominal?

MS. ARMSTRONG: No.

MR. DELANEY: No, short answer, no. You provide levels for them. That's it, yeah.

MS. ARMSTRONG: Motors, motors is not necessarily a good example of this.

MR. DELANEY: Well, we're talking about motors, though, right, so.

MS. ARMSTRONG: No, I mean, he's asking with respect to fans.

MR. DELANEY: Generically.

MS. ARMSTRONG: Right?
MR. DELANEY: Okay.

MS. ARMSTRONG: I mean so really there's not going to be a minimum and a nominal for fans. You're going to end up with a rating.

MR. DELANEY: Yeah.

MS. ARMSTRONG: And that rating has to be, has to be developed pursuant to our procedures. You're not going to have this idea of minimum and nominal. Motors are the only product where we have this kind of hand we've been dealt with by statute, which is a little different than the rest of the world. The other 60-plus products, we define how you make ratings. And those ratings govern representation, and it's going to be a single point number. And we're going to discuss how we get there and what that means. But once we say this is how you find your ratings, we're going to say, this is the upper end. And, I guess you can call it a range. You can always conservatively rate back down from that, if you wanted to.

MR. SMITH: Upper it.

UNIDENTIFIED MALE: With losses.

MR. DELANEY: Upper end of losses, lower end of efficiency, is that what you mean?

MS. ARMSTRONG: So I was talking efficiency, but that's fine. You can't overrate, in other words. You can't say, you can't claim a higher efficiency than what we're
allowing you to claim.

MR. SMITH: And my, and my point is that that number, that one number for any given point --

MS. ARMSTRONG: That number, yes.

MR. SMITH: -- is, I mean, we have to meet it. You pull a product, it's got to meet it. And the fact, the fact that that is, okay --

MR. DELANEY: Yeah, because your ratio, because these are ratios. It's built all into the ratio.

MR. SMITH: Okay, so now, before we talk about manufacturing tolerances, because I think what you said is, manufacturing tolerances are on us, is that right?

MR. DELANEY: Think about this way, think about this way.

MR. SMITH: I'm asking Ashley. Manufacturing tolerances are --

MS. ARMSTRONG: So we have what we call certification statistics built in that are supposed to account for the variations you would typically see in fan manufacturing. So if you come back and tell me you surveyed your AMCA members, blah, blah, blah, and typically they experience a five percent range, blah, blah, blah, we'll throw on there a 97 and a half or something like that confidence level.

MR. SMITH: Is that right, okay.
MS. ARMSTRONG: And we'll make you rate with that in mind. And it's, what it's going to do is push your ratings down. But that, what it's going to protect you against is if I spot check your product.

MR. SMITH: Okay, so now --

MS. ARMSTRONG: That's how it works.

MR. SMITH: -- the following question is this. How do you deal with measurement uncertainty? So in the, in the lab, in the lab, right, we're measuring flow, pressure and power.

MS. ARMSTRONG: Correct.

MR. SMITH: Right. So the power meter that's specified in 210 is plus or minus one percent. The flow and the pressure uncertainty is also graphically displayed inside at the 210. And it is the standard against which we accredit laboratories. They have to be able to measure that close. The point is it's not zero, and so how are those measurement uncertainties dealt with?

MS. ARMSTRONG: Okay, so I would say the certification tolerance should take into account manufacturing variability and test tolerances when testing with, by a manufacturer with his technicians in his lab. That's what the stats should take care of, stuff within your control. So whatever the cumulative effects of that, we should talk about it.
Fast-forward, because this is always what everybody cares about. Fast-forward to the other side, regulations are in. DOE pulls a product, or we tell you you have to ship a product to X-lab, a third-party lab typically. And you're not allowed to be there, and you're not allowed to run the test. We're having someone else run the test.

I'm talking to you and those behind you.

MR. SMITH: No, no, I know.

MR. WHITWELL: Been there, done that.

MS. ARMSTRONG: So fast-forward. We have an additional tolerance on the enforcement side that acknowledges that when you take a unit and you test it at a different lab, when you test it with different people, you may introduce another level of variability, test to test.

MR. SMITH: Test tolerance.

