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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.  
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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

1 Aircoil Company, alternate member for the cooling  
2 technology.

3 UNIDENTIFIED MALE: Thank you.

4 MS. ARMSTRONG: You're welcome.

5 MR. ERNST: Skip Ernst, Daikin Applied.

6 MR. WHITWELL: Bob Whitwell, Carrier.

7 MR. DYGERT: Ryan Dygert, Carrier.

8 MS. PETRILLO: Laura Petrillo-Groh, Air-  
9 Conditioning, Heating and Refrigeration Institute.

10 MR. FLY: Mark Fly, AAON.

11 MR. WINNINGHAM: Dave Winningham, Allied Air.

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

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

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

17 MR. JOHNSON: David Johnson, Berner International.

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

20 MR. DIKEMAN: Steve Dikeman, AcoustiFLO.

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

25 MR. SMILEY: Bill Smiley representing Trane.

1 MR. SMITH: Wade Smith with the Air Movement and  
2 Control Association.

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

5 MR. HAUER: Armin --

6 UNIDENTIFIED FEMALE: No. Go. Sorry.

7 MR. HAUER: Sorry. Armin Hauer of ebm-pabst in  
8 Connecticut.

9 MR. DADDIS: Duane Daddis, Carrier.

10 MR. BUBLITZ: Mark Bublitz, The New York Blower  
11 Company.

12 MR. HOWE: Nick Howe, Carnes Company.

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

15 MR. WOLF: Mike Wolf, Greenheck.

16 MR. ROY: Aniruddh Roy, Goodman.

17 MR. MCCABE: Michael McCabe, consultant to Trane.

18 MS. ARMSTRONG: Ashley Armstrong, DOE.

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

21 MR. COCHRAN: Pete Cochran, DOE.

22 MR. JASINSKI: Sam Jasinski, Navigant consultant.

23 MR. WIGGINS: Steve Wiggins, Newcomb and Boyd.

24 MS. SHEPHERD: Amy Shepherd, Air-Conditioning,  
25 Heating and Refrigeration Institute.

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

3 MR. MATHSON: Tim Mathson, Greenheck Fan.

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

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

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

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

13 MS. JAKOBS: Diane Jakobs from Rheem.

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

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

18 UNIDENTIFIED MALE 1: Okay. Any other Working  
19 Group members online at this point? So, once again, welcome  
20 to the fifth meeting of the ASRAC Fan Working Group.  
21 Ashley, were there other housekeeping matters, or did you  
22 want to go into the status of homework and the updates  
23 there?

24 MS. ARMSTRONG: Yeah, so I guess this would be a  
25 good time just to talk about the agenda really quick, to

1 touch base on a few things. I, I do want to go through the  
2 list of homework items that we had sent out like right  
3 after, couple days after the previous meeting, and see where  
4 we are on each of those. I know we had a handful of  
5 requests to speak. I tried to catch them all last night  
6 before I, when I was writing this agenda, but I might have  
7 missed some. If, if anybody else would like to speak,  
8 you're welcome to do so. If you have a presentation or a  
9 file that you would like to share, either it's with regards  
10 to detailed responses to homework, or specific items that  
11 the committee's been grappling with, Alex is happy to load  
12 that if you have a, you know, little disk, any, load that so  
13 that everyone can see it. I didn't print out the individual  
14 presentations though.

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

21 One is, DOE is going to give our presentation of  
22 the NODA in terms of how the analyses were conducted, what  
23 types of data sources were used, let each of us kind of walk  
24 you through what we've already published with regards to the  
25 analysis for fans and blowers to date. One of the things

1 that I also wanted to do, and it's kind of, we touched on  
2 this a little bit last meeting, but it's kind of a new, new  
3 subject to this group. It's discuss representations and,  
4 and kind of how you make representations, what does it mean  
5 to come up with a representative value or a rated value for  
6 your fan or blower, you know, how does that work typically  
7 with DOE regs, what are some options on the table here and  
8 then what does that mean in terms of certification and  
9 ultimately enforcement of those rated values. And that's  
10 just more of to give you a sense of what we do to date,  
11 generally speaking for all products. I think it might be  
12 helpful to inform you about that aspect of our regulations  
13 as we move forward. So that's more of a, I'm doing that ad  
14 hoc. I didn't actually come up with a presentation in the  
15 middle of the night last night. But hopefully we can have  
16 that dialogue towards the end of the day.

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

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

24           MS. ARMSTRONG: Yes.

25           MR. BUBLITZ: Okay. Can we identify ourselves on

1 the record as we speak?

2 MS. ARMSTRONG: That's fine.

3 MR. SMITH: This is Wade Smith.

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

6 MR. SMITH: This is Wade Smith.

7 MR. BUBLITZ: Wade.

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

22 MS. ARMSTRONG: So that's really up to the Working  
23 Group. I think at some point it would be helpful for  
24 someone from AMCA, or whomever at that point, to present the  
25 definitions to the Working Group to get the Working Group's

1 feedback before you present. I mean, obviously.

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

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

8 MR. SMITH: Right.

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

11 MR. SMITH: Sure.

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

17 MR. SMITH: Okay.

18 MS. ARMSTRONG: Anybody else?

19 MR. HAUER: I have a question.

20 MS. ARMSTRONG: Yes.

21 MR. HAUER: Armin Hauer of ebm-pabst. I was  
22 wondering, is the Department obligated to, to any  
23 international commonization of standards? Obviously, all  
24 the trans, the trans-Pacific trade deals going on and the  
25 Atlantic trade deal, do we have to commonize (phonetic sp.)

1 any of that standards or can we reinvent the wheel here?

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

14 MR. HAUER: That's fair enough.

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

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

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

23 UNIDENTIFIED MALE: Yeah, I did it.

24 MS. ARMSTRONG: Great. Anybody else? All right.  
25 We're going to go through the list of homework items. And

1 I'm just going to go through them one by one. I don't have  
2 them on the board, but so one of the things I said we'd do  
3 is schedule meeting times, location. Everybody has those  
4 now and we've updated our website. We should all have where  
5 the meeting is, what, all the various times it starts and  
6 ends and all the various places that we could be meeting.  
7 Everyone have those that need that information? We're good?  
8 Okay. Check. Amber will provide feedback on the compressor  
9 cutoff definition on a fan. I think you provided something  
10 about her and I wonder if you want to just give a high level  
11 explanation of what you provided in case anybody has any  
12 other feedback they'd like to.

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

15 UNIDENTIFIED MALE 2: Oh, joules per kilogram.

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

22 MS. ARMSTRONG: Okay. Does anybody else have any  
23 feedback on that item? We're in general agreement on that  
24 one? Okay. Great. So that saying, I said we'd send out  
25 redline to the presentation. Everyone got the

1 presentations, they were submitted, they were sent out a  
2 couple days after the last Working Group meeting, so  
3 hopefully they helped you in advance.

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

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

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

19           You want to do opening presentations first?

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

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

24           UNIDENTIFIED MALE: Okay.

25           MS. ARMSTRONG: -- we can do that. Okay. Sounds

1 good. Next is AHRI will provide some type of proposal to  
2 the Working Group regarding the scope that attempts to  
3 address the concerns voiced within the working group  
4 regarding delineation and how, how it expands use and data  
5 and energy use. So I think, Laura, you have the  
6 presentation loaded, or do you want to --

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

11 MS. ARMSTRONG: Okay. Great.

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

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

19 MS. PETRILLO-GROH: For the next meeting.

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

22 MS. PETRILLO-GROH: At least some --

23 MS. ARMSTRONG: Twenty something?

24 MS. PETRILLO-GROH: -- at some of we'll be able to  
25 have for that.

1 MS. ARMSTRONG: Okay. So the other thing we did,  
2 before we jump into the presentations, was we had asked  
3 about specific items for feedback regarding the test  
4 procedure. We had listed a bunch of test procedure items  
5 with regards to AMCA 210. Have you guys had a chance to  
6 look at some of those questions?

7 UNIDENTIFIED MALE: Yes.

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

11 UNIDENTIFIED MALE: I didn't have a presentation.

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

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

18 MS. ARMSTRONG: Some --

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

22 MS. ARMSTRONG: Great.

23 MR. SMILEY: So --

24 MS. ARMSTRONG: So with that, would you like to  
25 take the floor?

1 MR. SMILEY: Well, I thought we were going to  
2 do --

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

4 MR. ERNST: Yeah, okay.

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

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

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

9 MR. ERNST: Is there a dancing bit?

10 UNIDENTIFIED MALE: No.

11 UNIDENTIFIED FEMALE: No.

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

14 UNIDENTIFIED MALE: Do you want to explain that?

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

16 UNIDENTIFIED MALE: No, no, no, no.

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

18 MR. ERNST: Preso.

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

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

22 UNIDENTIFIED MALE 2: The first one was --

23 UNIDENTIFIED MALE 1: (Indiscernible).

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

25 MS. ARMSTRONG: All right.

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

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

9           MR. ERNST: Okay.

10          UNIDENTIFIED MALE: Okay. Thank you.

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

23          UNIDENTIFIED MALE: Yes.

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

1 MR. ERNST: Please.

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

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

6 MR. FERNSTROM: Okay.

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

8 MR. FERNSTROM: Thank you.

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

1 summertime air.

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

1 return air section, whatever you want to call it.

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

14           Now, the first problem that you're going to have  
15 on a supply fan only system, with a negative pressure here,  
16 atmospheric pressure here, you can't exhaust air. Right?  
17 Negative pressure here. This is zero pressure or  
18 atmospheric pressure. There's no exhaust from this supply  
19 fan only system from the back, from the rooftop exhaust  
20 section. That's a problem. That's the first problem and a  
21 big one. And again, this is, now when that happens, when  
22 you, if you end up with no exhaust from the unit, then the  
23 supply fan starts, it starts pulling air through two paths.  
24 The planned air path is back through the return air portion  
25 of the unit. But it's also pulling in outdoor air for

1 ventilation. And that ventilation air can't exhaust here.  
2 What it does is it builds up pressure in the space so that  
3 the air goes out through the walls of the building and then  
4 back through the outdoor air. Those are the two air paths  
5 that you will start generating on that supply fan only  
6 system. And again, whenever you have two parallel air flow  
7 paths, you get equal pressure drops through each path, it's  
8 just the air will, you know, adjust itself until you get  
9 equal air pressure drops.

10           So, now what happens on a tight building when all  
11 the doors are closed? What's going to happen? You've got  
12 this outdoor air, air damper open, the fan is going to be  
13 trying to draw in some outdoor air, but that outdoor air has  
14 to go someplace. The only way is to build up a big positive  
15 pressure in the space so that it goes out through the walls  
16 and that's why you often will walk into a building and open  
17 the door and you'll feel a blast of air in the face, because  
18 the door was shut and it built up this positive pressure. I  
19 bet everybody has experienced that. And again, that's  
20 typical of a supply fan only system where, again, you're  
21 having trouble exhausting air through the intended exhaust  
22 path. Instead, you're exhausting through the building. Now  
23 when the doors open, then you have this wide open path of  
24 outdoor air into the building and then out through that door  
25 and you get all sorts of ventilation air. Way more than was

1 intended. So you get, that's where you start wasting  
2 energy. Now when the doors shut, it's a tight building.  
3 You get very little ventilation control and there you get  
4 your problems with insufficient ventilation and poor indoor  
5 air quality. At the end of the day, you've had no control  
6 is really what you have. It just depends on what happened  
7 is when, you know, people go in and out of the building you  
8 go from excess positive pressure to all sorts of, you know,  
9 excess outdoor air when the, when the doors open.

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

15 UNIDENTIFIED MALE: That's a problem.

16 MR. ERNST: Now this is where you end up with a  
17 second problem. You have this big negative pressure trying  
18 to pull air in through this outdoor air damper. As we said,  
19 whenever that, those door open, you get an, all sorts of air  
20 coming in because you have this big suction pressure at this  
21 point. The, so again, at, this is, you're going to end up  
22 with very poor ventilation control is the second problem.  
23 And I'll show you a little bit about dampers. You can even  
24 quantify this to some extent. I can't reach to all portions  
25 of the screen. But this is, your dampers, as damp, this is

1 as your dampers open and close. This is zero percent open.  
2 This is 100 percent open and then that, this would be zero  
3 percent air flow and 100 percent air flow. And this would  
4 be typical damper operation. And this is where you have  
5 very little pressure, suction pressure across the damper in  
6 a closed position. And this is where you have tremendous  
7 pressure across that damper. What happens in this scenario,  
8 you open the damper just a very slight amount and you get  
9 all sorts of air, because you've got all that suction  
10 pressure on the damper when it's closed. Now, that's the  
11 poorer control situation.

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

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

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

22           UNIDENTIFIED MALE: Remember, identify yourself.

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

24           MR. FLY: This is Mark Fly from AAON and that  
25 looks like an opposed blade damper. I mean, if you look,

1 the opposed blade damper will have a more linear effect than  
2 a, than a parallel blade (indiscernible).

3 MR. ERNST: Okay.

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

6 MR. ERNST: Yeah.

7 MR. SMILEY: What type of damper it is.

8 MR. ERNST: Yeah.

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

11 UNIDENTIFIED MALE: Let's go.

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

24 This would be the, adding a return fan to that, to  
25 that unit. Now you set up the return fan, you draw this,

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

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

13 MR. WIGGINS: Yeah, I have a major disagreement  
14 with what you've shown because you're assuming that you  
15 don't know how to design a system properly, you don't know  
16 how to set the controls up to make it work. You can design  
17 a supply only system and select your duct design properly,  
18 select your dampers properly, install your controls properly  
19 and make a supply only system work with a variable exhaust.  
20 Can it work the way you've shown it? Well, the sad  
21 statement is, the vast majority of them that are installed  
22 today work exactly like you showed because they're not set  
23 up properly. They're not designed properly. But you can  
24 take a supply only system and make it work. I set them up  
25 all day, every day and make them work. So, what your

1 example is, is right. That's how we typically see them in  
2 buildings today, but I can design the system with only a  
3 supply fan and set it up and make it work, because the Navy  
4 in 1978, '74 through '78, did a research project on over  
5 1,500 buildings that were designed with return fans and  
6 supply fans to determine why they were having so many  
7 problems with fan tracking and what, and how it's  
8 controlled. And they determined that, I'm sorry, my name is  
9 Steve Wiggins. I forgot to say that when I started talking.  
10 They determined that in 99 percent of those cases, with  
11 proper design, they could have completely eliminated the  
12 return fan. In some of the cases, they felt like they  
13 needed a relief fan, but not a return fan. And so, with  
14 proper design, I can do everything you're talking about  
15 without having a return fan. I may be limited on space and  
16 configuration to be able to size the return ductwork  
17 properly and be forced to make a return, return fan  
18 selection and make it work. But let's get it on the record  
19 that I can design supply only fans, set it up, make it work  
20 and it'll work well.

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

23 MR. WIGGINS: Sizing of return ductwork is the key  
24 element of it. The size of the dampers, the type of the  
25 dampers you talked about, the controllability is a key

1 element. Where am I going to monitor my building pressure  
2 and how I'm going to control the dampers has a key part of  
3 it? But I can set relief up and do all of that and make it  
4 work. We do it every day, all day long.

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

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

10 MR. ERNST: Okay.

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

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

15 MR. WIGGINS: Exactly. Exactly.

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

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

21 MR. ERNST: Uh-huh.

22 MR. WIGGINS: -- with proper design, and I don't  
23 even have to have a return fan in a lot of applications. I  
24 personally feel like the vast majority. When I do need a  
25 return fan, even sizing the ductwork can minimize the impact

1 you talk and other control strategies can help them get what  
2 you're talking about.

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

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

8 MS. ARMSTRONG: Okay.

9 MR. ERNST: Yes?

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

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

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

20 MR. ERNST: Uh-huh. Agreed. Yeah.

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

1 whole load that the supply and the return fan would be  
2 carrying.

3 MR. ERNST: Right.

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

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

19 MR. STARR: So this is Louis Starr of NEEA. So I  
20 just came off of the commercial air handler rulemaking where  
21 AHRI provided shipments and they looked at it. And I can  
22 tell you what we were using in the static were 7 and a half,  
23 15 and 30 tons, which covers, you know, a certain size range  
24 of air handlers. We were using one inch static pressure for  
25 the whole system. That's supply and return. That's the

1 external static pressure, so. Kind of going into what Steve  
2 Wiggins said, and also if you look at where the, that the  
3 kind of units, there's a surprising, a lot of constant air  
4 volume units, so they're actually pretty simple systems.  
5 What, what you're showing here is, is a more complex system,  
6 but what it, it doesn't really capture much of the  
7 population is what I would say. And that's right off, it  
8 shouldn't, I was surprised too. I would think there would  
9 be lot more kind of VAVs, stuff with VAV boxes and  
10 distributed air systems, but a lot of it is just kind of  
11 your plain, simple retail-type stuff with a, you know, a 20  
12 ton unit on a large box retail store and, you know, you've  
13 got to drop, drop a supply only unit and the return's kind  
14 of right there, so.

15 MR. ERNST: That is where the biggest portion of  
16 the rooftop market exists in quantity of units. But there  
17 are quite a few large units with, one, two, three, four,  
18 five story buildings with ducted returns. And that's where  
19 --

20 MR. STARR: Right.

21 MR. ERNST: -- this issue --

22 MR. STARR: Well --

23 MR. ERNST: -- comes into play.

24 MR. STARR: And that's what I'm saying. What, if  
25 you back and you, those are public record. When you'll see

1 exactly how many of them are and it's surprisingly, it's not  
2 that many units, but I mean, I think it's an important issue  
3 and it's worth talking about, but in, in the scope of how  
4 much energy and how much is related to these units, we  
5 should definitely take a look at that and I think it would  
6 be worthwhile to understand the, the effect of what you're  
7 describing to us.

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

17 UNIDENTIFIED MALE: What's the --

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

20 UNIDENTIFIED MALE: Wasn't it 24 percent?

21 MR. WHITWELL: It was 24 percent of --

22 UNIDENTIFIED MALE: Is that a lot?

23 MR. WHITWELL: -- that includes a large volume in  
24 the 20 to 30 ton. If you look at the 30 ton and above, the,  
25 the numbers are more like 75 percent. Okay? Now you won't

1 see that in the data, but, but that's, that is the case.  
2 And what Skip is describing here is not only equipment up to  
3 63 ton, but this is equipment that is above 63 tons has  
4 these same, has these issues as well. So, we're talking  
5 about --

6 MR. STARR: Yeah, okay.

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

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

15 UNIDENTIFIED FEMALE: Limited might be the right  
16 word.

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

23 MR. WHITWELL: No, that was not --

24 UNIDENTIFIED MALE: Yeah.

25 MR. WHITWELL: -- part of that --

1 UNIDENTIFIED MALE: No.

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

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

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

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

11 UNIDENTIFIED MALE: We had no reason to collect --

12 MR. STARR: Right.

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

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

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

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

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

23 UNIDENTIFIED MALE: Okay.

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

25 MR. WHITWELL: And, and, I'm sorry, this is Bob.

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

12 MR. ERNST: And --

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

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

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

25 MR. ERNST: Yeah.

1 MR. WIGGINS: So we, we actually were doing.

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

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

7 MR. ERNST: Yeah.

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

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

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

22 Now, if you add an exhaust fan to the unit, things  
23 work a little differently. The, you can, again, add an  
24 exhaust fan, draw the negative pressure at the inlet of the  
25 unit and the fan provides the exhaust pressure that you

1 need. So that the exhaust fan takes care of that no exhaust  
2 problem. Takes care of this no exhaust problem. Just like  
3 the return fan did. However, the, you still have this big  
4 negative pressure at the outdoor air intake, so you still  
5 have that same potential problem, you can't control your  
6 ventilation air as well with a, an exhaust fan on this type  
7 of application as you can with a return fan. The, now the  
8 exhaust fans can be applied to save energy compared to a  
9 return fan. They, they don't maybe do as well on the  
10 ventilation control on that high ducted pressure return, but  
11 the more, the supply fan, as someone already mentioned, the  
12 supply fan is doing more of the duty. The exhaust fan is  
13 only sized to handle your maximum exhaust air flow.

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

23           So, with all that, I, this was the thought that I  
24 wanted to leave you with. The, I mean, we focused on a  
25 rooftop with a ducted return with a fairly good sized

1 pressure drop. The issues apply, it's just a matter of how  
2 big is that return pressure drop. That tells you the  
3 magnitude of the problem. The problem's very big on the  
4 application I showed you and I can assure you on 40, 50 and  
5 large ton rooftops, this is your typical example. Almost  
6 every one of our orders comes in with a return fan or  
7 exhaust fan and they're all sized for about an inch of  
8 pressure. That is your typical value on the orders we  
9 receive. The, the, when you add the return fans and the  
10 exhaust fans, you can properly control building pressure and  
11 you're going to need that as you get pressure drops larger  
12 than this. But, and return fans and exhaust fans, they  
13 perform differently. The, you size them differently. They  
14 perform differently. It, the building designer has to  
15 choose, they, this is, these are valuable tools for the  
16 designer and they're in the best position to decide. Do you  
17 need one of these fans and which one? Agree? Little bit?

18           Okay. The, now if you look at a, if you put a  
19 supply fan and a return fan in a box, the, you put the same  
20 fan, both your supply fan and your return fan in that same  
21 air handler, in that same rooftop, in that same box, here's  
22 what's going to happen. You're typically going to see a  
23 peak efficiency line somewhere like this. Your supply fan  
24 is going to have about two or three times more static  
25 pressure than the return exhaust fan, so it relatively is

1 going to be much closer to the peak efficiency line and, and  
2 much, and more efficient. The, again, AHRI is collecting  
3 data on this and we'll see what all the manufacturers  
4 submit. But what we submitted to AHRI would show that what  
5 we typically see is the exhaust fan, return fan is about  
6 one-half or two-thirds the efficiency of the supply fan on  
7 our typical applications.

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

14 MR. ERNST: Right.

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

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

1 UNIDENTIFIED MALE: So why do you do it?

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

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

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

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

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

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

1 MR. FERNSTROM: Okay. Thank you.

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

4 MR. SMILEY: Yeah.

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

6 MR. SMILEY: Yeah, for the most part.

7 UNIDENTIFIED MALE: Yeah.

8 MR. FLY: But it's --

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

11 MR. SMILEY: Depends on the application.

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

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

14 UNIDENTIFIED MALE: That was Bill Smiley talking.

15 MR. SMILEY: Sorry.

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

19 UNIDENTIFIED FEMALE: Speak up, please.

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

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

1 conventional metrics --

2 MS. PETRILLO-GROH: Right.

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

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

8 MR. FERNSTROM: Yes.

9 MS. PETRILLO-GROH: Okay.

10 MR. ERNST: Yes?

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

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

25 MS. PETRILLO-GROH: Yeah, let's, could we return

1 to this when we, once he finishes, because I'd like to talk  
2 through it a little bit more?

3 UNIDENTIFIED MALE: Sure.

4 MS. PETRILLO-GROH: Thank you.

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

17 Now this is why the return fan is not sized near  
18 peak efficiency. The, this would be your typical, it's one  
19 way of designing an air handler or a rooftop, the air  
20 handler portion of a rooftop. The, looking at a plenum fan,  
21 again, this would be looking at an elevation use with return  
22 air coming back in this direction to a plenum return fan and  
23 your plenum supply fan being down at the discharge end of  
24 the unit. Your filters and coils are typically sized for  
25 about 500 feet per minute. The, that's because you don't

1 want to blow water off the cooling coil and it's, again,  
2 where, at least where your, some, a lot of your filters are,  
3 depending on the type of filter you're choosing, it is a  
4 fairly common arrangement to see this arrangement with about  
5 a 500 foot per minute velocity. Now your outdoor air  
6 dampers, return air dampers, exhaust air dampers all work  
7 pretty well at 1000 feet per minute. At double the velocity  
8 and what happens is the designers are able to downsize this  
9 portion of the unit. You kind of put the return air fan,  
10 your return air fan needs to go into this return section and  
11 you can set up and design and, a unit like this in this  
12 configuration. But again, there's more room for the supply  
13 fan than there is for the return fan. And as we saw in the  
14 last example, this fan actually has to be bigger to have the  
15 same efficiency than the supply fan. So this is how your,  
16 this would be the typical designs as you see them today.  
17 There's other arrangements that you typically will see.  
18 This part of the return, the return economizer section,  
19 outdoor air section, has been sized smaller and the return  
20 fan has been squeezed into it and this has been going on for  
21 20 or 30 years, 40, 40 years.

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

1 pulling up?

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

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

9 MR. ERNST: Right.

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

15 MR. ERNST: Uh-huh.

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

23 MR. ERNST: Yes, I agree.

24 UNIDENTIFIED MALE: Okay.

25 MR. ERNST: Now this is what you'd have to do to

1 put in a return fan of equal efficiency. It's going to not  
2 have to be bigger than the supply fan, because it's applied  
3 at, at a lower static pressure for the same CFM. And you  
4 can see, the unit is going to have to grow tremendously, and  
5 you completely redesign to put in a return fan in the same,  
6 it's going to be analogous for an exhaust fan too. The, the  
7 units as they exist today will have to be completely  
8 redesigned. They will not work on replacement applications,  
9 especially on indoor applications where you're especially  
10 space constrained, but you also have flatbed sized  
11 limitations and so on. Yes.

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

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

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

21 MR. FLY: Yeah. This is Mark Fly of AAON. I  
22 don't think we can because we really, this is not data that,  
23 that we have typically collected. And I know for my  
24 company, we're, it's, it's painful that we're going back and  
25 basically looking at every order to extract this data,

1 because this is not something that we collect, on what size  
2 supply fan and steady pressure was, was selected with, with  
3 the supply and the return. So, I think the push-back you're  
4 seeing is yes, I know that you guys have, have a, has, have  
5 attempted to accommodate it. I don't think we know at this  
6 point whether it's sufficient or not. And that's --

7 UNIDENTIFIED FEMALE: That's the --

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

9 UNIDENTIFIED MALE: I think the data will tell us.

10 MR. Fly: Well --

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

17 MR. ERNST: Uh-huh.

18 MR. FLY: Well --

19 UNIDENTIFIED FEMALE: But in the premise --

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

21 UNIDENTIFIED MALE: Well --

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

24 UNIDENTIFIED MALE 1: -- by their training. I  
25 think the analysis has been today is really more fan

1 standalone and not embedded fans and products. Because the  
2 cost increase of the product if you put a bigger fan in, I  
3 don't think is included in your analysis. I don't know for  
4 a fact, but I suspect that. And that's what we're trying to  
5 work towards.

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

10 MR. ERNST: All right.

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

14 UNIDENTIFIED MALE 2: Right. But the  
15 regulation --

16 UNIDENTIFIED MALE 1: -- is equal.

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

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

20 UNIDENTIFIED MALE 2: -- does not have that.

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

23 UNIDENTIFIED MALE 2: Right.

24 UNIDENTIFIED MALE 1: -- of measuring. The metric  
25 to measure torques.

1 UNIDENTIFIED MALE 2: Right. Right.

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

4 UNIDENTIFIED FEMALE: Right.

5 UNIDENTIFIED MALE 1: We don't know.

6 UNIDENTIFIED FEMALE: So what --

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

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

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

17 UNIDENTIFIED MALE: Correct.

18 UNIDENTIFIED FEMALE: Right.

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

21 UNIDENTIFIED FEMALE: Right.

22 MR. SMITH: Maybe --

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

25 UNIDENTIFIED MALE: Wait. Wait. One person speak

1 at a time.

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

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

5 UNIDENTIFIED MALE: And have done.

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

9 UNIDENTIFIED MALE: So --

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

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

24 UNIDENTIFIED MALE: Please identify yourself.

25 MR. WHITWELL: Bob Whitwell, Carrier.

1 UNIDENTIFIED MALE: Thanks.

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

11 UNIDENTIFIED FEMALE: Right.

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

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

23 UNIDENTIFIED MALE 1: Not yet.

24 UNIDENTIFIED MALE 2: Not, but that's the intent.  
25 Right?

1 UNIDENTIFIED MALE 1: That's the intent.

2 UNIDENTIFIED MALE 2: Oh sure. Yes.

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

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

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

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

1 but it seems like it would be a different static pressure.

2 MR. FLY: This is Mark Fly with AAON. Let me, let  
3 me address it a little different way. From a design  
4 standpoint, not looking at regulations with what's happened  
5 in the past, for example, your, your supply fan might be a  
6 20 horsepower motor. Your return fan, with this reduced  
7 size smaller than the supply fan, is a one horsepower motor.  
8 So, I mean, it was an economic and energy issue, it, you  
9 know, it didn't make, it was one-twentieth of the energy  
10 consumed by the fan system.

11 UNIDENTIFIED MALE: Right.

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

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

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

24 UNIDENTIFIED MALE: So if the metric in theory  
25 captures this change in size, that would take care a little

1 bit, but, but then you're saying it wouldn't be the economy,  
2 it doesn't make sense to chase after one watt --

3 MR. FLY: Right.

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

6 MR. ERNST: That you can chase somewhere else.  
7 So, the question is, when you get the return fans then  
8 what's economically justified on the return fan, besides on  
9 efficiency. And it may be a different answer than the  
10 supply fan.

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

14 MR. FLY: Right.

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

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

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

20 UNIDENTIFIED MALE 1: -- have to grow?

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

23 UNIDENTIFIED FEMALE: Yeah. Exactly.

24 UNIDENTIFIED MALE 1: But as, as you, as you  
25 increase the size of that return fan, you increase the

1 length and the width of the units and at some point --

2 UNIDENTIFIED MALE 2: Yeah.

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

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

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

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

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

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

22 UNIDENTIFIED MALE 1: Go ahead and load that.

23 UNIDENTIFIED MALE 2: Easy act to follow.

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

25 UNIDENTIFIED MALE 3: We're safe. We're waiting

1 on you.

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

5 UNIDENTIFIED MALE 4: Air handler open?

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

17 It can be a fixed geometry design with very  
18 limited variability or it can be structured like building  
19 blocks to create a custom one-of-a-kind unit for any  
20 particular application. And most air handlers today have a  
21 catalog. Most of the catalog air handlers, but they're set  
22 up that you can configure them in a variety of ways  
23 depending on the application and the need. It could be  
24 horizontal, vertical. They have different types of fans  
25 that are used in them. Typically housed centrifugal fans,

1 single-width, double-width, BI, BC, airfoil, FC, un-housed  
2 fans like plenum fans. Typically BI, BC, airfoil type fans.  
3 Or you can have multiple fans.

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

13           MR. FERNSTROM: This, this is Gary.

14           MR. SMILEY: Yes.

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

17           MR. SMILEY: Yes.

18           MR. FERNSTROM: In the multiple fan picture --

19           MR. SMILEY: Yes.

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

22           MR. SMILEY: Yeah.

23           MR. FERNSTROM: It's --

24           MR. SMILEY: It's direct, direct drive mounted  
25 right on the other end of the motor.

1 MR. FERNSTROM: Okay. So --

2 UNIDENTIFIED MALE: It, it's spinning.

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

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

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

12 MR. SMILEY: Yeah.

13 MR. FERNSTROM: Not its horsepower rating  
14 necessarily.

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

17 MR. FERNSTROM: Yes.

18 MR. SMILEY: -- being powered.

19 MR. FERNSTROM: Thank you.

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

1 they do that.

2 MR. SMILEY: Yeah.

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

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

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

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

12 MR. SMILEY: Yeah.

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

16 MR. SMILEY: Right.

17 MR. STARR: -- some other things.

18 MR. SMILEY: There's a --

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

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

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

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

25 MR. STARR: It's never usually for efficiency so

1 much or, I mean, you can state that the air flow rights that  
2 may be off.

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

10 UNIDENTIFIED FEMALE: Thank you.

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

13 UNIDENTIFIED MALE: And, and application reasons  
14 as well.

15 MR. SMILEY: Right. Well, yeah. Yeah,  
16 application reasons. Okay. Definition of an air handler.  
17 AHRI is an industry organization that is supported by a  
18 large number of air conditioning manufacturers. They're an  
19 international organization. They're well-known and, and  
20 respected around the world for the technical aspects, much  
21 similar or similar AMCA is on fans and ASHRAE is on overall  
22 systems. For AHRI, we have a large number of air  
23 conditioning equipment already defined and regulated per  
24 AHRI standards for testing and performance reporting and  
25 certification. We have and definitions of these equipment

1 as well. Definition of an air handler is basically a  
2 factory-made encased assembly consisting of a supply fan in  
3 parallel, which may also include other necessary equipment  
4 to perform one or more of the functions of circulating,  
5 cleaning, heating, cooling, humidifying, dehumidifying and  
6 mixing of air. It shall not contain a source of mechanical  
7 cooling. So, it's, it's a box with a fan and a coil in it  
8 and other types of things in it, filters, et cetera, that  
9 provides the air that supplies an occupied space with  
10 comfort and with the opt for ventilation to provide healthy  
11 air.

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

21 Not as prevalent, but sometimes used, housed axial  
22 fans, vane axial or tube axial. Housed centrifugal fans of  
23 the mixed flow, flow type, usually single-width. And there  
24 may be some others, but probably not as popular in the  
25 overall population of air handlers.

1           Typical applications that I mentioned earlier, you  
2 can have, have them mounted on a roof and they can bring in  
3 outside air, return air and supply the building. Or, you  
4 can mount them indoors, which the majority of air handlers  
5 are actually installed indoors. Where, again, they get the  
6 return air and some outside air, maybe from a connection to  
7 the outside or a fresh air type unit that pre-conditions the  
8 outside air. And then provides air and comfort to the  
9 occupied space. It can be a VAV system. It can be a  
10 constant volume system. There are a variety of ways you can  
11 apply these and each type of application can have a lot of  
12 different variables or components in the unit. You could  
13 have just a single unit or you could have two that are  
14 connected together. Here you might have an air handler or  
15 some type of unit pre-conditioning the outdoor air or the  
16 ventilation fresh air coming in and supplied to the indoor  
17 air handler. So, as opposed to the return air exhaust fan,  
18 a return fan exhaust fan sample, this could be two separate  
19 units.

20           A typical application, you could have either a  
21 draw thru where the fan draws the air through the coil and  
22 the filters or you could have a blow thru where the fan  
23 blows the air through the coil. Or you could have vertical.  
24 You could have just about any configuration where the fan's  
25 on top, fan's on the bottom. Because you create this unit

1 with basically building blocks of the different components  
2 you can arrange in a lot of different ways. And the way it,  
3 it's arranged is a function of the application and what the  
4 customer orders or wants. We don't dictate that it has to a  
5 specific design.

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

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

18           The one thing they all have in common is a fan.  
19 The fan is in a box and the box is the minimum configuration  
20 when trying to assess the fan performance. And that's the  
21 way the AHRI standards are, are written, is you take the  
22 bare basic configuration, which is a fan in a box and that's  
23 how you test it. That's how you rate it. Because the box  
24 can make the fan work differently than the fan works all by  
25 itself. It can change the way the fan performs.

1           The industry generally, sort of, kind of knows  
2 what the ideal pressure drop of all the components they  
3 offer for sale are. Because in, in configuring one of these  
4 units, you need to know what the component pressure drops  
5 are and the application external pressure requirements are  
6 in order to size the fan, the motor and the RPM so you match  
7 what the customer needs.

8           Standalone fan by an AMCA 210 type test versus  
9 same fan in a typical air handler cabinet. They do not  
10 perform the same. There are two, possibly two things going  
11 on. One is, you have the pressure drop of the, of the box  
12 and then you have a change, potential change in the fan's  
13 capability by the way the fan or the box influences the way  
14 the air goes into the fan. If you have a one mile wide box,  
15 and a little bitty fan sticking in it, there's probably not  
16 going to be any interaction between the box and the fan.  
17 But you can't sell a one mile wide box. And a more  
18 practical size and application assessed, a more optimized  
19 efficiency, you would have a box of some size with a little  
20 bit smaller fan inside. That, that variation changes. But  
21 it does change the way the fan works. So, you can't tell me  
22 what that fan's going to do in a box by giving me the fan-  
23 only performance. Unless you tell me what the box is, what  
24 the box is doing and I understand that interaction. Is  
25 there a question?

1           MR. STARR: Yes. This is Louis from NEEA. So I  
2 don't, I don't spend all day looking at fan curves. But the  
3 red and blue one --

4           MR. SMILEY: You're good.

5           MR. STARR: I can imagine that.

6           MR. SMILEY: That's good.

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

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

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

18           MR. SMILEY: It will --

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

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

24           MR. STARR: Yes, but --

25           MR. SMILEY: -- the fan type, where it's

1 positioned in the box, how close the sidewalls are, how  
2 close the coil is, whether it's blow thru or draw thru,  
3 whether it's ducted or not. But yes.