MS. ARMSTRONG: And essentially, if you fail that test, it's built that way to protect you. If we're going to define something that ends up being non-compliant and there are associated penalties, et cetera, with that, we want to make sure we're right. So on the enforcement side, the tolerances work against DOE and in your favor, or some may say to make sure that we've accounted for things that are, one could argue, beyond your control. Does that answer?

MR. MATHSON: Uh-huh.
MS. ARMSTRONG: So that was my ratings presentation. We can just --

MR. SMILEY: I'd like to do it again, I don't understand.

MS. ARMSTRONG: We can do it again. How about that?

MR. DELANEY: With slides.

MS. ARMSTRONG: Why don't you finish the motor stuff.

MR. DELANEY: Okay, one more.

MS. ARMSTRONG: But, ultimately, when we come, I mean, the reason why the minimum or the conservative approach is important is, you are going to be held responsible for that fan system rating. And so, once you add the pieces together, motor, drives, et cetera, whether you use the nominal approach or the wire to air approach, the responsibility is on the fan manufacturer.

MR. SMITH: And the representation that's in question here is the efficiency?

MS. ARMSTRONG: So we can have that discussion too. I know you guys are also concerned because you want to be able to make other representations, things that you normally do.

MR. SMITH: Flow and pressure --

MS. ARMSTRONG: Exactly.
MR. SMITH: -- and speed.

MS. ARMSTRONG: So --

MR. SMITH: And power.

MS. ARMSTRONG: Correct. Right. Typically, the way we do this is to say your energy efficiency representations are made by blah. That being said, or in accordance with whatever we spell out in the regs, right. There are certain instances where there are certain pieces of information that impact our standards, or that impact our product. So, for example, for those in the room, cooling capacity. Sometimes we've gone as far as to say, you know, representations of those need to be made in accordance with, you know, but typically it's the efficiency.

So we would have those, I mean, that's part of what this is all about. Let's get around a table and figure it out. But part of that, driving that discussion is going to be what are your actual production variations on an aggregate. I know that's something that no manufacturer is going to disclose, especially not to disclose to DOE. On an aggregate basis, are we talking 99 percentile, like we are about certain lighting products, are we talking 90th percentile for confidence limits. And that should encompass test variability when testing with your own technicians in your own lab.

MR. CATANIA: So before we leave this topic and at
the risk --

MS. ARMSTRONG: Did I explain it --

MR. CATANIA: Tom Catania.

MS. ARMSTRONG: -- close enough?

MR. CATANIA: At the risk of freaking people out, those principles, when applying to a standard, relatively straightforward, maybe not so easy to achieve, but relatively straightforward. But when they're tied to a voluntary market transformation program with financial incentives or other benefits, and commercial settings may be a little different than consumer settings, there is additional complexity and additional discretion, correct, on the part of whoever the Government is overseeing the program, whether it's something like Energy Star or utility rebate programs and so forth, so. It, and it's not without precedent that more discretion has been exercised in remedies and so forth and how you respond to violations, where you're claiming performance above the standard, but the basis for calculating it is the standard.

MS. ARMSTRONG: Right, I mean clearly, I think what you can tell by, so I'm not here in an enforcement capacity as a lawyer to speak about the Department's discretion and, you know, all that kind of stuff when it goes into enforcement cases. But that being said, I think what you would see if you look back at what cases the
Department has brought or has settled, they surround standards. I mean, we're worrying about people complying with standards. That's not to say that if we test your product and we get something that's 20 percent off its rating, we won't knock on your door and say, hey, what's going on, let's have a conversation. But you're also not, it's unlikely that, we would probably say, look at our test data and reexamine yours, something's not quite right. But if you're 30 percent more efficient than the standard, we're also not going to send you a test note and say, cough over units in five days. There are different processes for handling that.

MR. CATANIA: Thank you.

MR. FERNSTROM: So, Tom, this is Gary. If I understood your point correctly, it was that if you're doing better than the DOE standard and maybe utilities are responding to that with incentives, there might be a little more discretion involved in finding you guilty of not doing what you say you're doing.

MR. CATANIA: Correct.

MR. FERNSTROM: And I've got tell you that our public utilities commission, anyway, has been driving us to use more and more creditable information. When we started doing rebates, we just based them on manufacturers' specifications. And we found out maybe in some cases that
wasn't adequate. So, now we're being asked more and more to
cite a report to a Government agency, the California Energy
Commission, DOE. And I'm sure that the PUC would have the
expectation that if it's reported, it is going to be just as
accurate as anything else that's reported, without any
additional discretion.