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

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

8 MR. STARR: Right. Right.

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

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

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

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

22 MR. SMILEY: Yeah. What most air handler unit  
23 manufacturers, the bigger ones, have that long term  
24 proprietary database that they use. The AHRI 430 allows  
25 some of that modeling where you don't have to test every

1 cabinet of every fan. You can predict, much like AMCA  
2 allows with using fan laws. You can use fan laws and  
3 cabinet effects that a lot of manufacturers develop their  
4 own proprietary relationship. There's, there's not a, an  
5 industry-defined relationship that I'm aware of.

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

9 MR. SMILEY: Yeah.

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

11 UNIDENTIFIED MALE: Well, what are catalog --

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

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

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

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

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

24 MR. SMILEY: If, yeah.

25 UNIDENTIFIED FEMALE: Just from, this is just for

1 a central stationary?

2 MR. SMILEY: Right. Yeah. Yeah.

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

4 --

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

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

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

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

17 MS. PETRILLO-GROH: And --

18 MR. FLY: This, this is Mark Fly with AAON. I  
19 think the answer to your question is no, there is not a  
20 defined standardized method for applying a fan in a box.  
21 And there'll be, I mean, some people do CMD computations  
22 with aerodynamics, there's all kinds of approaches that,  
23 that all of us manufacturers in the group, you know, have  
24 done. Some of it's experience. Some of it's, you know,  
25 I've sold 10,000 units and measured 5,000 of them and I know

1 what those 5,000 did. So, it's not, it's, it's all very  
2 proprietary and no two people does it, do it the same. But,  
3 regardless, we have to know the red line to sell a product.

4 MR. SMILEY: Wade, hi.

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

16 MR. SMILEY: Uh-huh.

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

23 MR. SMILEY: Right. That's correct.

24 UNIDENTIFIED FEMALE: And that also changes, but  
25 then just like that bare fan, when you apply the air handler

1 in the field, there's also a system effect, the building on  
2 the air handler.

3 MR. SMILEY: Well, you know, no.

4 UNIDENTIFIED MALE: No, not --

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

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

11 MR. SMILEY: Uh-huh.

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

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

20 MR. SMITH: I know you are.

21 MR. SMILEY: Okay.

22 MR. SMITH: But if you, if you, if you want to  
23 wrap the circle around the fan, right? Then the casing  
24 effects are external to the rating of the product and the  
25 certification of the fan performance. And the important

1 point that I want to make is that, that's no different than  
2 the rating of the fan which goes into the field. So it is  
3 an option. It may not be the option you choose. It's  
4 totally up to you. It is an option and it does work. If  
5 you instead choose to draw the circle around the box, then  
6 those casing effects are incorporated into the certification  
7 that you have made to the Department of Energy.

8 MR. SMILEY: Uh-huh.

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

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

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

22 MR. SMILEY: Uh-huh.

23 MR. SMITH: Okay.

24 MR. SMILEY: And we have a recommendation.

25 MR. STEVENS: Well, I don't know if that's, this

1 is Mark, Mark Stevens for AMCA. And there's actually two  
2 effects that are going on. You, you mentioned it --

3 MR. SMILEY: Yes.

4 MR. STEVENS: -- in the narrative in the bottom.  
5 But I think the two, the two effects are kind of muddled  
6 together in the top. And that's the system effect and then  
7 this pressure drop into the, whatever purposes are attached.

8 MR. SMILEY: Right.

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

13 MR. SMILEY: Uh-huh.

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

16 MR. SMILEY: Oh yeah.

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

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

21 MR. STEVENS: But you, you, you alluded to the  
22 fact that there were system effects. What I'm saying is, is  
23 that this exaggerates that point. But as, I don't, I don't  
24 think that, that delta you're showing is all system effect.  
25 Most of it's pressure drop.

1 MR. SMILEY: No.

2 MR. STEVENS: Which would explain red and blue.

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

6 MR. STEVENS: Uh-huh.

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

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

12 MR. SMILEY: If I said, okay, I want to test this  
13 without a coil, I would get the red curve. Now in there, in  
14 the outside chance that having a coil in there affects the  
15 way the fan performs a little bit more than just the box,  
16 the test methodology that I'm going to describe, you test  
17 the, the box with a fan and a coil in its standard  
18 configuration. Then you mathematically remove the coil from  
19 that measured performance to get the fan in a box  
20 performance. The reason we do that is because we have  
21 multiple rows of coil we could use. We have infinite  
22 variation in fin series we could use. We have different  
23 tube diameters in the coil we could use. So every order  
24 could have a different pressure drop coil applied. But we  
25 can't test every, every one of those configurations. So we

1 make an assumption. And we've been doing this for 50 years.

2 MR. STEVENS: Understand that.

3 MR. SMILEY: Yeah.

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

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

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

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

24 MR. DYGERT: Yeah, I agree.

25 MR. SMILEY: Based on real test data, but there's

1 no data on there.

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

3 MR. SMILEY: Yeah.

4 MR. DYGERT: -- another example --

5 MR. SMILEY: Yeah.

6 MR. DYGERT: --that goes to the point as well.

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

11 MR. DYGERT: Agreed.

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

14 MR. DYGERT: So I have, I, this is information  
15 correct on your, your slide with the three color lines. So,  
16 between the red, so the one on the left, the red and green,  
17 so the system is affect, the system is affected you're  
18 talking about is, so it's, it's not necessarily a bad system  
19 effect, in other words, when you wrap air in the wrong  
20 direction. It could be that or it could just be the fact  
21 that you have pressure drops. So it's not, the terminology  
22 system effect doesn't necessarily refer to fan system  
23 effect, or is it, I'm just trying to understand the  
24 terminology to make sure. The difference between the red is  
25 not necessarily a fan system effect. It's just a system

1 effect of having maybe a pressure drop in there and  
2 potentially could have a fan system effect --

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

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

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

14 MR. DYGERT: Okay.

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

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

23 MR. SMILEY: Well, it went down, because part of  
24 this difference here is not only a cabinet pressure drop,  
25 but a reduction in the fan's pressure rise probably, because

1 there is a reduction in the fan brake horsepower for this  
2 particular example.

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

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

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

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

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

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

23 UNIDENTIFIED FEMALE: Well, you, well --

24 MR. SMILEY: It's an example.

25 UNIDENTIFIED MALE: Please identify yourselves.

1 MS. PETRILLO-GROH: Laura Petrillo-Groh, AHRI. So  
2 where, where you have the horsepower curves, is that where  
3 the blue, is that for the fan --

4 MR. SMILEY: Yeah.

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

6 MR. SMILEY: Red is --

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

8 MR. SMILEY: Right.

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

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

13 MS. PETRILLO-GROH: Okay.

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

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

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

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

25 MR. SMILEY: Uh-huh.

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

3           MR. SMILEY: Well --

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

6           MR. SMILEY: -- if this is the designed pressure  
7 and here's where it is with the coil, or here's where it is  
8 in the box, I have to speed that fan up to recover that  
9 pressure decrease that the fan is now seeing. Or I use a  
10 bigger fan. Have to, have to increase the test speed of the  
11 fan somehow to get the pressure back up to where I need it.  
12 So the fan in a box with the coil at 6,000 CFM would operate  
13 right there. But if I need it at that much pressure, or  
14 that much pressure, I would have to speed the fan up which  
15 will take the horsepower curve up as well. So, you see it  
16 in the efficiency curves. This is the fan only efficiency  
17 curve and this is static efficiency. This would be the fan  
18 in a box efficiency curve. So the efficiency went down.  
19 The effect of the box on the fan caused the fan's efficiency  
20 to go down. So we may or may not know what the real applied  
21 pressure drop is of the components. What the real fan  
22 performance, or what the real fan performance is inside the  
23 unit. The industry has developed over many years of test  
24 and rating methodology for commercial cataloged air  
25 handlers. Performance in that box. The test methodology

1 and data analysis presents presentation are defined in the  
2 AHRI standard 430. Methodology is well accepted in the  
3 industry. It's used by most of the major manufacturers.  
4 AHRI can speak to, to that. Throughout the commercial air  
5 handling industry, product specifications, applications,  
6 building codes and customer bases. So when we get  
7 specification and an order for an air handling unit, it  
8 usually defines, so it has to meet AHRI 430 performance  
9 certification industry standard. You take, here are the,  
10 the standard test configurations. Now before everybody  
11 jumps all over me, I understand that we don't really have a  
12 fan wall for a mobile fan test methodology defined yet for  
13 430.

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

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

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

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

24 UNIDENTIFIED FEMALE: Yes.

25 MR. SMILEY: This is, would be indicative of

1 what's called a fan wall or --

2 UNIDENTIFIED MALE: Fan arrays.

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

5 UNIDENTIFIED MALE: Correct.

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

8 UNIDENTIFIED MALE: Right.

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

14 UNIDENTIFIED MALE: Accredited.

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

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

21 MR. SMILEY: Yeah. So you basically connect the,  
22 the box and coil and the fan to that test facility and run  
23 an air flow test. You measure the power in the motor, bring  
24 horsepower into the fan and you develop the performance map.  
25 Blow thru, draw thru, vertical, doesn't matter. It's a bare

1 configuration for the testable configuration for an air  
2 handler fan. Test methodology defined in AHRI 430. So,  
3 what we have is a test method that's technically-based,  
4 well-defined and proven. It's been around a long time. We  
5 have a way to determine fan in a box performance  
6 experimentally. Manufacturers have developed over the years  
7 methodology to predict things that they don't test. What we  
8 don't have is an efficiency metric that would be applicable  
9 to fan in a box. So we don't have a metric right now as far  
10 as I know, as far as I'm concerned. I don't know what value  
11 we need to shoot for. We recommend using the air handler  
12 performance determination based on the AHRI standard 430 as  
13 the test methodology and the testable configuration  
14 definition for air handlers. The performance-based and  
15 efficiency ratio methodology, similar but may be different  
16 from that developed and presented by the current industry  
17 through AMCA. It seems to be a reasonable approach for air  
18 handlers. Maybe a low pressure, a medium pressure and a  
19 high pressure application point for basing the efficiency  
20 ratio might be a better one to use for air handlers. I  
21 don't know. We need to look at the data and do the  
22 analysis. The required efficiency levels are yet to be  
23 determined and will need to be adjusted to accommodate the  
24 fan in a box configuration, since that's how the product is  
25 tested and applied. We're interested in the energy, the

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

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

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

22           MR. SMILEY: Yeah, a little bit.

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

25           UNIDENTIFIED FEMALE: Go ahead.

1 UNIDENTIFIED MALE: Go ahead.

2 MR. SMILEY: Okay. I know in terminal machinery,  
3 specific speed in the old days was used a lot from a design  
4 standpoint. And we never really used it that much in the  
5 fan industry. Although I have, and I know a lot of you guys  
6 have as well. In trying to understand why you would design  
7 or select or pick a fan of one type versus another, and it's  
8 a function of diameter, operating conditions, et cetera.  
9 Specific speed is a dimensional relationship that is a  
10 function of CFM, pressure and RPM. And this representation  
11 is using cubic feet per minute, inches of water and RPM.  
12 Now coupled with that's another dimensional relationship  
13 called specific diameter, which is a function of pressure in  
14 inches of water, CFM and cubic feet per minute and the  
15 diameter in inches in, in the particular relationship that I  
16 show for the value of the numbers. And what you see on this  
17 plot is a variety of fan types and low specific speed is  
18 basically low flow, high pressure or low RPM. High specific  
19 speed is high CFM, low pressure or, I, a high RPM. And any  
20 combination of those metrics. So, the different fan classes  
21 or types, like a FC fan, the red curve. Airfoil fan, the  
22 blue curve, double-width. The single-width airfoil fan, the  
23 green curve. A plenum fan or plug fan, which would be an  
24 un-housed centrifugal, usually single-width fan, BI,  
25 airfoil. A prop fan, a high efficiency prop fan and a, kind

1 of a standard efficiency prop fan. Or a panel, panel axial  
2 fan. So they all have different peak efficiency  
3 capabilities. And these are static efficiency, not total  
4 efficiency. They all have different characteristic shapes.  
5 They're all located in a different location as that, that  
6 particular fan type on a specific speed curve. Specific  
7 diameters is the same way. Panel axial fan is the highest  
8 specific speed. The very first specific diameter, which  
9 means for the same CFM static pressure, you need a big one  
10 of those suckers. And double-width FC fan is a red curve,  
11 which means for the same CFM, static pressure, you'd use a  
12 small. So when you look at this, you go, okay, I've got to  
13 design CFM static pressure of some value. I can look at any  
14 speed I want, any diameter I want and you can use this type  
15 of relationship to zero in on, based on the design criteria,  
16 how much space you have, what type efficiency you're trying  
17 to get to, where are you on that efficiency curve? You can  
18 see what the relationship is for speed and diameter to hit  
19 that same CFM static pressure with different fan types. So  
20 you might take a small FC fan and run it at a low speed or a  
21 big BI fan, running it at a higher speed or a huge prop  
22 running at a very high speed.

23 MR. STARR: So this is Louis with NEEA. So in  
24 theory, you can't just say you were designing an air  
25 handler, handler from scratch. You had to make some design

1 decisions, you would first go to the first, the first chart  
2 there and look at your flow and pressure. Right? That your  
3 design requirements --

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

7 MR. STARR: Correct.

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

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

17 MR. SMILEY: Right.

18 MR. STARR: -- that are --

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

21 MR. STARR: You could work backwards.

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

24 MR. STARR: I mean, in general isn't there, so I  
25 imagine space has a lot of, or a pretty controlling factor.

1 The document goes the way I described it. Right?

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

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

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

24 MR. SMITH: I know. I, I just want, I just want  
25 to, I want to give this a little history because I think

1 it's important for folks to understand. And at the end of  
2 the day, the membership came back around to, to advocate, to  
3 decide upon, to build a consensus around a scheme in which  
4 the requirement, the DOE requirement, develops a maximum  
5 horsepower for a given flow and pressure. And coalesced,  
6 the membership coalesced around a single number for ducted  
7 fans, a different number and a different basis for un, non-  
8 ducted fans. Fans that didn't have ducts on the outlet.  
9 And the, one of the attributes of that approach that our  
10 membership liked is that within the ducted fan category, it  
11 encourages sub, product substitution. And one of our  
12 observations, as we looked at the actual selections that  
13 were made in 2012, is there were a lot of bad selections.  
14 Meaning they picked the wrong fan. And when we tried to  
15 evaluate the impact of correcting those selections, many, in  
16 many, many individual cases, and this is not a general  
17 statement that, that should be applied as an average, but in  
18 many cases we found a more efficient, lower priced, lower  
19 horsepower fan, because they had picked the wrong fan type.  
20 Right? And so this idea of choosing of, of inviting, right?  
21 A regulation that says, look, you've got this flow, you've  
22 got this pressure, this is the maximum horsepower. Figure  
23 it out. Invites product substitution and does for the  
24 regulatory environ what a specific speed would do and I  
25 think it's actually what the consultants were trying to get

1 at with this specific speed-based metric.

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

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

21           MR. SMITH: Right.

22           MR. SMILEY: -- that's, that type's out there  
23 falls on that curve. There's a band around that. That's  
24 just kind of a, an average accepted static efficiency, not  
25 total. You know, Armin I'm sure has one that's based on

1 total efficiency that, that historically we've never really  
2 worked at total from an application or design standpoint.  
3 Well, from a design standpoint I do all the time, but  
4 anyway. So, I, I hope this helped a little bit. You know,  
5 it doesn't answer all the questions. It, it points to  
6 different designs of fans work differently. You pick one  
7 versus another for a lot of reasons.

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

17 MR. SMILEY: It, it becomes an optimization  
18 process. Speaking from my experience and not for other  
19 manufacturers, and I don't want to tell you proprietary  
20 design information, but the products that the company that I  
21 work for, Trane, produces, we would have, we size the air  
22 handlers based on coil square footage. And that implies a  
23 certain capacity of heating and cooling. And based on that,  
24 there's a design CFM, 500 feet per minute, 550, 450,  
25 whatever you want, and that's usually an optimization of

1 heat transfer, air-side pressure drop, cost and also there's  
2 a limit as to how high a velocity you can go so you don't  
3 blow water off the coil, you know, which nobody wants rain  
4 in, in their building. Because of the air or moisture  
5 condensing on the coil, which is part of the heat transfer  
6 process. We know that, that capacity can be applied to an  
7 occupied space. It could have a very wide range of static  
8 pressure requirements. This building needs four inches of  
9 static because of the way the, the, or the consultant  
10 designed the ductwork. This building might need six. This  
11 building might need two. Well, in order to allow an optimum  
12 selection based on whatever criteria the customer has, we  
13 may have four or five different fan selections, fan types  
14 for that one box. We may have an FC fan. We may, you know,  
15 we, we probably have an FC fan. We probably have a double-  
16 width airfoil fan. We might have two or three different  
17 diameters of each one of those. We could have a single-  
18 width airfoil plenum fan and we have a fan array. So we  
19 might have, you know, six or seven different fan options for  
20 that one cabinet size. Cabinet size based on how big the  
21 box is to contain that square footage base area of the coil.  
22 And there's an optimum aspect ratio of the coil design from  
23 a cost heat transfer optimization. So, it, it's kind, to  
24 answer your question, it's oh yeah, yeah, sir, but well, no,  
25 not really, but yeah, sort of. You know? But it, the neat

1 thing about the custom air handler, the, the air handlers is  
2 there's a lot of flexibility. You know, from a  
3 manufacturing standpoint, you try to minimize the  
4 manufacturing cost and you've got money made and space and  
5 everything to build this equipment. But you want to give  
6 the customer the biggest amount of flexibility so you don't  
7 have to do a modification switch to the equipment, which  
8 would cost him more money. Or you might have to, it might  
9 restrict how he designs his equipment room or his ductwork.  
10 So, you know, over a hundred years you try to, you know, and  
11 all the manufacturers do that. They try to accommodate what  
12 the customer will pay you for. And if the customer comes to  
13 us and says I'm only going to pay for the, for the highest  
14 efficiency product in the world, we've got it and we can  
15 give it to you. But you know, there's a lot of decisions  
16 that go on in the customer's mind. Same way with a  
17 standalone fan, you know? I want 90 percent efficient fan.  
18 Well, we've got it. Here's, here it is. If you want to pay  
19 for it, here's how big it is. Now it's, so.

20           Anyway, there's a variety of available fan types,  
21 including variable frequency drives and other methods of  
22 variable air volume, control of the fan performance either  
23 by a standalone fan or a fan in a box, any, any type of fan.  
24 So you can, you can best fit not only the air flow and  
25 pressure requirements, but also acoustics which are

1 important, efficiency and discharge requirements in an  
2 efficient and cost-effective package, so.

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

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

7 UNIDENTIFIED MALE: ECM one.

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

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

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

20 MR. BUBLITZ: For, for one speed or?

21 MR. SMILEY: No.

22 MR. BUBLITZ: You did a whole series of?

23 MR. SMILEY: No. If, if, if you had, if people  
24 still printed the catalog, you'd have a fan map with  
25 variable speed or various constant speed curves, constant

1 horsepower curves and lines of constant efficiency, sort of.  
2 You know, I mean, you know, usually you don't take speed and  
3 diameter until effect of changes to efficiency. Well,  
4 speed, I mean. But the same sort of rules at, at 210.

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

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

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

11 MR. SMILEY: Pardon?

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

14 MR. SMILEY: Accelerated?

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

17 MR. SMILEY: Because what motor, that air handler  
18 has four motor options. Okay? So, if you want to take the  
19 wire to air power, you have to specifically define what  
20 motor that is. Well, we've got other motors we'll sell you  
21 with that unit. We'll sell you an ECM motor. We'll sell  
22 you a premium motor. We'll sell you a high efficiency  
23 motor. We'll sell you an inverter-duty motor. What motor  
24 do you want? We'll sell you a motor that's twice as big as  
25 what you need.

1           MR. HAUER: But the customer, the electric  
2 utility, they are interested in the power consumption. They  
3 are not interested in horsepower.

4           MR. SMILEY: Right.

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

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

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

22           UNIDENTIFIED FEMALE: No.

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

25           MS. ARMSTRONG: How about a break?

1 MR. SMILEY: -- this fan versus that fan.

2 UNIDENTIFIED MALE: Yes.

3 MS. ARMSTRONG: Thanks.

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

6 MR. SMILEY: You need that stuff?

7 UNIDENTIFIED FEMALE: No.

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

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

12 (Whereupon, a brief recess was taken.)

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

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

17 MS. ARMSTRONG: So I do want to make one  
18 announcement before we move on to our third presentation.  
19 And I meant to do it this morning, so it was an oversight on  
20 my part and I apologize. So, we do have a new member of the  
21 Working Group, because we had somebody drop off. Debra  
22 Miller dropped off. She was one of the ASRAC reps. So we  
23 now we still have two people from ASRAC on the committee,  
24 but she dropped off because she couldn't, couldn't commit to  
25 attend for the rest of the meetings and follow, a lot of

1 schedule, conflicts, et cetera. So, we had a 26th person  
2 that had previous applied that wasn't able to join the  
3 Working Group previously, so we have added them as a formal  
4 voting member. There sitting behind you from Regal Beloit,  
5 Paul, he's representing NEMA as a motor guy. So good  
6 vision. We welcome you. You will, you noticed my e-mail  
7 last night had him on it. So now if we work off my latest  
8 group e-mail, it has his additional e-mail address as part  
9 of the group. So, welcome.

10 MR. LIN: Thank you. Thank you.

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

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

15 MS. PETRILLO-GROH: It ends with LPG.

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

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

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

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

23 UNIDENTIFIED MALE: Yes, ma'am.

24 MS. PETRILLO-GROH: No, that's not it. Oh, does,  
25 that could be it.

1 UNIDENTIFIED MALE: Are we also getting the other  
2 presentations?

3 MS. ARMSTRONG: Yeah. So --

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

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

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

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

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

14 UNIDENTIFIED MALE: Could I just get that?

15 MS. ARMSTRONG: Sure. Yes. Thank you.

16 MS. PETRILLO-GROH: It ends with LPG.

17 UNIDENTIFIED MALE: No pictures of the family  
18 vacation.

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

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

22 UNIDENTIFIED MALE 2: Is this it?

23 MS. PETRILLO-GROH: Yeah, there we go. Hi. So,  
24 I'm Laura Petrillo-Groh from AHRI and we've put together  
25 just a short presentation to sort of go over some of the

1 equipment that's impacted by this regulatory, this  
2 rulemaking and sort of talk through some of the issues that  
3 we see, both legal and non-legal. And you know, as much as  
4 we can discuss the resolutions. We've also included that in  
5 this presentation. You can go to the next. Thanks. So  
6 one, we've got two buckets of equipment really that we've  
7 been focusing on. One are fans and EPCA covered equipment.  
8 And we have that listed on our screen. And then we've got  
9 fans and non-covered equipment. So to start off with some,  
10 you know, covered equipment, we've got the packaged unitary  
11 equipment category and we look, we looked at the different,  
12 you know, common names for this type of equipment. We've  
13 got several different classes of equipment even within the  
14 packaged unitary class, including packaged terminal units,  
15 mini-splits, multi-splits, VRF. We've got water source heat  
16 pumps, single package vertical units and then your  
17 traditional packaged ACs, heat pumps and rooftops and split  
18 systems. On a, you know, as we've heard in earlier  
19 presentations, all of those fans definitely have a supply  
20 fan. And depending on the manufacturer, the type of product  
21 it's in, it could be any of these type of fans. So any of  
22 the centrifugal housed or un-housed, axial housed, mixed  
23 flow or crossflow. So some of them are more common than  
24 others, but we have, you know, there are cases where we're  
25 seeing in some of the data collection that we're doing and

1 feedback from the manufacturers, that these are all fans  
2 that could be represented in each of these unit types. We  
3 also have some fans on the condenser, condenser and  
4 evaporator and those are typically axial panel fans. And  
5 then if you're using a return fan or an exhaust fan in the  
6 unit, it could be one of the types of units, the fans listed  
7 on the screen.

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

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

22           But from these testing of equipment, using the  
23 appropriate equipment test, we don't know a lot of things  
24 about the, about the fan. We don't know the fan total  
25 static pressure, the fan or motor input power, cabinet

1 effect, fan-only applied efficiency, end-use static pressure  
2 and CFM. And Skip really went over the cabinet, Skip went  
3 over the cabinet effect really well, but what we're talking  
4 about is the overall influence of surrounding components,  
5 structure and casing, which causes changes to air flow and  
6 pressure drop and influences how the fan can, the fan  
7 performance is and where it's going to operate.

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

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

21           We've got several different types of heating  
22 equipment we've kind of grouped together just for this first  
23 slide. They include warm air furnaces, unit heaters,  
24 boilers and water heaters. And they have different types of  
25 fans than we've seen previously including the power burner

1 and the inducer draft fan. And some of these may or may not  
2 be included in the scope, depending on where we draw the  
3 line.

4 Can you hear me?

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

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

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

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

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

13 MS. PETRILLO-GROH: Okay.

14 UNIDENTIFIED MALE: Or use the microphone.

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

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

21 So for air handling equipment, which is not a  
22 covered product, we've grouped a bunch of different types of  
23 equipment into this, into this category, including room fan  
24 coils, unit ventilators, fan-powered terminal, terminal  
25 units, constant volume or variable air volume, fan-assisted

1 chill beams and then we've also got what you would typically  
2 think of air handling units. It's central station air  
3 handling units, custom air handlers make up air handling  
4 units, outdoor air handlers, and dedicated outdoor air  
5 systems. And the blower coil and low pressure air handlers  
6 as well.

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

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

25           We don't know the fan total static pressure,

1 cabinet effect, fan-only applied efficiency, fan or motor  
2 input power in some types of equipment, end-use CFM and  
3 static pressure. And Bill really covered very well the  
4 variability of custom air handling units makes it difficult  
5 to define and test. So the port, the world of central  
6 station air handling units and what can be tested and what  
7 can be certified through the air, the air, the AHRI program  
8 is much smaller than the world of air handling units that is  
9 currently out there. While the custom air, air handling  
10 unit manufacturers are very small businesses, they're  
11 regionally located.

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

20           And we know, what we know is the unit input power  
21 and the external static pressure. We know it by testing the  
22 unit and predicting that, that test to different, to other  
23 sizes and configurations. And we don't know the fan CFM,  
24 fan or motor input power, fan total static pressure, cabinet  
25 effect or fan-only applied efficiency.

1           For cooling towers, the common, this is not, also  
2 not a covered product. We have packaged cooling towers,  
3 packaged evaporative condensers and field-erected mechanical  
4 draft cooling towers. We've got CTI representing on that  
5 later today. So, the typical fan types, again as, as, as is  
6 written on every side, these fans can be single or they  
7 could be multiple fans. But we have the heat rejection fans  
8 will be axial or centrifugal.

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

15           MR. HAUER: Laura?

16           MS. PETRILLO-GROH: Yes?

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

19           MS. PETRILLO-GROH: Yes.

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

22           UNIDENTIFIED MALE: Please identify yourself, Mr.  
23 Burdick.

24           MR. BURDICK: Larry Burdick, SPX. There's a,  
25 there is a model, there is a number for the fan CFM that we

1 use in our prediction model.

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

4 MR. BURDICK: Right.

5 MR. HAUER: Okay. Thank you.

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

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

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

18 Amy's going to step in here.

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

22 UNIDENTIFIED MALE: But you also need to identify  
23 yourself.

24 MS. SHEPHERD: And that was Amy Shepherd from  
25 AHRI.

1 UNIDENTIFIED MALE: Thank you.

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

1 rulemakings for one system.

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

13           It also avoids multiple testing of the covered  
14 equipment. So, there is a testing burden. Any test  
15 procedure that DOE develops under EPCA can't have an undue  
16 testing burden. So that's something else that's addressed  
17 by the exemption of a product that uses applied in covered  
18 equipment. Because there's a test procedure and a test  
19 that's run on that system to develop an energy metric. And  
20 something that underlies the entire statute is this idea  
21 that what matter is the energy savings and there's a metric  
22 that's developed for that, and a standard that's developed  
23 to that. And then it's up to the manufacturers to look at  
24 the technology that's feasible, their customers, their  
25 market, their expertise, you know, their, their

1 marketability to compete and develop the optimal design for  
2 that system at the cost that is the lowest. So, all of that  
3 is baked into the statutory framework and that's important  
4 and it's something that you lose when you go in and start to  
5 regulate these components of the covered product. And  
6 that's why EPCA avoids that, which we'll talk about on the  
7 next slide.

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

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

19           So we believe that EPCA allows one standard for  
20 covered products and DOE also articulated this view in 2009  
21 in the Federal Register when it was talking about, it was  
22 commercial equipment, commercial warm, warm air furnaces, I  
23 believe. But it talked about the fact that the DOE is  
24 authorized to establish a performance standard or a single  
25 design standard. And therefore, a standard that had both or

1 that had multiple design requirements was beyond the scope  
2 of DOE's legal authority. We agree with this statement and  
3 we think that's why the framework approach was correct,  
4 because it's, it's in accordance with this. And I think,  
5 you know, as I mentioned, when you look at EPCA and you look  
6 at the fact that it's designed to set these energy savings,  
7 it's designed, the idea behind is that you give  
8 manufacturers the goal of this energy savings and you say,  
9 let the market work it out at the lowest cost to reach that.  
10 And the need to have the technology and the design  
11 flexibility to do that. And that's why there is this one  
12 standard.

13           Now, covered equipment is also, when you look, I'm  
14 not going to bore you with, I could have lots of slides too,  
15 just like Bill. But there's different sections of EPCA and  
16 they talk about things like energy standards, energy use,  
17 energy metrics, covered products and they're all singular.  
18 Sorry, I know that's boring. That's what lawyers do. But  
19 it talks about one of the following types of equipment and  
20 it talks about a performance standard, which is why DOE  
21 concluded in the rulemaking before that, that's what we're  
22 talking about. And so everything is singular and when they  
23 do, when EPCA does address components, there's a very  
24 specific language in the statute that addresses component  
25 regulation. And again, there's several places in there that

1 does that. But there isn't a general presumption that DOE  
2 can regulate all the different components of a covered  
3 product or these specific sections that talked about the  
4 regulation of components wouldn't be necessary. But where  
5 that has occurred, for example, on the residential side with  
6 the fan furnace efficiency those, you know, those were  
7 statutory changes that happened in order to enable that.

8           So that's why we think if there's an energy  
9 efficiency standard for this covered equipment, you can't  
10 have additional design requirements on top of that. And we  
11 also think, there's another thing that runs through the  
12 commercial section for specific types of equipment for, you  
13 know, commercial package AC and heating, PTACs, heat pumps,  
14 warm air furnaces which is that DOE needs to follow ASHRAE  
15 90.1 and that, when that is amended on those covered  
16 products, DOE evaluates that amendment and determines  
17 whether or not they're going to adopt it or whether they're  
18 going to go beyond it. And when they do that, they have to  
19 meet a specific statutory burden of showing clear and  
20 convincing evidence that they should do that. That's  
21 different than the standard they have on the residential  
22 side. So, that's something that's also built into the  
23 statute that DOE doesn't have the authority to just exceed  
24 ASHRAE without going through that process and making that  
25 showing.

1           So, those are reasons why we think for covered  
2 equipment DOE has to meet its statutory obligations and  
3 that's where, that's where we think DOE can do that.

4           Any questions or thoughts?

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

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

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

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

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

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

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

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

1 MS. PETRILLO-GROH: Yes.

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

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

4 MR. COCHRAN: Okay.

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

9 MR. COCHRAN: Yeah.

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

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

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

21 MR. COCHRAN: We're taking separate --

22 UNIDENTIFIED FEMALE: It's a covered product.

23 MR. COCHARN: And I think all that is, if you  
24 want, maybe when we get into that, maybe if you get into  
25 more of the testable configuration where you're defining it.

1 And that's stuff that the Working Group has to work through.  
2 But from an authority and statutory position, DOE's position  
3 is, we have authority to regulate fans and blowers. We have  
4 authority to regulate the other products. This Working  
5 Group is going to work through all the details and I think  
6 at this time, I guess, our opinion, if you guys --

7 MS. PETRILLO-GROH: But there --

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

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

15 MS. ARMSTRONG: So I --

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

18 MR. COCHRAN: Uh-huh.

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

23 MS. ARMSTRONG: So, I think Pete articulated DOE's  
24 authority position. We believe we have the authority to  
25 cover fans and blowers. DOE did not set up a Working Group

1 to discuss its authority. We set up a Working Group to  
2 negotiate definitions, task procedures and standards and  
3 scope of those potential regulations for fans and blowers.  
4 So I, I think that's where we are at this. I mean, the  
5 authority is something that the Department has articulated  
6 and it will articulate it further as it moves through the  
7 process. You join the Working Group to negotiate aspects  
8 of those potential regulations in good faith. But  
9 fundamentally arriving and questioning DOE's authority was  
10 not within the purview of this Working Group and really is  
11 not why you were nominated to be on it.

12 MS. PETRILLO-GROH: I fundamentally disagree. DOE  
13 can't take an action in a rulemaking that exceeds the scope  
14 of its authority. And I think that, that, that is our  
15 position and I think even putting that position aside, we  
16 think that the fact that these products are covered  
17 equipment and that they have a standard or DOE can develop a  
18 standard is the right approach. As we say in the previous  
19 light, it avoids a lot of the complexity, that you capture  
20 the total energy use of that system and we think that in  
21 terms of enforcement that, you know, we can come up with  
22 something that, that works in terms of allowing DOE to  
23 identify abuses of any exception for things that are  
24 components of cover, covered product. And we, we don't have  
25 that fully fleshed out yet, because we're thinking about it

1 and we also need to get a little bit more information I  
2 think about the distribution chain here. But I think we  
3 have, we think that there are some lessons that can be  
4 learned from what happened on the residential side with  
5 regional standards for air conditioning. Because we had a  
6 bit of a similar issue there where manufacturers are, were  
7 allowed to produce basically two products. Some are  
8 compliant in one installation and some are not. That's  
9 different because that specific statutory provision has  
10 language that addresses things further down the supply chain  
11 and this doesn't. But one of the key facts for that was  
12 labeling and we think labeling can work here and we just  
13 need to think about the best way for DOE to identify that,  
14 which we're still doing. And we recognize that and we're,  
15 you know, we're looking at the options there. So, that's  
16 one thing that, that we're looking at to recognize this.  
17 But -- uh-huh.

18 MR. FERNSTROM: This is Gary for the California  
19 Investor-Owned Utilities. It seems to me there are two  
20 issues here. One is the debate between you all and DOE  
21 about whether or not DOE has the regulatory authority to  
22 address this. DOE says it does. You say it doesn't. Now I  
23 don't think that's something the Working Group can address.  
24 My opinion is that we have to presume that DOE is correct  
25 and the Working Group then will go from there with respect

1 to its development of a recommendation as to whether unitary  
2 equipment should be covered or not, with respect to the  
3 fans, of course. I think we need to look at the data that  
4 is being collected in order to establish that recommendation  
5 and at least speaking for the California utilities and  
6 perhaps the environmental advocacy group within this Working  
7 Group, we're not convinced at this point that the fans  
8 utilized in unitary equipment should be exempted yet. So, I  
9 would propose that we go ahead, gather the data, look at it,  
10 understand the energy savings and then the environmental  
11 representatives in this Working Group can make a decision as  
12 to whether it wants to agree to exempt this equipment or  
13 not.

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

21 MR. FERNSTROM: So, so speaking for the California  
22 IOUs, we are not prepared to agree to that at this point  
23 until we see the data and I believe that the other  
24 environmental advocate representatives in this Working Group  
25 have a similar view.

1 MS. SHEPHERD: Right. And I'm not suggesting  
2 that, that we're looking for your agreement on this today,  
3 obviously. I mean, we recognize that there's additional,  
4 that there's additional information that can be informative  
5 on this issue.

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

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

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

24 MS. PETRILLO-GROH: And I think that there's  
25 another, there's another issue too that if, for, for Dave's

1 point, if you have that being accounted in two places, your  
2 fan has two standards. It has a fan standard and it has the  
3 standard that's being applied as it's, as it's applied to  
4 the covered product. And you can't have two standards for  
5 one covered product. So, I, I think that, that, I mean,  
6 that's exactly why this interpretation of EPCA that, that,  
7 you know, I, meaning is clear from the statute and the fact  
8 that there are specific provisions that talk about component  
9 regulation. And even a component has to be a covered  
10 product before it can be regulated as a component.