MR. SMITH: Yeah, I think, this is Wade Smith. I
think the, this is a sobering discussion for our members,
because so many of the products that are going to be covered
by this regulation are so seldom manufactured. In other
words, we got some members sitting here in a room who
actually never make a product that they've ever made before.
Every unit is peculiar. And they use AEDMs to rate these
units, but the subject of manufacturing tolerances is
interesting because it's one thing to maintain a tight
manufacturing tolerance on a production line of similar
products, dimensionally similar products. It's quite
another thing to maintain that dimensional similarity with a
unit that, you know, with a rating basis, the rating test
unit. And so I think each manufacturer is going to come to
this subject with a different answer.

MS. ARMSTRONG: Okay.

MR. SMITH: And I think what I heard you say is,
if I'm a manufacturer and I'm making a stamp them out
product and I do statistical analysis of my production and I
know what the performance is on a statistically significant distributive basis, I got the bell-curve. And I think I can be within two percent, just pick a number, you know, I'm taking, I'm taking two percent and that's it. And the next guy says, I'm going to be lucky to get 15, they're going to have to take 15. And you're not going to tell them whether they have to take 15 or two. You're just going to tell them if I pull a unit and test it, it's got to be right. Am I correct in that?

MS. ARMSTRONG: So the answer is mostly. I'm going to bound that range. I'm going to tell you what the lowest number you can rate at, which is going to be the standard. And I'm going to tell you what the highest number. Within that range, it's on you. But when I pick a unit --

MR. SMITH: Well okay, here's the issue.

MS. ARMSTRONG: I, I get everyone --

MR. SMITH: With the proposed rule, we're not talking about a single point of test.

MS. ARMSTRONG: Uh-huh.

MR. SMITH: We're talking about a complete range. So the description that you're making applies to an infinite number of operating points for any particular fan, right?

MS. ARMSTRONG: I understand.

MR. SMITH: So it's a sobering challenge to
contemplate all this at one point, or three test points. But it's a much more challenging subject when you say, no, it's the range.

MS. ARMSTRONG: So I'm not saying range is the same way you're saying range, I don't think.

MR. SMITH: (Indiscernible).

MS. ARMSTRONG: Take a single point in your range.

MR. SMITH: Yeah.

MS. ARMSTRONG: Um --

MR. CATANIA: There's a range in that.

MS. ARMSTRONG: There's a range in that single point value. If you were to make more than one of them. I get that some of these are custom built you'll never make but one of them, we have other regs to deal with that. We can talk about those. But let's say you decide to make a hundred and we can all, I think, agree that not a hundred are going to test out identical, right.

MR. SMITH: Sure.

MS. ARMSTRONG: That's the range I'm talking about. So what should that one point be represented as?

MR. SMITH: Right. So what I'm going to suggest to you is that the deviation from the norm in certain parts of the performance map are going to be much tighter than the deviation from the norm in other parts of the performance map.
MS. ARMSTRONG: Okay.

MR. SMITH: And the measurement tolerance varies across the performance range and is documented in the 210, never mind the fan's performance.

MS. ARMSTRONG: Yes.

MR. SMITH: So this becomes a subject that has an extra dimension of complexity because of the way we propose to have the regulation.

MS. ARMSTRONG: Fair enough. And so I think it would be, you know, it is, let's see, what time is it? It's 4:30 now. We're wrapping up at 5:00 today. I think it would be good if you finish, Dan finishes his thing (indiscernible). No more talking about ranges and, and stuff with motors.

MR. DELANEY: I'd talk about it all night.

MS. ARMSTRONG: Perhaps give me some time to come up with an example of what this would look like and just kind of walk you through. If we were to do things the way we do normal business today, and overlay the potential regulatory approach as it is set out in the second NODA, how would, what would ratings look like?

MR. DELANEY: Uh-huh.

MS. ARMSTRONG: How would those ratings for each of those points be developed? And what information from you will we need. That way you can understand kind of how this
would work. But when you make a certified rating to the
Department, I mean, we understand every test point isn't
going to come out identical.