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

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

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

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

19 UNIDENTIFIED MALE: Well, yes.

20 MR. FERNSTROM: But it is a situation.

21 MS. ARMSTRONG: Okay. So, I, I'm just going to  
22 reiterate. This is, the, the Working Group should not be  
23 discussing, it is not within the purview of the Working  
24 Group to discuss DOE's authority and interpretations of the  
25 statute. That being said, you're well within your right to

1 submit comments outside this process whatever. That was not  
2 what ASRAC charged this Working Group to do. That's not in  
3 the scope of the, the ground rules that we negotiated at the  
4 beginning. That was not in the scope that ASRAC asked you  
5 to do. So that being said, I'm going to bring back the  
6 discussion to kind of scope of, we're talking about  
7 standards. We're not talking about authority. That's off  
8 the table. We're talking about standards and what's  
9 potentially in and out and whether we should report. And,  
10 and at this point it goes to Gary's comment that he just  
11 stated that he would like to see data before he is in a  
12 position as a Working Group voting member to vote. I don't  
13 know how other people around the table feel, but that's  
14 really where we are. I mean, for someone to vote on scope,  
15 they, they're asking for more information to better inform  
16 them, to better inform their vote. Talking, you know, the  
17 authority is just off here.

18 MS. PETRILLO-GROH: Ashley, I fundamentally  
19 disagree with that. You can't consider options that, that  
20 you can't consider options that DOE doesn't have the  
21 authority to do. And I, and I don't want to, I don't want  
22 to belabor this point. I think we can move on and get, and  
23 move to the data and talk about other things, but  
24 recognizing that in the, in other ASHRAE negotiated  
25 rulemakings, they are discussions about what DOE has the

1 authority to do and what not. And sometimes, you know, when  
2 we did it last summer, the attorney for DOE would have to go  
3 upstairs and confer and come back and said that's not going  
4 to be on the table because we don't have the authority to do  
5 that. So, I, I think that is an issue. It's a fundamental  
6 issue for us. But again, as I said, I think that we can  
7 have other discussions about options and this still I think  
8 can be a very viable option regardless of whether we address  
9 that issue directly.

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

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

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

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

24 UNIDENTIFIED MALE: Yeah, I --

25 MS. ARMSTRONG: -- to work on this, on, the

1 Working Group, it is not in the ground rules for the Working  
2 Group to discuss DOE's authority as it relates or, or vote  
3 on a position about it. So, to the extent somebody wants to  
4 discuss the applicability of potential standards or how  
5 certain types of equipment should be tested, that's well  
6 within the purview. But it was definitely in ASRAC's  
7 charter, nor was it in the ground rules.

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

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

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

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

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

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

24 UNIDENTIFIED MALE: Well, I can't argue with you  
25 now.

1 MS. PETRILLO-GROH: -- these people need to make a  
2 decision about, you know, what this rule's going to look  
3 like and if it's going to have legal problems, at the end of  
4 the day that's an important factor to consider.

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

9 MS. ARMSTRONG: So but --

10 MS. SHEPHERD: And --

11 MS. ARMSTRONG: -- I go back to Trinity is, I  
12 think, point about, should we proceed with the working  
13 group. I mean, that's essentially what he was asking and  
14 that's something that's within this Working Group to decide.  
15 Should be keep continuing to meet if you're, I mean, what  
16 I'm hearing and, and I hope this isn't the case, because I  
17 think the last meeting we were making pretty good progress  
18 and I thought this morning we were making good progress,  
19 until we got here. Was the fact that we were talking about,  
20 you know, the details and those types of things or what  
21 potential regulations might look like and, and how that  
22 things might be tested and the details that are within the  
23 scope of the Working Group. But it really comes to the  
24 heart of, you know, if you're telling us there's a subset of  
25 this Working Group that believes that they can't proceed

1 without articulating or voting on opinions of DOE's  
2 authority --

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

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

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

1 morning.

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

7 MS. ARMSTRONG: Okay.

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

15 UNIDENTIFIED MALE: That's over lunch?

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

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

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

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

23 UNIDENTIFIED MALE: Want to do the caucus?

24 MR. FERNSTROM: -- environmental crew maybe two or  
25 three minutes. To all be on the same page with this.

1 MS. PETRILLO-GROH: So what would be the out, so  
2 if, what are the alternative outcomes? So if, if we had  
3 this vote and it came out one way, what would be path  
4 forward and on the other way what would be the path forward?

5 UNIDENTIFIED MALE 1: What's the resolution?

6 Let's --

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

8 UNIDENTIFIED MALE 1: -- just be very --

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

11 UNIDENTIFIED MALE 1: Regulated.

12 UNIDENTIFIED MALE 2: Current, currently regulated  
13 products.

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

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

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

20 MS. ARMSTRONG: They are not all regulated.

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

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

25 MS. PETRILLO-GROH: This was, I pulled that off of

1 the, you know, the part of the EER website that says  
2 commercial?

3 MS. ARMSTRONG: Fine.

4 UNIDENTIFIED MALE: What other sites were used?

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

7 UNIDENTIFIED MALE: What other (indiscernible) --

8 MS. PETRILLO-GROH: Sorry.

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

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

25 MS. PETRILLO-GROH: No, I think that the, the key,

1 I think the key concern are the practical issues that we  
2 outlined. So I think there are --

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

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

7 MR. CATANIA: -- we had --

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

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

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

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

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

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

1 determination now.

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

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

8 MR. CATANIA: Well --

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

14 MR. WHITWELL: So this, this is Bob Whitwell from  
15 Carrier and I think I'm speaking, I hope I'm speaking for  
16 the rest of the AHRI members when I say, really what we're  
17 looking for is exemption of the condenser fan and the supply  
18 air fan on covered products, because those are included in  
19 the efficiency metric and they already have for, for this,  
20 this equipment. It's included in the, in the EER or the  
21 IEER metrics that exist today, or the EER that exists today  
22 and the IEER metric that we're negotiating currently in the  
23 other rulemaking process. And in fact, if you look at the  
24 energy savings that, we, we, we have each, the manufacturers  
25 and the energy advocates presented positions yesterday.

1 We're, we're narrowing in on a, on an agreement, I believe,  
2 in that other rulemaking and there's a significant amount of  
3 energy savings with this, with the proposed vote positions.  
4 A good portion of that energy savings is due to the fan  
5 energy. And it's, it's the fan energy during the cooling  
6 operation, within the heating operation and during the  
7 ventilation op, operation. It's (indiscernible).

8 UNIDENTIFIED MALE: Okay. And all the implied  
9 static.

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

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

24 MR. WHITWELL: I, I don't know the answer to that.  
25 But I do --

1 MR. CATANIA: (Indiscernible).

2 MR. WHITWELL: -- I, I --

3 UNIDENTIFIED MALE: I do.

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

5 MR. WHITWELL: But --

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

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

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

25 MR. CATANIA: That's the, that's the, that's the

1 fan power at the wire. That's the connected load in BHP --

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

7 MR. CATANIA: Supply air fans.

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

10 MR. CATANIA: My, it was my --

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

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

15 MS. ARMSTRONG: From behind you.

16 MR. CATANIA: Okay.

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

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

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

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

25 MS. ARMSTRONG: -- I mean, if you're using that as

1 your argument, that is what the other rule is. And if  
2 that's your ask, I think that's a very different ask of the  
3 people around the table that --

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

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

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

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

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

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

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

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

22 MR. WHITWELL: -- but I --

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

25 MR. WHITWELL: -- sorry, I just, I'm sorry. I, I

1 just wanted to make --

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

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

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

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

24 MS. ARMSTRONG: Okay.

25 MR. CATANIA: Okay. So I guess, this is Tom

1 Catania again, I guess if I was going into your office, one  
2 of the things I would be thinking about is that at the  
3 highest level, the DOE's authority to regulate safe energy  
4 here and the desire on the part of the people who regulate  
5 power generators around the country, is very broad. And  
6 you've experienced as an industry watching the salami get  
7 sliced multiple times and the minute it's made the statutes,  
8 to cover things where opportunities for savings have been  
9 missed and then identified subsequently and oh, we're going  
10 to either have to change the test procedure or the authority  
11 or something like that. That's what's going to happen again  
12 if there are millions of, you know, horsepower that in the  
13 real world are increasingly detected as not being safe. So,  
14 it's do you want to do it in a comprehensive process that,  
15 that considers in the proceeding you just described in this  
16 proceeding an optimization of this, or do you want to fight  
17 trench, legalistic trench warfare and have, you know,  
18 difficulty predicting your capital investments and research  
19 and that spending as the salami keeps getting sliced as  
20 people go back. Whether it's the advocates or the  
21 Department directly and says okay. If it'll require us to  
22 tweak our legislative authority a bit or our interpretations  
23 and our rules a bit, but this is a big pile of demonstrated  
24 energy savings opportunities sitting there that's not being  
25 taken advantage of. And that's the way I would think of it

1 if I was trying to do capital spending plans and investments  
2 looking out decades where these things get fixed later and  
3 you guys have had it happen multiple times. Mike.

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

8 MS. ARMSTRONG: Uh-huh.

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

11 MS. ARMSTRONG: They are.

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

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

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

17 MR. PETRILLO-GROH: Yeah, go ahead.

18 MR. WOLF: And then the second thing is for every  
19 action there's a reaction. So let's assume for a moment  
20 that I'm just going through my head here, that we take some  
21 of the stuff off the table. What will happen then? I'm,  
22 I'm guessing the process will go on. We'll have AMCA, you  
23 know, I know my, my initial comments to the NODA. I, I  
24 suggested the ASRAC process because I'd probably get more,  
25 excuse me, more people involved and we'd end up with a

1 better rule. Now, to Trinity's point, it's getting a little  
2 frustrating coming up to Washington every couple of weeks  
3 and feeling like we're spinning our wheels. And my guess is  
4 that if we take some of these things off the table and said,  
5 all right, you know what, they, they don't apply. We're  
6 going to go back to what we were doing before and, you know,  
7 time will march on and the, AMCA group or the advocate group  
8 will just continue on with what we've developed and that's  
9 what will get probably adopted if it's legally okay to do  
10 that. And again, I'm kind of thinking ahead in the house  
11 market, I think, again, it would be better that we include  
12 all the fans, you know, the manufacturers that, that are  
13 applying fans, rather than just this kind of relatively  
14 narrow view of, of AMCA and, and advocates. So, you know,  
15 you, I don't know if that's a question or a statement. I  
16 guess I'll ask if the question could actually, if the ASRAC  
17 were disbanded --

18 MS. ARMSTRONG: Yes.

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

21 UNIDENTIFIED MALE: Statutory.

22 MR. WOLF: Can you answer that or not?

23 MS. ARMSTRONG: Yeah. So, I can, I mean, I'm not  
24 going to do it from a statutory authority side, but just how  
25 this will work, more as a process kind of thing. So if this

1 group votes, we would have to vote to disband. We would ask  
2 ASRAC to disband us, because ASRAC is the one that chartered  
3 us. So we would have to do that. ASRAC would then disband  
4 the committee. They would tell DOE it was disbanded and why  
5 and DOE could march on with its own rule. I mean, at that  
6 point in time it becomes its normal rulemaking process. We  
7 would go through our proposal development process and then  
8 put a proposal and notice and comment. I mean, we've  
9 already stated a couple of them that we intended to do so  
10 for fans. So, it would just go through our normal  
11 rulemaking process that doesn't afford as many of the back  
12 and forth opportunities with all of us in the room to deal  
13 with some of the stickier issues that we have been talking  
14 about. So, but that's what would happen if we disband.

15 MS. SHEPHERD: And this is Amy --

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

21 MS. SHEPHERD: And this is Amy from AHRI. I mean,  
22 our intention in presenting this was to just give you the,  
23 the, explore this as an option and tell you why we thought  
24 it was a good option. That it, it wasn't our intention to  
25 bring this to vote today. That's what I said to Gary. When

1 we know there's more information coming. But what I think  
2 we just want to do is continue to explore this as an option.  
3 Our intention here was just to give you an explanation of  
4 what we think the basis for the option would be. And that's  
5 it. I mean, I, I think there's definitely a benefit to  
6 moving forward and just continuing to consider this as an  
7 avenue for these types of products, or some variation on  
8 this as we have discussed.

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

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

1 just wanted to --

2 MR. WHITWELL: Yeah. So --

3 MS. MAUER: -- point that out.

4 MR. WHITWELL: -- okay, so let me expand on that.

5 So, the condenser fan is 100 percent covered. When the

6 compressor is on, the condenser fan is on and it's --

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

8 MR. WHITWELL: -- captured 100 percent.

9 UNIDENTIFIED MALE: Yes.

10 MR. WHITWELL: The supply air fan is captured when

11 it's running in cooling operation. When the unit is running

12 the heating operation, it's actually helping to heat so

13 it's, it reduces the heating, the heating requirement for

14 the heat pump or for the electric heater or for the gas

15 heat, because it, it's, the inefficiency is adding heat to

16 the air. Okay? And that's a small part of that total

17 operation. The, the ventilation energy is not captured in

18 the metric, although it is being captured in the analysis

19 and the savings that are being included in the analysis for

20 that rulemaking. Furthermore, there was an, an ask or some

21 discussion and the industry members need to go back and

22 think about this. To consider a revision or tweaking of the

23 IEER metric to include ventilation. So that's something

24 that we can consider as part of the ongoing negotiations.

25 MS. MAUER: I think that's one component in my

1 understanding. The other significant component is that IEER  
2 test is using unrealistically low external static.

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

7 MS. MAUER: Right. I understand --

8 MR. WHITWELL: And --

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

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

11 MS. MAUER: -- representative.

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

16 UNIDENTIFIED MALE: Because?

17 MR. STARR: Yeah, this is Louis. I mean, that's  
18 kind of a lot of where I have the heartburn. They're using  
19 .3 static inches for it, so think of all the ductwork  
20 systems and the tab guidance beat that. How many of them  
21 actually hook up and only have .3 inches of static pressure  
22 loss in the pressure return. And that's what they're using.  
23 It's owner analysis, they, the consultants went back and  
24 used what they considered a more realistic number --

25 MR. WHITWELL: .75 and 1.25.

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

4 UNIDENTIFIED MALE: Uh-huh.

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

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

12 UNIDENTIFIED FEMALE: Prepared by a condenser  
13 company.

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

20 MS. MAUER: This is Joanna. Yeah, I understand  
21 that the analysis is attempting to reflect actual field  
22 energy consumption, as it should. I think the, the concern  
23 is that if the test metric is not appropriately reflecting  
24 field energy consumption, then it's not adequately kind of  
25 incentivizing fan energy improvements.

1 MS. WINNINGHAM: And, and, this is Dave with  
2 Allied. Joanna, I completely understand what you're stating  
3 there and that has been asked too. But we are accounting  
4 for that energy as it's applied, kind of per our discussion,  
5 beyond what the test procedure, and we are making our  
6 decisions based upon that, that energy, that energy. What  
7 we are, what gives us heartburn is we have, we have done  
8 that and that has significantly changed the fan power in  
9 that discussion. I mean, it, it has, it's probably --

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

23 MR. WINNINGHAM: Understand, and I understand what  
24 the test procedure is and how we're, how we're doing that  
25 analysis and I think the debate here is, okay, if we're

1 going to account for that energy there, then we can't  
2 account for it here.

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

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

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

10 MR. WINNINGHAM: Go ahead.

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

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

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

20 MR. STARR: No.

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

25 MS. SHEPHERD: You fired me, I know.

1 MS. ARMSTRONG: No, no, I didn't fire you. I'm  
2 just not talking authority. So I, so, if, if your ask is to  
3 the group for us to potentially consider taking off the  
4 table at this point, small, large, very large, greater than  
5 65,000, um, air cooled split package, air conditioners and  
6 heat pumps because of all the aforementioned reasons, um,  
7 are you willing to also commit to a metric and test  
8 procedure provision as part of that ask.

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

11 MS. ARMSTRONG: I mean, just wondering.

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

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

25 MR. WINNINGHAM: I, I think that's part of the

1 discussion.

2 MS. ARMSTRONG: So, so can I make a suggestion?

3 MR. STARR: Yes.

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

15 MR. BOTELEER: I have one comment. Can I make one  
16 comment and here?

17 MS. ARMSTRONG: Yeah.

18 MR. BOTELEER: As a, as a --

19 MR. STARR: Please identify yourself.

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

23 MR. STARR: Thanks.

24 MR. BOTELEER: We've been regulated for about 20  
25 years now, so we have a little bit of experience here.

1 MS. ARMSTRONG: And they keep coming back for  
2 more.

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

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

7 MR. BOTELEER: Oh, okay.

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

9 MR. BOTELEER: I would just, I'm not going to be  
10 part of the caucus, but I, I would just mention that, it was  
11 mentioned that motors were regulated as a component. And if  
12 it goes into a piece of equipment, it can also be regulated.  
13 And that's, that's probably not by accident. One of the  
14 issues that you're going to face under regulation is a fan  
15 manufacturer' enforcement. And Ashley and I go back and  
16 forth on a regular basis for enforcement and issues we have  
17 with enforcement. And if you think that the market is not  
18 going to challenge you at every corner and try to take  
19 advantage of lower cost and get around the regulations, you  
20 are sadly mistaken. I have examples. We have a small motor  
21 rule. I got a call the other day from one of my sales  
22 people. One of his manufacturers is redesigning an entire  
23 product line, moving millions of dollars' worth of motors to  
24 another product that's not covered so he can avoid the  
25 regulation.

1           So I think when you look at something like this,  
2 and I understand the issues, you know. If it's covered,  
3 it's, and you're double counting it, that is definitely an  
4 issue. But if you're a fan manufacturer and you're creating  
5 a situation where you regulate not at the point of  
6 manufacture, but at the point of application, you've created  
7 a situation where the market is going to take advantage of  
8 it. So that's, my worse, my worse of what, what occurs in  
9 the market.

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

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

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

22           MR. BOTELE: Right. If there's a fan blade that  
23 could go two different directions, you will find at some  
24 point that there's a, it would never happen here, but the  
25 manufacturer from Southeast Asia somewhere would suddenly go

1 to one of your competitors and find that they're building  
2 air handlers with some piece of product that, we find motors  
3 that have no nameplates.

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

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

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

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

18 MR. WHITWELL: That's right.

19 MR. BOTELEER: But that's the discussion.

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

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

23 MR. BOTELEER: Okay.

24 MS. SHEPHERD: That, that any solution has to be a  
25 solution --

1           MR. BOTELEER: I just wanted the fan manufacturers  
2 to understand that.

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

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

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

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

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

17           MR. BOTELEER: Yeah, baby number two.

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

1 nameplate, because they're not subject to standards right  
2 now.

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

12           MR. WHITWELL: Yes, yes, okay.

13           UNIDENTIFIED FEMALE: Yeah.

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

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

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

20           MR. BOTELEER: No. Well, 50, 60 is covered. Okay,  
21 we know that. We were smart enough to figure that one out.  
22 But we said, well we won't cover 50 hertz, so we have a  
23 manufacturer from India importing equipment and all the  
24 motors are 50 hertz, labeled 50 hertz and they have no  
25 anomaly efficiency, don't meet anything. And they said,

1 well we didn't have to comply because it's a 50 hertz motor.  
2 Of course, we're going to run it on 60 hertz.