But, let's just say that, you know, we've done it
in a manner that we think the consumer, or the commercial
customer in this case, should get that or better performance
for the most part. Otherwise, there's something off with
your methodology or rating.

MR. SMITH: Dan, Bill Smiley, Trane, I have one
real quick --

MS. ARMSTRONG: So that's generally the high
level.

MR. SMILEY: -- question.

MR. DELANEY: Sure.

MR. SMILEY: And it surely has to do with what
you're talking about.

MR. DELANEY: Sure.

MR. SMITH: Yes, sir.

MR. SMILEY: If you go back, well --

MR. DELANEY: Which one?

MR. SMILEY: -- back to that chart that had all
the yellow on it --

MR. DELANEY: Yeah.

MR. SMILEY: -- which was your --

MR. DELANEY: Yeah, yeah, the motor, yeah.
MR. SMILEY: Your motor efficiency at various load points. And two things, one is, that's two pole and four pole, but we used a lot of six and eight pole as well.

MR. DELANEY: Yeah, and that's what I've noted here.

MR. SMILEY: And do you have that information?

MR. DELANEY: Yeah, yeah, absolutely. So what I was thinking before we even go do that. Let's really talk about what we really want. Do you really want fixed speed. What's really needed there. So before we go crazy, go getting it, we're ready need to talk about what's beneficial and got to get the metric. Got to do a lot of other decisions. Absolutely, we can go back maybe and deal with this.

MR. SMILEY: No, this is very good when you don't have a variable speed drive.

MR. DELANEY: Yup, correct.

MR. SMILEY: This is extremely good information and necessary. The question I have is, is this old motor data that's run like in 30 seconds on a whole speed work curve --

MR. DELANEY: No, sir, this is stabilized.

MR. SMILEY: -- or is this? Stabilized at some operating temperature that's --

MR. DELANEY: Full load.
MR. BOTELER: -- per DOE test methods.

MR. DELANEY: Yes, per DOE test method.

MR. SMILEY: I don't know what that is.

MR. BOTELER: IEEE 112 method.

MR. DELANEY: All you need to know is that's what we're regulated at. Right, that's the regulated method. That's what, that's what this all this data is provided at. Okay, last topic I had. This is the one, the only one I thought would be controversial.

MR. PERSFUL: This is Trinity, Twin City Fan. I just want to make sure I understand that last point you just said. So this, this table is at a 100 percent load.

MR. DELANEY: No, no.

MR. DELANEY: Yeah. So we go from a hundred to 25 percent at fixed speed, at fixed speed, because that's what was desired by the pump guys

MR. PERSFUL: Well, I mean at, at --

MR. DELANEY: At 60 hertz or whatever your base frequency is, yeah.

MR. PERSFUL: And so, so let's, I'm just trying to think this in my head, so let's say if we're at 40 hertz.

MR. DELANEY: And change, and the efficiency would less than comparing it to this, yes.

MR. PERSFUL: Correct --

MR. DELANEY: Yeah.
MR. PERSFUL: But is that going to be annotated? I mean, do we have a chart that goes, you know, 40, 41, 42?

MR. DELANEY: Right, so that's where the PDS discussion when you want that information, that's where that, that's where the reference loss is. That's where the equation. That's where I can test it. I can, then you can extrapolate it yourself. We can do it for you, right, so.

MR. PERSFUL: So we use the equations, so in cases where we just sell a bare fan, without the motor and drive, but it gets, let's say it gets tested with a, at least going to get tested with a motor.

MR. DELANEY: Yeah.

MR. PERSFUL: Is it, is it the, the, the thought of the working group that it, it's going to be tested using --

MR. DELANEY: So, I don't want to jump to that conclusion, because that is --

MR. PERSFUL: Will this equal value.

MR. DELANEY: -- that is certainly some of the discussion that needs to be still had here, but it, it certainly can be, right. It can be like the motor, like the pump guys decided. They just did equalized points; so they have a base, which was, like I said my memory, 75, 100, 125, just equally loaded at 33 percent each. Right, it's due to --
MR. PERSFUL: Because I'm, I'm thinking if I sell a fan at 40 hertz and so the DOE is going to survey that, that product to me at that point, you know, then do they reference a, a calculated method.

MR. DELANEY: We would have to have a table that would back that up; so whether that we provide that, whether we use that IC, right, we'd, one would have to be given this, because you always have to have a reference, right? You have to have a minimum that says you can't go below that for the motor. So how that would look, I, I don't want to jump to conclusions how it would look. Certainly, we could, we could come up with something, but we need to decide a lot of other things about how the metric and, you know, and then we certainly can put together some data to support that for you.

MR. SMILEY: Real quick, Ashley, Bill Smiley, Trane. Can you guys provide a link to the DOE motor test standard that defines the temperature and the process that you go through for that? I'd appreciate it, rather than try to find it myself.

MS. ARMSTRONG: Uh-huh.

MR. DELANEY: I'm surprised they didn't put it on there. Okay.

So, the last topic which, early on in this, you know, when I first came into this I assumed we had a lot of
continuous motors. Right, then I heard earlier on from AMCA and Wade most of, most of the motors are one horsepower and below. It's mainly air over direct drive motors, if you will, right?

So this is a product that has been on our radar for many years. It's out of the regulations. It's not going to be covered June 1st, 2016 either, okay? A lot of difficulties in doing this, if it was easy it would have been done long ago, okay? I'm sure many of you are familiar why it's difficult. And I'll just walk through a couple of items just for discussion. By no means are we giving up on this. This is an item that we're working on for our next regulation, which is small motors. And certainly, probably we'll have to work on it to support this regulation as well too. That's our hopes.

So just, just some of the reasoning, you know, and going to nameplate rating alone, that doesn't mean that much in the air motors. I'm sure a lot of you are shaking your heads yes; you understand that. It doesn't mean much. It's a current type thing. We give a sample. It's tested. I want to see that current within X amount, whatever your percentage is you want to see, they got, I got the right motor. Horsepowers don't mean nothing. What they do mean is at cold, we test them. They're assigned from the NEMA, break down torque. That's how we get the horsepower. It
means nothing. It's almost like a frame assignment to you, 
half with a half, a three quarter with a three quarter, 
right. It's almost like a substitution number. It's not 
really. It doesn't mean much. You don't care so much 
about. You care, does it move my fan within the operating 
parameter I need, okay? And that's why much of the air over 
market is sample.

And this isn't totally closed air. This is more, 
it includes that product. But I would say it's more of the 
open air over type product direct drive. Certainly 
centrifugal but it could be any prop fan or other. 
Certainly a lot of rooftop use, that's why there's belted or 
direct drive.

Obviously most people understand it doesn't have a 
fan on the back. It will overheat without that fan. 
Obviously the driven fan that's providing the cooling, some 
of the belted product works that way as well too. There is 
such a thing as, you know, they're kind of, they're created 
in the marketplace, so we can get continuous air over. 
Sometimes that's mean belted. You'll see a fan duty 
sometimes. It used to mean things in the past. It really 
doesn't mean anything anymore. It's legacy terms that kind 
of got carried over, but fan duty is to mean draft-induced 
or sometimes. It used to mean, used to mean belted in the 
past too. But the end result is, obviously at the air of
that product it's not that. It's not going to stay within
that and get a good efficiency point, right? It’s very
difficult to do that on a dime.

Where does this all originate. You all understood
this many, many years back. So they just do a cold point.
Literally, it's the shortest time you can get that motor on
the die now, get the current to stabilize. Done, you're
done with the rating. Wherever you want assign? Whatever
that torque does, that's the assignment of horsepower. It
doesn't really mean anything. It doesn't mean anything to
us. It doesn't really mean much to you, motor sampled. You
want to make sure that current is repeatable, but when you
put it in your fan, it's not within whatever your
percentage. Usually 10 percent is the UL rule. And that's
probably, probably similar to what you guys use to ensure I
got the right motor or my motor's operating as it should be.

Test method, obviously there is none. No industry
test method. The CSA C747, as a result of small motor rule,
NEMA manufacturer revised that standard dramatically. Just
improved, you know, many of the, we talk about power, you
know, quality. There's really no good term for this. It's
accuracy requirement says, what's your policy supply end has
to be. It’s what your torque requirement is. It's your
accuracy haul, your measuring equipment. That's a lot of
money. Motor manufacturers invest massive amounts of money
in our, in our motor test labs. And if you had do wire to
air, you'd have to do very similar major upgrades. And I
think some of you mentioned before, pump guy certainly saw
it at the end of the rule and we're very concerned with
that. You know, that's a major investment for you to have
to measure both amp watts at the levels necessary to get the
accuracies.