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

11 MR. BOTELEER: Yeah, yeah, further to that, you  
12 know, our first regulation was we, our, our methodology was,  
13 have the narrowest equipment class you could possibly have,  
14 you know. We, we sell between 40 and 50 million connected  
15 horsepower a year. Let's try and narrow it down and  
16 regulate the least amount. Well, that opened up the door  
17 that we've regulated general purpose product, but we didn't  
18 regulate definite special purpose product. So, wow, here's  
19 a door where I can call it something else and avoid the  
20 regulation coming up a year from yesterday. And in June of  
21 2016 essentially covers all those. We, we learned our  
22 lesson as we say now, almost, almost.

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

24 MR. BOTELEER: Yeah, yeah. They're others still  
25 out there.

1 MR. LEONARD: Dan Leonard, working on that.

2 MR. BOTELEER: Wade, Wade, we're working on this  
3 commerce presentation.

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

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

23 MR. WHITWELL: Yeah, and I, I worry about it.  
24 That's, that's right. I worry about the regulatory burden  
25 here, because we're already certifying to DOE our cooling

1 performance. We're certifying our heating performance  
2 separately. Now we're looking at we're being faced with  
3 certifying the performance of all the fans that we have,  
4 which could be five fans in one piece of equipment,  
5 different fans. And we're going to --

6 MR. FLY: With five different motors --

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

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

11 OFF THE RECORD.

12 ON THE RECORD.

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

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

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

25 MR. WHITWELL: Okay, so yes, Bob Whitwell,

1 Carrier. So AHRI members spoke over lunch and we're not  
2 ready at this point for a specific ask. But what we, first  
3 off, let me say, we do want to work the process and we want  
4 to get to some kind of consensus, okay. So Ashley, do you  
5 want to get to a consensus.

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

8 MR. WHITWELL: We, we would like to come back and  
9 we want, we're hoping that we can get agreement on a  
10 concept. Okay, and the concept is that if the fan energy is  
11 included in, in an energy metric on a product that's already  
12 regulated by DOE, that that fan can be exempted. Okay, so  
13 what we, what we need to do. We, we want to have some more  
14 time and what we'll do is we'll go through that list of  
15 products that you saw up there and we'll identify where  
16 those products, what our ask is as far as what would be  
17 exempted. For example, I spoke earlier about the  
18 negotiations that's, that's going on. And parallel to this  
19 on the, uh, commercial unitary small, large and very large  
20 equipment for those that, you know, that covers equipment  
21 from six tons, up to 63 tons, or actually up to 760,000 BTU  
22 problems, so a lot of roof tops and split air cooler  
23 equipment. And on those products, the condenser fan, we are  
24 moving from an energy metric EER, which is a full load  
25 metric to a part load metric IEER. The part load metric

1 takes into consideration the energy at different load  
2 points, 175 to 50 and 25. And as the fan stages the  
3 compressors and the fan stage down for those part load  
4 points, you get the credit for less energy used at the, at  
5 the part load conditions. And those equipment, on that  
6 equipment the condenser fan is on when the compressor is on.  
7 It's off when the compressor is off. It's 100 percent  
8 covered in the energy metric.

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

19           The, the discussion in that rulemaking was that,  
20 that test procedure would be worked over the next, I don't  
21 know, maybe it takes a year or two years, and would be  
22 adopted for the next round of rulemaking, which is going to  
23 be sometime in the future. Not, not the levels that we're  
24 talking about right now, but it'll be some time in the  
25 future. But we, we, the ask is, has been for us to commit

1 to changing the AHRI procedure. And I think that's going to  
2 happen, but as I said, was just yesterday and we've got to  
3 consult with the rest of the, uh, AHRI members before we can  
4 100 percent commit to doing that.

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

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

18           MR. FERNSTROM: State your name.

19           MR. SMITH: I'm sorry, this is Wade Smith. Do you  
20 have a proposal for some physical description of a condenser  
21 fan that would be exempt, rather than, uh, an exemption that  
22 ties to the application, the use in a particular piece of  
23 equipment? Or is it some physical description that you can  
24 use to ask for an exemption of all panel fans that are of  
25 this, that meet this description, whatever it might be?

1 MR. WHITWELL: We, we can come up, I'm sure we can  
2 come up with that. I mean, I --

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

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

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

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

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

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

22 MR. SMITH: So, so that's all. Maybe in the  
23 future we'll all do it, you know. So that, that's, that's  
24 the seat of the cockpit. I think you need to come back and  
25 make a suggestion in terms of how those are, if they want to

1 be exempt then they have to be defined tied into the  
2 problem.

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

6           MR. WHITWELL: The, unfortunately --

7           UNIDENTIFIED FEMALE: No.

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

12          MR. SMITH: And consumed.

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

17          MR. SMITH: So the operating hours --

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

20          MR. WHITWELL: Yeah.

21          MR. SMITH: I got you there, yeah.

22          MR. WHITWELL: Yeah, so.

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

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

1 not.

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

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

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

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

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

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

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

25 MR. WHITWELL: That'd be part of the ventilation.

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

4 MR. WHITWELL: That's right.

5 MR. ERNST: Potentially all operating modes.

6 MS. MAUER: Not today in the metric.

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

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

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

17 MR. SMITH: And not in this rule?

18 MR. WHITWELL: Not in this rule.

19 MR. SMITH: At some future date?

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

22 MR. SMITH: Like six years from now?

23 MR. WHITWELL: Yeah.

24 MR. CATANIA: I have a question.

25 MS. ARMSTRONG: Who is that.

1 MR. CATANIA: Yeah --

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

9 MR. CATANIA: Very slight.

10 MR. CATANIA: Tom Catania. You know, one thing I  
11 think we all need to collectively think about as you're  
12 going through these decisions about both the timing of the  
13 rule and the aggressiveness of it and so forth, is that it's  
14 so tempting to focus on the stick element of regulation and  
15 ignore the potential current opportunities. And if some  
16 combination of changing of the test procedures, uh, updating  
17 them as well as new standards are done well, you know,  
18 Gary's clients and their sisters around the country are  
19 already spending billions of dollars incenting more rapid  
20 adoption of these more energy efficient products. And, you  
21 know, if regulation want to indeed survive, and even the  
22 dozens, the projections that I've seen from people who want  
23 to know these things, does, those numbers that are already  
24 large today double in the next two years. The extent to  
25 which some of these advocates here, people like Gary's

1 clients, see real world real energy savings as a result of  
2 the work that's done here, the potential for carrot and  
3 incentives for these products getting into the market more  
4 quickly is going to be profound.

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

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

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

25 Too, and, and for the IEER metric, in order to

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

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

15           2014, that number was up to 20 percent, so a  
16 significant move that industry has moved to different  
17 technology, reducing fan energy, saving a lot of energy for,  
18 for consumers, so we understand the carrot part. Uh, and as  
19 an industry, we are working there, continuing to work  
20 outside of the regulatory, that the federal regulatory arena  
21 to improve the efficiency of our equipment, and provide for,  
22 for our customers, so. Yes?

23           MR. SMITH: Right, so, at this point I just want  
24 to interject a little pitch for the metric that was  
25 developed in the MCO which the science of maximum horsepower

1 to any and every operating point, which on the surface seems  
2 like an undue burden. But it has a few very important and  
3 attractive attributes, especially during manufacture that  
4 bear pointing out here.

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

17           Sell a little larger fan. Sell a more efficient  
18 fan. Did it cost a little more? Our, our expectation is  
19 the market will respond by compensating and, and selecting a  
20 less efficient, less expensive fan. So the savings that we  
21 could produce by taking that approach, by tying the  
22 performance to valuation or regulation to particular test  
23 bumps, the savings was very uncertain and the fear was that  
24 it would be nonexistent. So that if we went into the  
25 utility rebate business, so to speak and promise the utility

1 a gain, I'm not sure that we would deliver.

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

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

24           The problem that this metric and this approach  
25 resolves is it resolves the problem that people aren't

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

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

17           There is also a challenge in that it's a bit more  
18 difficult to evaluate, right. And so, you know, those,  
19 those of you who, uh, sell products with embedded fans,  
20 just, just need to go through the evaluation. But if you do  
21 that and you compare the savings and the investments that  
22 you have to make in order to comply with a reasonable  
23 efficiency level as proposed, and then back up and say, no,  
24 I'm going to use a different metric and a different approach  
25 that'll actually cause the least efficient products to come

1 off the market, by God. And that's the only way to generate  
2 savings. And then that begs the question, how much savings  
3 did I generate and how much did I have to invest to get it.  
4 You're going to find that this approach is really  
5 attractive. It's attractive if your motive is to save  
6 energy. It's attractive if your motive is to sell more  
7 efficient products that you've already manufactured.

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

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

25           And the more, the more our membership became

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

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

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

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

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

24 MR. STARR: This is Louis of NEEA. I'm just  
25 mentioning I was talking to one of the fan manufacturers at

1 lunch that also gets air handling equipment.

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

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

16 MR. WHITWELL: Yeah.

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

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

1 that could be greatly improved.

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

9 MR. SMITH: Straight talking, right?

10 MR. WHITWELL: No, what?

11 MR. SMITH: Great.

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

20 MR. BOTELEER: It's unknown.

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

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

25 MR. BOTELEER: Yeah.

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

4 MR. BOTELEER: That's right.

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

6 MS. ARMSTRONG: Not exactly.

7 MR. BOTELEER: The magic is in the motor.

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

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

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

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

20 MR. BOTELEER: I did. Do you want me to  
21 (indiscernible).

22 MR. WHITWELL: Well actually that was discussed.

23 MR. BOTELEER: Oh, sorry.

24 MR. WHITWELL: That was discussed some at the last

25 --

1 MS. ARMSTRONG: You love it. Other industries  
2 that are subject to (indiscernible) have not embraced it  
3 with the same love that you do.

4 MR. BOTELEER: Let me tell you why we love the  
5 basic models.

6 MS. ARMSTRONG: We're getting there.

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

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

1 we want to call them.

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

3 MR. BOTELEER: And treating them differently.

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

7 MR. BOTELEER: Many.

8 MS. ARMSTRONG: Oh, carrier alone?

9 MR. WHITWELL: Yeah.

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

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

13 MS. ARMSTRONG: Thirty trillion?

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

18 MS. ARMSTRONG: One more time.

19 MR. WHITWELL: For the record?

20 MR. BOTELEER: I want to, at this time I --

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

23 MR. BOTELEER: Well I was just going to comment on  
24 Tom's, Tom's comments about, you know, some of the  
25 incentives out there. The utilities right now have \$9

1 billion in their war chest that fund high performance  
2 products. We have an initiative through ACEEE, fan  
3 manufacturers, pump manufacturers and compressor  
4 manufacturers are all working on identifying the product and  
5 how to label that product, so that the utilities can use  
6 that in those incentive programs.

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

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

20 MR. FERNSTROM: So this is Gary. I, I'd like to  
21 make a comment following up on Rob's and Tom's and Wade's.  
22 And that is, if the efficiency savings attribute isn't in  
23 the metric, we can't take credit for it. We can't get  
24 incentives for it. And I think, uh, Wade and AMCA have come  
25 up with a very clever approach to a metric that recognizes

1 the system-related savings through the appliance regulations  
2 that we have not previously been able to recognize. And  
3 from an incentive's point of view, we will all be so much  
4 better off if that metric moves forward.

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

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

15 MS. MAUER: Okay.

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

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

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

19 MS. ARMSTRONG: Well, so --

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

23 MS. ARMSTRONG: Okay, well --

24 MR. SMILEY: -- where the fan came from or what it  
25 is.

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

11 MR. WHITWELL: So --

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

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

1 connect it to a motor and put it in a housing and, and, and  
2 test it.

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

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

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

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

13           MR. WHITWELL: So what is that fan then?

14           MR. SMITH: It's a fan.

15           MR. WHITWELL: Okay, well --

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

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

21           MR. FLY: But if she sees --

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

24           MR. FLY: But if she sees an impeller, this is  
25 Mark Fly with AAON. If she sees an impeller on the dock,

1 that is not a fan?

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

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

5 UNIDENTIFIED PERSON: Still no fan.

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

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

9 MR. WHITWELL: So Wade --

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

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

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

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

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

20 MR. WHITWELL: Right.

21 MR. FLY: Right.

22 MS. ARMSTRONG: You agree with that?

23 MR. FLY: I do.

24 MS. ARMSTRONG: Because that's different than what  
25 you just asked the part for.

1 MR. FLY: Uh-huh.

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

5 MS. ARMSTRONG: See how this works?

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

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

12 MS. ARMSTRONG: Because --

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

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

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

25 MS. ARMSTRONG: Can I talk to you about that list

1 of equipment you think is exempted from 13 SEER?

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

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

9 MS. ARMSTRONG: It may have been.

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

11 MR. WHITWELL: Yeah, yeah.

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

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

20 UNIDENTIFIED MALE: Prove it.

21 MS. MAUER: That's helpful to understand.

22 MS. ARMSTRONG: Well, so --

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

25 MR. SMITH: Suppose it's a, goes into a product

1 which is not certified?

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

4 MR. SMITH: Why?

5 MR. JOHNSON: It does not need to?

6 MR. SMITH: No.

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

8 MR. SMITH: But it's already certified.

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

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

12 MS. ARMSTRONG: This is what they understand.

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

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

18 MS. ARMSTRONG: Well, one of the --

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

20 MR. SMITH: So this is Wade. I just want you to  
21 understand that there is more than one answer. And one  
22 answer that I think would work is an answer that says, I  
23 make a box. I buy a fan. The people I buy the fan from  
24 certified it to DOE. I receive the fan. I make no  
25 certification to DOE. That's an option.

1 MS. ARMSTRONG: That is what you're, okay --

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

4 UNIDENTIFIED MALE: One person at a time.

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

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

10 MR. WHITWELL: Can I ask a clarifying question?  
11 So in that case, Wade, would that always be a testable  
12 configuration?

13 MR. SMITH: Whoever makes --

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

15 MR. SMITH: No, no.

16 MR. WHITWELL: Yes, so --

17 MR. SMITH: Whoever, whoever assembles the fan,  
18 the first point at which it's in a testable configuration,  
19 that entity would have the responsibility to certify it to  
20 the DOE.

21 MR. WHITWELL: Yes, so that's a choice  
22 manufacturers could make. They could make the choice to do  
23 that.

24 MR. SMITH: They could either do it or not do it.

25 MR. WHITWELL: But, in a lot of cases that's not

1 going to be the most economical approach.

2 MR. SMITH: Well, okay.

3 MR. WHITWELL: So --

4 MR. SMITH: But, but that's an option.

5 MR. WHITWELL: And so, I, I mean it's, it's always  
6 an option. I mean, we can buy a complete unit from somebody  
7 and resell it. That's an option too, right, so.

8 MR. WINNINGHAM: What I think the point is, this  
9 is Dave with Allied, that many of these are going into parts  
10 that are already regulated. And we all had a discussion  
11 about, you know, incentives. There are already incentives  
12 out there for the products that we make. There are ones for  
13 SER, EER, you know, IEER. And, and to make a case that just  
14 because I have good fan efficiency, means I'm going to save  
15 all this energy when you have multi-variables. We have a  
16 refrigeration system in your moving air, you can push that  
17 power from one place to another. Just because I have good  
18 fan efficiency doesn't mean I have a good system efficiency.

19 MS. ARMSTRONG: I think we acknowledge that on day  
20 one to a certain extent, although they don't necessarily go  
21 one in one. There are other aspects that affect the system  
22 efficiency. Having a more efficient fan whether that be a  
23 different category of fan doesn't necessarily hurt though,  
24 either. I think what we're asking of you is, you're asking  
25 the Committee to consider not analyzing or studying

1 standards for a subset of the market. So we're really  
2 asking, what would that look like?

3 MR. WINNINGHAM: That's why we're --

4 MS. ARMSTRONG: And, and, and so in terms of  
5 definitions, how would you tell? How would you distinguish  
6 it? What is the scope we're talking about in terms of  
7 receiving numbers, shipment numbers? I mean, back it up  
8 with data and what that regulation would look like and  
9 present it to us to understand. I mean, is it everything?  
10 Is it a subset of everything? Is it, those that are just  
11 embedded when they come in or if they're manufactured  
12 domestically? If you're otherwise bringing in, fan,  
13 testable fan configurations and then inviting them on  
14 equipment, that's a different issue. You know, all these  
15 things have to, are details that impact the magnitude of  
16 your ask.

17 MR. WINNINGHAM: Okay. Okay.

18 MS. ARMSTRONG: Where are, where are we? Are we  
19 going to talk about motors?

20 MR. BURDICK: Well, we're going to have a CTI  
21 presentation.

22 MS. ARMSTRONG: Sure, you can go next.

23 UNIDENTIFIED PERSON: The CTI?

24 MR. BURDICK: And so, this paper, first of all, I  
25 just appreciate the opportunity to be able to make comments

1 and certainly CTI Group is interested in participating in,  
2 you know, in this discussion, interested in finding, you  
3 know an equitable solution and that type of thing. But here  
4 in this presentation, want to identify many of the issues  
5 that we have for our industry, to be able to adopt it. And,  
6 you know, recognizing too that there are probably, there are  
7 definitely better ways to identify energy savings, rather  
8 than just with a pure efficiency number, or a fan efficiency  
9 application point efficiency type situation. And so,  
10 there's a calling to --

11 UNIDENTIFIED PERSON: That should be up there.

12 MR. BURDICK: Yeah, I think I see it. And so, I  
13 have a colleague here on the line too, Paul Lin. And I  
14 don't know if you'll be able to open the mic for him for  
15 that type of thing in case he wants to interject something  
16 here that I miss or don't state properly.

17 So this graph was presented in the CTI Position  
18 Paper that's posted on the DOE Website. It's been there  
19 maybe since the first of January or so. And what it's  
20 showing is the amount of energy that is attributed to  
21 cooling tower fans shows kind of lower left there, one  
22 percent is what we're seeing, well, you know, based on this  
23 published data for energy consumption on building HVAC use.

24 And something that I'd like to clarify too right  
25 off the front, I don't have as many nice pictures as some of

1 these other folks do. I can add those on later and you can  
2 look at the SBXCooling.com, Baltimore Aircoil Website, the  
3 Gapco Website, you know, and start to see, you know, some of  
4 the configurations, you know, that are possible with these.  
5 There's really quite a wide variety that's possible there.  
6 But anyway, so this part or the part that's significant  
7 about this is that, this is not, we're not dealing with air  
8 that is circulating through the building. We're dealing  
9 with air that is solely, its sole purpose is drawing from  
10 the ambient and rejecting heat to the ambient.