But, yeah, many, many issues and many, many costs,
but even if they did, okay, so what is mainly the issue
here. What we can't decide how you do the air over test.
So if we're going to do it just air over motor, do a CFM at
a static pressure. None of us like to do that, even though
most of us can do it. It's not something we really want to
do, is doing a bunch of blower testing or air chamber
testing. Air velocity at a specific point, you know, we can
put an manometer at a certain point on the motor and define
it within a certain position. Then that let's the
manufacturers do all kinds of crazy things on the fan and
air, and that's probably not very good.

Another way to do it, you can do temperature
stabilization. You can just say every motor has to
stabilize at this point. That's not great, because then it
makes the horsepower throw off as well too. A lot of air
over motors are very cool, 45 C range. You would, you would
penalize it by running that high, some a little higher than
that. Not many though. Many, many air over motors run very
cool.

And then as far as classification at the bottom, air over motors, they're, they're probably the least
efficient in the motor marketplace. There is no regulation
on them today. Down and dirty as we've heard most of this
marketplace is, right? Some PSCs are very efficient
product, but cap start induction run product is definitely
on the lower end of efficiencies. There's even shaded pole
and some, not much, on the very, very low end. I saw the
120 watts hovering around there, but mainly below 120 watts.

The technologies obviously in the less than one
horsepower. Many are single-phased and many are, as I
mentioned, shaded pole. There's, there's still a
significant number of split phase, PSCs certainly and the
cap start induction run, which obviously are, are less
efficient than the regulation for small motor today. And
none of those motors could ever reach the small motor rule
levels without growing a frame maybe even two frame sizes.
It makes it uncompetitive, so it would essentially push many
of those technologies, if we use that as a baseline. Or as
we said here, maybe we just define a whole new efficiency
level as a result of this committee that makes sense, that
drives what's necessary, or maybe, if you'd like, maybe we
have to develop our own set of efficiency levels based on
whether it's a certain type of single-phased technology.

    Obviously, I didn't include the ECM. That is a
higher efficiency product that obviously can meet many of
the products, but complicated because you, you can't really
use the test methods. It's not for an ECM motor to define
the losses. You can do it. Don't get me wrong, but it's
not intended for that use.

    So that completes my stuff. Any questions about
it?

    MS. ARMSTRONG: No, just one comment.

    MR. DELANEY: Yeah.

    MS. ARMSTRONG: So Paul, welcome. Last meeting,
DOE presented nominal values for TEAO motor. If you could
look at them --

    MR. DELANEY: Yeah, I --

    MS. ARMSTRONG: -- and give us some feedback on
them. You know, we have, I don't think I as a committee
we've decided or made any decisions or expressed any level
of comfort with these nominal values or even a nominal
approach yet, but I think having some feedback, or we at
least attempted to do it. We assigned some more of the
catalog information we were able to collect. I think, you
know, having your spin on what that might look like would be
helpful.

    MR. LIN: Okay. Now, now that last, I noticed
when I tried to go back and pull some of the other
information. I was able to find the last, but it did get
out on the, the --

MR. DELANEY: It didn't.

MS. ARMSTRONG: It may not be on the docket. I'm
not really sure what parts of that I’ve been sending out. I
sent it out, but it hadn't made it to the docket, but I'll
send it again.

MR. DELANEY: Okay, I don't think.

MS. ARMSTRONG: No problem. But it’s in the slide
document --

MR. DELANEY: Yeah, absolutely.

MS. ARMSTRONG: -- you nominal values based on
regulatory and then obviously nominal value. We attempted
to do nominal values for these. We did not go further for a
more, I would guess, the beginning part of your, what your
beginning part of you representation will take care of, but,
and that would be helpful.

MR. HAUER: I have a question back on the PDS.
It's Armin Hauer speaking.

MR. DELANEY: Yeah.

MR. HAUER: Are there any electrical procedures
included load side or line side on variable speed drive?

MR. DELANEY: It goes back to the PDS concept.

MR. HAUER: Yeah.
MR. DELANEY: The input/output is you're measuring input of a control, output of the, of the motor.

MR. HAUER: All right. But would you not be able to fetch your, basically artificially increase where efficiencies if you neglected to use load side filters?

MR. DELANEY: Yes, so, let's go back to that, yep. So that is accounted for in the test, in the test, obviously not reference, right. So obviously losses of the, I took that one slide out. It actually showed all the measurement points. It just got, I didn't want to get into too many things, but you see what that dotted line is. That's actually where we'll be polling voltage watts from as well to during the test. I know this isn't the representation of that, but it's measuring both in front and behind. It's isolating the CDM when you do the test. You have to know it includes any auxiliaries or filters upstream or downstream in the CDM.

So the CDM is the one that's penalized for it, because obviously they're the ones necessary probably to have the filtering, you know. So it's incorporated into the CDM test.

MR. HAUER: But okay some manufacturer will be here for AHRI 1210 certification. Now, one manufacturer so far has certified their products. And AHRI 1210 also judges about specs on the motor, and it also judges about how long
it's induced in the, into the line. And so you could
basically boost your efficiency in the PDS if you left you
left out the filters, so how would this change?

MR. DELANEY: Good question. So there is a base
line test point set of carrier frequencies, a base setup
that has to be repeated each time on the test. So it says
regardless of what you want to use it and this is the same
test. So if I go from one place to the next, this is the
test setup that has to be done on the drive each time. So
that's, that's the only way to make it fair, is to make a
setup that each person has to repeat. So that's how it
deals with that, okay.

MR. BUBLITZ: I have a question. Mark Bublitz,
New York Blower. So there's DOE standard losses that were
published, you know, published. And then there's this
approach, right. Is this working group supposed to pick
which one and what's that, what's the action?

MR. DELANEY: But we don't, we don't have a
proposal, so I, I, just to make that clear. I don't have
any proposal for air over.

MS. ARMSTRONG: No, no, but you have for the
other, the rest of them.

MR. BUBLITZ: No, I'm talking about the whole
product.

MR. DELANEY: I don't know.
MS. ARMSTRONG: We do.

MR. DELANEY: Do, for, you mean for this, for the PDS, yeah, yeah.

MS. ARMSTRONG: Yeah. So, yeah, and we would have to have that discussion about where we want to go. Do we want to do something like, and I'm not sure they are that different, but I think there are some, some differences in terms of for the nominal approach, do we would want to use something setup like this. I'm not sure Dan's process will actually be done in order for us just to point to by the time they may need it in the test procedure hearing. So we may have some timing issues there. But do you want it to move to an approach like this or do we want to do our own thing similar to what we did in pumps? And pumps used aspect of this, so they're not completely off and they're not different. They're pretty similar, but they're not exact.

MR. SMITH: Is this to set the default values?

MS. ARMSTRONG: It's to set the default values. It's not the nominal values. And maybe you don't care, as long as you have that ability.

MR. SMITH: No, I don't care.

MS. ARMSTRONG: You care as long as you have that ability and care as long as they're setup in a way that, I think, A, provides you meaning results, but B, they also
protects you if DOE were to test, do actual testing that the
ing rating is still, is equitable as being a nominal method and
tested method. Anyway, you can hold that it, the answer,
simple answer to your question is yes, that it’s open to
discussion and building on whatever else you want to do.

MR. DELANEY: It's a little complicated by the
fact that if we said a majority of it is air over and you
don't have an efficiency level, then you make big assumption
to I3 or NEMA premium, and that's a big assumption that
changed the motors you get today would dramatically change
for you.

MS. ARMSTRONG: That's why that table is pretty
important.

MR. DELANEY: It is, it's very important, yeah.
That's very important. If we use that reference loss.

MS. ARMSTRONG: You could also say for certain
types of motors, do they always have to get tested. And
that's the other options. It's also, it's within your
purview to have that kind of discussion here, depending on
what you may want. So that's why some of the questions we
had teed up from the last set of, and I know you guys both
had some of them, but some of the questions we had teed up
with regards to the last set - how do you test some of the
answers to your questions and then nominal approach versus,
um, wire to air approach. That’s why some of those are
important. It gets to the heart of which way we want to go.