11           It doesn't circulate through the building. Type  
12 of a situation. So, I wanted to make sure I clarified that.

13           So again, one percent figure is, uh, what we think  
14 is substantial about that. Then here, talks some more about  
15 some of the takeaways from the previous slide. Outdoor heat  
16 rejection equipment, six to seven percent of the total, fan  
17 energy. Outdoor heat rejection equipment includes eco-  
18 condensers, evaporative condensers, open and closed cooling  
19 towers. It's very important here that a very small unit  
20 efficiency or unit improvement can be obtained with  
21 increments in fan efficiency.

22           The input power affects very small product energy  
23 than talking about this last few meetings here, uh, product  
24 energy efficiency is much more affected by the heat  
25 exchanger size of the design. And the pressure drop through

1 the unit. Yes?

2 MR. PERSFUL: Trinity Persful here. When you say  
3 efficiency, are you talking about a, like BTU efficiency or  
4 --

5 MR. BURDICK: Exactly. I think the next slide  
6 gets into that where it's, uh, uh, in actually 90.1, for  
7 example, uh, opening, open, uh, cooling towers have a figure  
8 for, uh, gallons of water cool per horsepower applied. Uh,  
9 and so, the GPM figure there is gallons of water cooled,  
10 GPM, uh, cooled.

11 MR. PERSFUL: Okay.

12 MR. BURDICK: Uh, and so basically, it turns into  
13 a situation of, uh, kilowatts of heat rejected, BTUs of heat  
14 rejected, relative to the kilowatts' consent. And, uh, like  
15 I said there before, uh, the fan efficiency is, uh, uh, far  
16 from, uh, one of the leaders in being able to improve  
17 overall system efficiency. We're actually having energy,  
18 uh, savings, uh, possible.

19 And so, this talks about, uh, heat rejection  
20 equipment, the metric, uh, BTUs per hour, the horsepower,  
21 uh, minimum efficiencies are mandated in, uh, 90.1 and IECC,  
22 uh, you know, uh, maybe, uh, some folks think that's not,  
23 uh, uh, necessarily enforced everywhere, but it is something  
24 that's, uh, completely adopted by our industry. Uh, we, uh,  
25 publicize it, uh, in everyone's, uh, selection software.

1 It's, uh, identified, uh, as a parameter of interest. And,  
2 uh, folks can make a, make a buy decision, you know, uh,  
3 based on that. Uh, I've also mentioned at other times too,  
4 where you can maybe achieve 20, 30 percent energy savings,  
5 uh, by sizing, by proper sizing that the heat exchanger, uh,  
6 for, uh, you know, a four or five percent, uh, incremental,  
7 uh, product cost. Got a question from Louis?

8 MR. STARR: So, on the, uh, I'm not that familiar  
9 with that. These particular things you're talking about  
10 here.

11 MR. BURDICK: Okay.

12 MR. STARR: Does, so the first one, the, the  
13 metric that measure the heat injection supplies that energy  
14 input, so if you had for let's say a really efficient motor,  
15 that's going to show up there.

16 MR. BURDICK: No, well it, it'll be in the system.  
17 Yeah, this, this, uh, this metric is about the whole system.

18 MR. STARR: Does it drive people, for instance, to  
19 use an ECM motor or a, uh, cooling tower? Does it drive  
20 people to use a VFD?

21 MR. BURDICK: Uh.

22 MR. STARR: Some measure of, of regulating your  
23 motor based upon outside air conditioners rearranged in  
24 there.

25 MR. BURDICK: In probably more like the last 10

1 years, that I've been involved with the industry, just about  
2 every type of one of these units that I've seen is been, uh,  
3 connected to a VFD, because they recognized, uh, they don't  
4 need the capability of the cooling tower full speed year  
5 around. And they can always capitalize on VFD by, uh,  
6 saving energy.

7 MR. STARR: So one thing for you to consider, if  
8 they can find a fan, that's being all of those things, a, a,  
9 uh, propeller, the motor, the drive --

10 MR. BURDICK: Yeah.

11 MR. STARR: We had a metric around that, if, what  
12 you would sell more of. Your BFD and better motors, so I  
13 mean, in other words --

14 MR. BURDICK: Still you can, you know, even on  
15 motors, uh, you know, you can have a NEMA premium and, uh,  
16 uh, you know, uh, the next better grade or next lower grade.  
17 Uh, that's not going to mean dollars per year, you know,  
18 that somebody's going to take advantage of this, because it  
19 doesn't run at that main type horsepower, very, a very high  
20 percentage of the year.

21 MR. STARR: But it --

22 MR. BURDICK: Pretty low service factor, a duty  
23 factor on, on --

24 MR. STARR: VFD mighty woes.

25 MR. BURDICK: Yeah, some --

1           MR. STARR: Some guys were, what's the word,  
2 interested in it because of this, is what I would suggest,  
3 so.

4           MR. BURDICK: Okay.

5           MR. STARR: It's more, like it's more of your  
6 products. If you think about it, you have a customer who's  
7 interested in paying the absolute lowest dollar for  
8 everything he can. He won't make the best decisions about  
9 whether he should have bought that VFD, or whether he should  
10 buy the more efficient fan, and you know, so it's get a  
11 little tricky with regulation, but I would just encourage  
12 you to --

13          MR. BURDICK: Yeah.

14          MR. STARR: There could be an upside is what I'm  
15 what I'm getting at.

16          MR. BOTELEER: Your box is due.

17          MR. BURDICK: I, it --

18          MR. LIN: This is Paul Lin. Do you hear me?

19          MR. BURDICK: Yes, go ahead, thanks.

20          MR. LIN: I thank you. I would just add that, uh,  
21 in addition to influencing the cooling tower business toward  
22 compliance, uh, the, uh, by customers, uh, with the, uh,  
23 minimum efficiency per cooling towers, 90.1 also influences  
24 adoption of VAV on cooling tower systems. What Larry said,  
25 just a few minutes ago about the very high percentage of use

1 of VFD's, uh, for cooling towers on HVACs, uh, it, it's  
2 really because of, of 90.1 and IETT, and the strong trend,  
3 uh, if not complete trend by the, our tech engineers that do  
4 these buildings and leaving contractors to use 90.1 as a  
5 standard of care for system design.

6 MR. MCNEILL: This is Donald McNeill. You might  
7 think about that whole industrial market. It doesn't have  
8 to comply with 90.1. It's about how it might affect the  
9 sales.

10 MR. STARR: Right.

11 MR. LIN: On that side, the industrial market is  
12 different from HVAC, because the, the applications tend to  
13 have multiple fans and it's very difficult to justify VFD  
14 when you have 10 steps of fan control with, with multiple  
15 cells. You know, industrial cooling towers are much bigger  
16 than HVAC in general. And things are accomplished by using  
17 two-speed fans in step-wide control with multiple cells.  
18 So, uh, VFD is not cost effective.

19 MR. BURDICK: Now, and --

20 MR. FERNSTROM: And so, so this is Gary for the  
21 California IOUs. There's a lot of industrial refrigeration  
22 that falls into the agriculture and food processing markets,  
23 which isn't, is a large industrial scale that you mentioned.  
24 And in those markets Beta Culture, for example, there's a  
25 really good opportunity for VFDs, because we're back down

1 into the commercial refrigeration size equipment again. And  
2 they don't --

3 MR. LIN: I'd agree with that.

4 MR. HALL: Solomon Hall speaking. I have a  
5 question about the definition of horsepower in this case.  
6 If you cut out the horsepower, does it mean you all must use  
7 as a general purpose motor that is regulated and that you  
8 use 100 percent, or are you using a service factor and maybe  
9 auto motors or a special duty motors?

10 MR. BURDICK: In this case, horsepower, you know,  
11 could be translated into kilowatts power or that type of  
12 thing instead. Horsepower is just a term that's used here,  
13 but, uh, it's the, it's the, uh, connected horsepower of the  
14 motor, because it's nameplate.

15 MR. MORRISON: Frank Morrison, Baltimore Aircoil  
16 Company. By definition, it's the nameplate, motor nameplate  
17 in that equipment.

18 MR. HAUER: What was the horsepower output  
19 (indiscernible).

20 MR. MORRISON: Nameplate.

21 MR. BURDICK: Nameplate.

22 MR. SMILEY: The motor, motor, this Bill Smiley,  
23 the motor output at design point of motor, that's the  
24 nameplate.

25 MR. HAUER: But what prevents people from using

1 service factor? You can use, if it looked in NEMA, MG-1, in  
2 many motors you can use the 1.5. So you can declare

3 MR. BURDICK: Again, VFD, VFD usually takes care  
4 of that, but it's connected to a VFD. In fact, they're  
5 always programmed to not allow, uh, uh, consumed kilowatts  
6 to go above the nameplates, you know. They're limited on an  
7 (indiscernible) volt to, uh, uh, prohibit that. Uh, it is  
8 necessary sometimes, uh, actually we still install 115  
9 service factor motors for situations when you're in very  
10 cold climates and you run it year round. But typically  
11 you're able to modulate that with additional number of cells  
12 or maybe sometimes you have, uh, half speed or so on.

13 MR. HAUER: So that's just, just a good practice,  
14 but it's not standardized. Does it meet that standard?

15 MR. STARR: I mean, this is Louis, and I was just  
16 thinking what would I mean, I'm sure you guys don't sell it  
17 out though, but keeps someone else from doing that. I mean  
18 best practices are good, but people could sell less  
19 horsepower and get the job as opposed to, you know, selling,  
20 you know, get with the program.

21 MR. BURDICK: Well, it, it, it, it's evaluated on  
22 every job. You know, on the industrial jobs even. It's  
23 often evaluated, you know. What does the client, you know,  
24 uh, uh, what does the EPC value most? Does he value most  
25 what was possible cost that he can turn over to the utility,

1 you know, three months from now. Or does he value, you  
2 know, uh, what it's going to mean to the owner, uh, in the  
3 long term.

4 MR. MORRISON: The first one.

5 MR. BURDICK: Yeah.

6 MR. HAUER: That leads me to the question. Is it  
7 then always, uh, the general purpose motor that's regulated  
8 by NEMA or, uh, other motors used in the cooling tower?

9 MR. BURDICK: It's, it's, uh, it's, it's a NEMA  
10 compliant motor. It's always a NEMA compliant motor. Could  
11 be premium, could be whichever, whatever grades are  
12 available and that are legal.

13 MS. ARMSTRONG: Is it always DOE regulated?  
14 They're not, right?

15 MR. BOTELEER: They will be June 1st of next year.

16 MR. DELANEY: But they could be a, it could be,  
17 could be advanced technologies too.

18 MR. BURDICK: Right, yeah.

19 MS. ARMSTRONG: We have, we have a combination of  
20 motors that --

21 MR. DELANEY: Variable speed.

22 MS. ARMSTRONG: -- maybe will be regulated by DOE  
23 in the next year. We'll, standards all accounted, or more  
24 advanced technology motors, variable speed, (indiscernible),  
25 et cetera, et cetera, are not regulated by DOE right now.

1 MR. BOTELEER: Or above 500 horsepower.

2 MS. ARMSTRONG: Right, or about 500 horsepower,  
3 which are not regulated at all. Does that help?

4 MR. HAUER: So basically it proves that the metric  
5 is not really solid with regard to horsepower.

6 MR. BURDICK: All right, so moving on to the  
7 bottom part of the, the page here. Uh, example of product  
8 performance included in, uh, including the 90.1 operating  
9 point is covered and published by CTI certification, uh,  
10 through open and close cooling towers, evaporative  
11 condensers and, uh, programs in, in progress. Or actually,  
12 I guess the evaporative condenser programs in progress, open  
13 and closed cooling towers are already in place. And it's  
14 verifiable, uh, via public, uh, CTI Website as to which  
15 models, uh, are, uh, certified.

16 And then, uh, issues with fan efficiency focus.  
17 Uh, I think we've talked about this. A lot of the same  
18 comments that you've heard before with embedded fans is  
19 what's important is what the system does to, is what, uh,  
20 the entire, uh, system responds to, uh, with the fan  
21 application. And one of the issues with our industry is  
22 there's relatively low volume of sales. You know we're not  
23 making 100,000 fans a year or putting out huge numbers of  
24 products here.

25 The implications of certification for every fan,

1 that has a big number of fans that we make for ourselves.  
2 You don't go to Grainger and buy these. They have to be  
3 resilient to the ambient effects when you have a 36 foot  
4 diameter fan. And it's on your product. You kind of have  
5 to take ownership of the structural reliability of that  
6 thing spinning around at 120 miles an hour on the tip, that  
7 it's not going to fall off, hurt somebody, kill people,  
8 cause other extraneous damage.

9           There are lots of implications about, you know,  
10 being able to withstand tornadoes passing by, storms passing  
11 by, other things that, you know are important for the people  
12 that are buying them and using them that they have to meet  
13 these criteria. So they are quite unique. Not something  
14 you can buy just anywhere. Wide variety of models and fan  
15 types on the market, there are other situations where there  
16 are low noise requirements. Those take a special type of  
17 air flow that have kind of a different efficiency profile  
18 than what a maximum efficiency capability type can be. You  
19 know, where it's wide forward swept blades. You end up with  
20 big tip clearances. You end up with, with other  
21 inefficiencies in the system in order to be able to run it  
22 really slow.

23           The talk about the application there a bit with  
24 the large tip clearance safety being able to withstand the  
25 sphere of duty that it's in. This might be a geothermal

1 power plant where the circulating water is highly corrosive,  
2 needs to be a high degree of stainless steel, high degree  
3 of, uh, corrosion resistant materials. Fiberglass parts,  
4 uh, you know, since some of these, uh, big fan blades on a  
5 32-foot, uh, fan that we make. It's got about a, uh, 14-  
6 foot long blade, that's a hollow fiberglass structure,  
7 specifically designed for, for this application so that, uh,  
8 water impingement drops, you know, don't bother it. It's  
9 able to withstand the sunlight, the U.V., the storms and so  
10 on.

11           So, you know, quite specialized equipment, very  
12 expensive to release new product into the market or change a  
13 characteristic about it.

14           MR. LIN: Larry --

15           MR. BURDICK: Yeah.

16           MR. LIN: There's a slide that was skipped.

17           MR. BURDICK: Sorry, this one?

18           MR. LIN: Yes.

19           MR. BURDICK: Oh, okay. Sorry about that.

20 Imposed changes to fan efficiency would, and redesigned  
21 with, uh, smaller heat exchangers to manage cost and, uh,  
22 higher actual energy usage. So there's a discussion about  
23 that, uh, probably in that table, uh, there toward the back.  
24 Uh, there is some too. Uh, the, the, uh, again, this leads  
25 to the system approach. It's not always best just to have

1 the biggest fan in and, uh, uh, sometimes, uh, uh, you need  
2 to do, uh, you know, a complete system evaluation where, uh,  
3 sometimes the smaller fan is better, but, you know, as  
4 opposed to maybe some of the traditional thought that the  
5 larger fan is always better and the larger fan is always  
6 more efficient. Uh, it depends on how the air is entering  
7 the, the, uh, fan opening and whether or not you're able to  
8 fill out the blade tips, uh, or get, uh, optimum air flow,  
9 uh, through the unit.

10           Uh, so heat rejection equipment amounts to only  
11 five, five to 10 percent of the total, uh, energy in a  
12 typical system, you know, relative to the chiller or the  
13 pump in an HVAC system. The, uh, fan requirement or the fan  
14 energy requirement for the, uh, cooling equipment, uh,  
15 fraction, you know, low fraction of, uh, what that, uh,  
16 power consumption can be. And then actual energy  
17 consumption is well below, uh, design on annual basis.  
18 Again, here, we're talking about it's not always a 80  
19 (indiscernible) of outdoors where the atmospheric heat  
20 exchanger equipment is designed to be able to take, is  
21 capable of doing that. You know, you don't want to leave a,  
22 a hospital, uh, in a bad situation, uh, on a hot day, uh,  
23 because your cooling tower isn't big enough. It has to be  
24 big enough from day one, so that it can always hit the peak  
25 days, always meets the cooling demand for peak days. But,

1 uh, at other times, well they're able to capitalize on  
2 turning off other cells or going with a VFD arrangement.  
3 And, uh, so that's the, uh, bottom point there. It talks  
4 about the VFD.

5           Okay, then, Paul this is something that you put  
6 together for, uh, the, uh, uh, consideration of a, uh, a met  
7 or different scenarios with a highly efficient smaller  
8 diameter fan relative to base size, uh, and so on. I don't  
9 know if you want to talk about any of that. And then the  
10 other thing that I prefaced that with, is that, uh, this  
11 group wasn't involved with, you know, the original, uh, uh,  
12 AMCA, uh, brainstorm or, uh, the other, you know, the other  
13 committee work that was done on this. Uh, we tend to use  
14 total efficiency in our industry, uh, for an evaluation. I  
15 would like to keep in mind that the exit velocity out the  
16 fan is important to us, so that we don't recirculate the  
17 heat that we rejected from the heat exchanger. Uh, but, uh,  
18 I think, uh, others here, Wade's mentioned, uh, uh, concern  
19 about this, uh, uh, when you look at it from the static  
20 efficiency point or the static efficiency prospective.

21           Paul, anything else there?

22           MR. LIN: Uh, not from me. Frank Morrison might  
23 have some comments.

24           MR. MORRISON: Yeah, I just encourage folks to go  
25 look at the, example on the, that's posted on the DOE

1 Website. But basically, it shows where an unintended  
2 consequence of actually meeting the, uh, higher efficiency  
3 with the fan actually lowers the performance of the cooling  
4 tower. It requires more fan energy to do it, but we comply  
5 with that, you know. Comply with one requirement that  
6 actually hurts you in another. So it, it gets very  
7 complicated, because these cooling towers range from about  
8 as big as the podium that Larry's standing at all the way up  
9 to four or five times the size of this room, 36 --

10 MR. BURDICK: That could be the plain area of this  
11 building.

12 MR. MORRISON: Yeah, you know, and, and you have a  
13 36-foot diameter fan, so it's a real challenge for an  
14 industry our size to handle it. So we're not as, as, uh,  
15 complicated as, as a carrier with six trillion when I think  
16 we only have a few billion possible combinations of, you  
17 know, accessories, low sound fans, unit size, and tubercle  
18 axial.