MR. SMITH: So let me ask you a question. Say I've got a fan that has maximum speed and sort of a worst case scenario, it, it carries 75 horse motor, but in its performance map it has, demands that drop all the way down to one, to one horse, right?


MR. SMITH: So now I'm making that product and I'm selling it as a bare shaft band and I choose to, for those that ask, and they certainly will, I choose to use the default value to determine the wire to air efficiency of assembly. It has my fan and I don't know whose motor, so it's not my, not my problems.

MS. ARMSTRONG: Right.

MR. SMITH: Customer buys that stuff, packages it. He wants to know what the wire to air is. I give him the answer, life goes on. Is the default values used in that computation to a one horse motor since this fan can be applied with a one horse motor, and it's catalogued with a one horse motor?

So, so I, I mean --

MS. ARMSTRONG: Go ahead.

MR. SMITH: Or is this, uh, is this a matter that we'd have to debate and decide upon, or it, okay.

MS. ARMSTRONG: This was one of our items of
feedback, that we had to decide.

MR. DELANEY: So a key is that duty cycle. What do you want in that metric, right.

MR. SMITH: No, you're, you're not on the same wave length here because --

MS. ARMSTRONG: Motor --

MR. SMITH: We're proposing that, that --

MS. ARMSTRONG: It's motor -- right. I mean that's really what you're asking.

MR. DELANEY: No, that's independent --

MS. ARMSTRONG: It's just sizing.

MR. SMITH: I'm sorry?

MS. ARMSTRONG: It's sizing and we kind of --

MS. IYAMA: So I think what you're asking is what size motor do I pick when I'm calculating my rating.

MR. SMITH: As a default value.

MS. IYAMA: As the default value. And I think --

MR. SMITH: And I'm going to say that the only time this matters is, is when I want to represent a particular motor and drive combination that carries the default.

MS. IYAMA: Right, so I think here is the different, different situation.

MR. SMITH: Because the default value in my calculation shows up in both the numerator and the
denominator --

MS. IYAMA: Right.

MR. SMITH: It doesn't actually matter

MS. IYAMA: Right, so the -- .

MR. SMITH: The time that it matters, right, is when I certify a particular motor and drive with efficiency I'm going to claim is above the default, right.

MS. ARMSTRONG: So I, the answer is yes, but I actually will go as far as I think it does matter, because I'm not sure we're going to end up at an index. And even if we did end up at an index, I'm not sure that index is a moving index, in which case they would always cancel out, depending on how we go with this. So I think we should assume it does matter --

MR. SMITH: Well, it matters --

MS. ARMSTRONG: -- because I think that's the better way to go. That it could matter.

MR. SMITH: It could matter even in the default calculation?

MS. ARMSTRONG: Correct. Because I'm not sure we're going to end up with an index. I mean, I know you guys want an index for purposes of making representation, but the standard's not an index.

MR. SMITH: Whether or not, whether, whether or not it's an index, Ashley, if I'm a manufacturer and I'm
making a product and selling it with bare shaft, I do not
want to be tested or held responsible for the performance of
the things that I didn't make or sell.

MS. ARMSTRONG: Right, so I understand. You don't
want to be held responsible for, I'll just say it, an
underperforming motor, got it.

MR. SMITH: Well I don't sell motors.

MS. ARMSTRONG: Got it, that being said, that's
why these issues are important. That's why the nominal
values and the way they are constructed are important.
That's why some of the questions we had teed up previously
and the way we're trying to construct the nominal values are
conservatives because of this issue specifically.

MR. SMITH: But when are we going to talk about
the pros, cons and difficulties and challenges associated
with the ratio FDIs?

MS. ARMSTRONG: So I guess this is a good time to
talk about what may come tomorrow because it's almost 5:00
and what topics does the working group really want to talk
about tomorrow in this room again. So, you know, be
prepared, mentally and otherwise.

MR. SMITH: And we’re here at 8:00 in the morning.

MS. ARMSTRONG: We are.

MR. BOTELER: It's 8:00 to 3:00.

MS. ARMSTRONG: You can go off record now. We're
good. Thank you.

(Whereupon, the meeting was concluded.)
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ASRAC FANS AND BLOWERS

WORKING GROUP MEETING

By:

Robin Conover, Transcriber