19 MR. BOTELEER: You need a basic model.

20 MR. BURDICK: Yeah, yeah.

21 MR. MORRISON: But it is a challenge, especially  
22 for an industry of our size. So that's why, you know, this  
23 is, we want to make the sure the group is informed of, you  
24 know, the challenges that we, we face and, uh, take that  
25 into consideration.

1 MR. BURDICK: All right, Wade has his hand up.

2 MR. LIN: The other, the other point that's,  
3 that's significant here is that, the discussions that have,  
4 have taken place, uh, in the, uh, working group meeting here  
5 pretty much been around commercial and, and what we call  
6 light industrial type applications. Uh, the way the rule is  
7 actually written and the way this definition is set up, it  
8 would also apply to the fans that we use on, uh, power plant  
9 size cooling towers, which could be a thousand foot long and  
10 have 30 plus fan cell on each at over 200 horsepower. There  
11 aren't very many of those around the country, but the thing  
12 that's important to keep in mind, is that each and every one  
13 of those field direct cooling towers is custom designed.  
14 They're not standardized products. So there is no way to  
15 pretest what would be in the tower, uh, for, for field  
16 directive service. They're custom designed for like a big  
17 building. It gets designed for each individual application.  
18 Um, and the fan gets specifically applied to the customer-  
19 specified demo performance duty.

20 There's an optimization process that we go through  
21 to, to match up the right size heat exchanger and fan, uh,  
22 to give the customer the most economic combination of, and  
23 those customers do evaluate fan power for the most part.  
24 Um, so, um, with all that in mind, I think it's really  
25 important that we're very, very careful with how the scope

1 is written and the definition, uh, because this could  
2 accidentally include a lot of products, um, not just cooling  
3 towers, but also air cool condensers, air cool speed  
4 condensers, um, for power plants which use big fans. Uh,  
5 uh, air cool heat exchangers that are used in, uh industrial  
6 processes, these are thin tube heat exchangers that do  
7 everything from condense propane to, um, you know, all sorts  
8 of applications in refineries and petrochemical plants and  
9 all that

10 Those products all too, also would fall under  
11 this, um, in this bucket. And they are, they, again, are,  
12 um, custom designed for each and every application.

13 MR. BURDICK: Okay, so Wade has his hand up.

14 MR. SMITH: Uh, I have a couple of comments and a  
15 question. The first comment is that the efficiency column  
16 on this chart speaks to fan total efficiency and, uh,  
17 unintended consequence of driving fan total efficiency up,  
18 in this case, is an increase in fan housed. And I, I, I  
19 point this out only because this demonstrates why, um, this  
20 type of fan we rejected the use of total efficiency. If  
21 this chart were redone in the column where static  
22 efficiency, you would find that the static efficiency rating  
23 of each of these fans would follow the horsepower, so that's  
24 the first thing is, if you use static efficiency, the  
25 statement that you use a more efficient fan that consume

1 more horsepower is no longer true.

2           Um, the second thing is to say that, um, AMCA  
3 members who make fans, um, make fans for, uh, all  
4 applications industrial and commercial, and many of those  
5 applications are custom. And, you know, part of the debate  
6 inside AMCA was, where do we want to cut this off? And our  
7 answer, which we proposed, is to cut it off at 200  
8 horsepower. And I presume that that would eliminate, if  
9 that went into effect that would eliminate a lot of cooling,  
10 large, very large cooling fans that were, were described.

11           Um, so those are the two comments. The question  
12 that I have is whether or not the metric that was proposed  
13 would have any impact on your business. Do, do, do you test  
14 any of your fans against that metric to determine whether  
15 any were noncompliant?

16           MR. BURDICK: I've evaluated some of, uh, uh,  
17 them, uh, the axial fans. I, I, I'm thinking that the axial  
18 fans are fairly okay with, if I'm using a 58 number, I don't  
19 know what number we're using, it hasn't been publicized, you  
20 know, what the targets are or what all of the criteria is.  
21 No, sir, I, I, I can't state that.

22           MR. SMITH: But at a 58, you didn't have a  
23 problem?

24           MR. BURDICK: Uh, there are some points with  
25 blowers, uh, that don't meet that. Uh, you know, and, and

1 actually, uh, EU327 has different figures for forward-curve  
2 versus axial. Uh --

3 MR. SMITH: And so, and so, and so --

4 MR. BURDICK: Oh, and I'm not aware of that. I  
5 don't know what those numbers are.

6 MR. SMITH: Well, there's two numbers proposed.  
7 One for ducted and one for non-ducted.

8 MR. BURDICK: And blowers and axial are different?

9 MR. SMITH: Uh, well, uh, yeah, if they don't have  
10 a duct.

11 MR. SMILEY: No, it's just ducted.

12 MR. BURDICK: It's just ducted and non-ducted.

13 MR. SMITH: Ducted and non-ducted, but if all the  
14 propeller fans --

15 MR. BURDICK: Okay, um, on some of the --

16 MR. SMITH: If all the propeller fans, all  
17 propeller fans --

18 MR. BURDICK: Well --

19 MR. SMITH: -- are non-ducted and have a different  
20 metric based on static efficiency, then housed centrifugal  
21 fans which have a different requirement and metric based on  
22 total efficiency.

23 MR. WHITWELL: Unless they're unducted.

24 MR. SMITH: No.

25 MR. SMITH: No, no. All housed centrifugal fans,

1 the proposal is, to treat them as though they were ducted.

2 MR. WHITWELL: I, I thought, though, sorry Bob  
3 Whitwell from Carrier. Sorry for interrupting the  
4 discussion, but I thought at the last meeting there was a  
5 discussion about different classes for forward, forward  
6 curved centrifugal, or centrifugal fans, whether they're  
7 ducted or non-ducted. That was a, that was a recent  
8 proposal and I thought it was, there were definitions, were  
9 --

10 MR. SMITH: Well now the problem, well we can talk  
11 about definitions, but the problem is that when you make a  
12 fan, you don't know whether it is, could be ducted or not.

13 MR. WHITWELL: Okay, but when I make a fan I know  
14 whether it's ducted or non-ducted, right, based on the  
15 discussion.

16 MS. ARMSTRONG: But whether, but I think we're  
17 trying to move to this testable configuration idea. It  
18 might be --

19 MR. WHITWELL: Yeah, so I'm sorry for, I'm sorry  
20 for, uh, hurting the discussion.

21 MR. SMITH: Well, uh --

22 MR. WHITWELL: But I just to --

23 MS. ARMSTRONG: How does it work and vary on a  
24 high level, before you get into details before Wade does.

25 MR. SMITH: Yeah, the proposal, the proposal is

1 that all housed centrifugal fans are --

2 MS. ARMSTRONG: Go where you go.

3 MR. SMITH: -- based on a standalone version, I  
4 mean total efficiency.

5 MR. SMILEY: And that's, Bill Smiley of Trane, and  
6 when we say, oh, okay for standalone fans, that's okay.

7 MR. SMITH: Okay.

8 MR. SMILEY: But for our applications, centrifugal  
9 fans can be, housed centrifugal fans can be applied non-  
10 duct.

11 MR. WHITWELL: And in most cases, for this, I'll  
12 say, most cases are.

13 MR. SMITH: Now, I would just encourage to  
14 evaluate the proposal and then propose changes if you don't  
15 like the results.

16 MR. SMILEY: We are and that's what we're talking  
17 about.

18 MS. ARMSTRONG: No, I, I think it's just like any  
19 other rating is what you're saying, Bob. I mean what we are  
20 proposing as first, for a given equipment cost, we are going  
21 to, or a given category of fans, we are going to tell you  
22 how it should be tested and rated.

23 MR. WHITWELL: Okay.

24 MS. ARMSTRONG: And that wouldn't include, um, you  
25 know, necessarily a look. At least what we discussed to

1 date, wouldn't include a declaration by the manufacturer  
2 about whether it's intended for it to be installed with a  
3 duct or not. We would normalize that across as part of the  
4 test procedure. That makes sense?

5 MR. WHITWELL: Well, I guess, I'm, I'm, I'm not  
6 sure it does, Ashley, but I guess one of the issues that I,  
7 that keeps coming up is that there's some discussion about,  
8 that it sounds like things are already determined.

9 MR. SMITH: No, it's just there's a proposal.

10 MR. WHITWELL: And, and then, again, things are  
11 still moving, so I, I just get real confused about what's,  
12 what's been agreed to and what isn't.

13 MR. SMITH: Okay, so this is, this is a coolant in  
14 presentation now, and I suggested.

15 MR. WHITWELL: Yeah, I, I know, I'm sorry for  
16 diverting you.

17 MR. SMITH: And I, and I suggested that you. The  
18 question --

19 MR. LIN: Excuse me, Wade --

20 MR. SMITH: No, no, no --

21 MR. LIN: This is Paul Lin, for --

22 MR. SMITH: I asked --

23 MR. LIN: There's just one more key point about  
24 the, uh, cooling tower presentation. We apologize that we  
25 didn't put any pictures of what they look like in this

1 presentation, but, um, but one thing to keep in mind is  
2 that, uh, the product in the housing, uh, and with this  
3 product the, there is never a fan in a testable condition in  
4 its life, uh, from the manufacturer of the impeller to the  
5 installation of the impeller in the unit, uh, to the sell to  
6 the customer, it is never in what you would call a testable  
7 condition.

8 MR. DIKEMAN: The whole time?

9 MR. LIN: So that, that's something that's going  
10 to have to be dealt with here. It's not a panel fan.

11 UNIDENTIFIED MALE: He's right.

12 MR. MORRISON: This is Frank Morrison with  
13 Baltimore Aircoil. Just to understand the cooling  
14 technology is to, also represent air cooled and water cooled  
15 equipment, and pneumatic equipment. So, you know, what, a  
16 lot of our comments, they get complicated when you're  
17 dealing with, uh, evaporative equipment, because you have to  
18 deal with the water aspects of it, but a lot of our comments  
19 also apply to the air cool side of it when I mention air  
20 cool steam condensers and, and things like that.

21 MR. SMITH: So, so my question to you was, whether  
22 or not you evaluated the metrics in our proposal? And do,  
23 do you, um --

24 MR. BURDICK: I think there're some blowers that  
25 are, that are going to be an issue.

1           MR. SMITH: I would give you encouragement to do  
2 that and to base it on what's proposed, which is different  
3 for centrifugal fans than it is for axials, that's all.

4           MR. BURDICK: Okay.

5           MS. ARMSTRONG: Um, so, in addition to that, I  
6 would say, you know, if I go back through your slides and,  
7 um, I just want to say thank you, because I think some of  
8 the information that we were seeking help in form our  
9 decision, like shipment. It's like usage number is actually  
10 in your presentation has been on the record. You submitted  
11 that before, um, to help us come up with, you know,  
12 potentially the, what we've been asking for, a variety.

13                   One thing I think I was going to ask of you is  
14 that, um, of the fans that we're talking about, um, in heat  
15 rejection equipment at least the subset of fans we're  
16 talking about are subject to your presentation, um, how  
17 would you differentiate them, similar thing here, um, from  
18 other fans on the markets? That's the last piece, because  
19 what you, when you ask for an extension and you provide the  
20 qualifying data in terms of, you know, at least I would  
21 think that would be helpful for the advocacy community to  
22 determine impact on, if we were to, then it comes down to  
23 differentiation. How can we tell your fans apart from the  
24 broader population of fans? And that's a piece I think that  
25 it's still outstanding in my mind and that might be because

1 of my lack of expertise in the fan industry as a whole, but  
2 I think we would welcome that discussion.

3 MR. BURDICK: Right, and, and, and maybe that's a  
4 bit about labeling. Uh, maybe, maybe that's, uh, one of the  
5 methods is that --

6 MS. ARMSTRONG: That's a hard sell for DOE. I'll  
7 just tell you that right now.

8 MR. BURDICK: Okay.

9 MS. ARMSTRONG: We're looking for discrete design  
10 characteristics, you know. What types of fans, what are the  
11 discrete design characteristics? If I walked into your  
12 facility as compared to Sam's facility, and his are not for  
13 those applications, but yours are, how do I tell the  
14 difference? Are they identical or not. Um, you know,  
15 labeling is a good tool to help. It is not a necessarily a  
16 differential, a third-party differential factor. Um, that's  
17 not to say DOE is not open to a label, but I think what we  
18 try to do when we draw lines between things, especially if  
19 we draw line between things that are subject to standards  
20 and those that are not, it is design characteristics. It is  
21 not a self-declaration. It is not the presence or not  
22 presence of the label. Um, we are really look, seeking  
23 design information for you to see, anyone for that matter,  
24 to be able to draw a line between that for which may be  
25 subject to standards and that for which may not be. Um, so

1 think about that.

2 MR. BURDICK: Okay.

3 MS. ARMSTRONG: I do acknowledge that you did give  
4 us a lot of helpful information as well. Thank you.

5 MR. BURDICK: Right.

6 MR. FLY: Ashley, just, just a question and I  
7 won't try to distract us too much, but you said you don't  
8 want to do labeling, oh, well, let's --

9 MS. ARMSTRONG: Exclusively, let's put it that  
10 way, right, and how that we don't, um, and it's not that we  
11 won't consider that. And if you guys come back with your  
12 proposal, I see where this is going, so I'll just go ahead,  
13 address that right out the gate.

14 MR. FLY: Well, well I don't want you to. Let,  
15 let me finish, then maybe you'd get it. So you're standing  
16 on the beach looking at the whales and you see fans come up  
17 on the dock, right. Um, how do you know what that fan is?  
18 Are you just looking at it's physical characteristics?

19 MS. ARMSTRONG: Well, it's really easy. All fans  
20 are in, right.

21 MR. FLY: I mean is there --

22 MS. ARMSTRONG: You're asking me to divide that, so  
23 I have a lot easier position from DOE's side of things, that  
24 everything's in.

25 MR. FLY: But does it have to have a model number

1 on it? Does it has to have some kind of label that says  
2 what it is?

3 MS. ARMSTRONG: It depends, right?

4 MR. FLY: Are you going to go up with your ruler  
5 and say, uh, I see this is coming from so and so and it  
6 looks like it's about this wide and --

7 MS. ARMSTRONG: Generally speaking, we like  
8 definitions to be very clear and unambiguous so it's very  
9 easy to tell which models fall into our scope of standards,  
10 right. For commercial equipment, we do have the authority  
11 to issue or consider labeling rules where for  
12 (indiscernible), the only one we have so far is for motors.  
13 They really like it. Um, we have declined to do it for  
14 other places, um, for a variety of reasons. It, it is a  
15 tool. It is a tool that help for compliance and  
16 enforcement, but like the motor's guy would tell you, that's  
17 not how we differentiate if something is subject to  
18 standards or not.

19 The presence or absence of a label is not part of  
20 the definition that says I'm in. I'm not in. It is the  
21 characteristics of, um, the motor itself.

22 MR. PERSFUL: This is Trinity from Twin City Fan.  
23 Maybe another way to ask it is, how do we, how do we keep  
24 my, my buddy, Nick here, how do you, when we compete in the  
25 marketplace, what's keeping him from saying, oh, no, this is

1 a cooling tower fan? I'm outside. Like or what's keeping  
2 me from labeling every one of my fans that I make a cooling  
3 tower fan? And so however that's defined, if you could say,  
4 you know, cooling tower fans have this special  
5 characteristic, whatever it is.

6 MR. BURDICK: Yeah, we rely a lot on, on labeling  
7 in, in CTI, uh, actually. There are, uh, stickers,  
8 certification stickers, uh, that we place on the products,  
9 you know, to advise, you know, whoever might be walking by  
10 or that type of thing, that it has a sticker. But it's also  
11 posted on public Website and if that model number is not on  
12 the public Website, uh, it's fallacy or, or, uh, it's  
13 inaccurate, uh.

14 Frank Morrison, Baltimore Aircoil. I think to  
15 your point, you know, one of the things the cooling towers  
16 is to do, is deal with basically 100 percent humidity air  
17 along with some droplets of, of this drip that fell off the  
18 fill pack or, uh, it's a back condenser or closed circuit,  
19 off the coil, that the fan has to deal with. And Larry  
20 talked about the blades have to be protected from erosion  
21 and things like that. So, so I think there's things that we  
22 could work on to, to make those definitions, uh, clear to  
23 everybody and run it by the group.

24 MR. BURDICK: Okay.

25 MR. FLY: Uh, I'll tell you where I was going,

1 was, you know, their cooling towers, my package equipment  
2 all have a label on them, because they bear the safety  
3 label, because if we're required to put some kind of label  
4 that have a model number and certain safety information,  
5 because under the rules of, of, uh, UL ETL listings --

6 MR. BURDICK: Uh-huh.

7 MR. FLY: -- you have to do that. I buy a lot of  
8 fans and some of them come in. If, if they don't, if  
9 they're not an assembled product, I guess I'm asking, do  
10 those all have a label on them? The stuff, I generally buy  
11 fan components and none of them have a label on it.

12 MS. ARMSTRONG: Right.

13 MR. FLY: So I don't know how you recognize, I  
14 mean, I may be buying a 21, 20-blade fan, and a 21-blade,  
15 and are you able to count the blades and figure out which  
16 model it was and whether that one's actually listed or not.  
17 They'll take a drawing I think, you know. I don't know how  
18 we avoid labeling on something.

19 MS. ARMSTRONG: Right. And, and I'm not saying  
20 that we necessarily avoid labeling. The labeling may be a  
21 good tool for a variety of, of topics, not only for  
22 compliance-related, but something that, what Tom mentioned,  
23 for utility and rebate-type purpose for market  
24 differentiation purposes.

25 MR. FLY: Right.

1 MS. ARMSTRONG: And perhaps that carrot that he  
2 was speaking of, that's another tool in that toolbox. I  
3 mean, labeling we will leave the plan on the table to talk  
4 about within this group. I'm just saying, it's also not the  
5 end all, be all. That's not how we, um, I would, that's not  
6 typically how we write regs to differentiate, um, standards  
7 applicability. That's, uh, in --

8 MR. SMILEY: (Indiscernible).

9 MS. ARMSTRONG: So I mean, that's just my ask --

10 MR. SMILEY: Yeah.

11 MS. ARMSTRONG: -- if, if you don't go back and  
12 think about that, um, I you, you know, you gave us some  
13 helpful information.

14 MR. SMILEY: Understood.

15 MS. ARMSTRONG: Potentially inform our decisions  
16 and I think that's an ask of, of you.

17 MR. SMILEY: This is Bill Smiley of Trane. I have  
18 a question, ma'am. In other regulated things, whatever they  
19 may be, how do you distinguish both?

20 MS. ARMSTRONG: Mostly by characteristics.

21 MR. SMILEY: Well, uh, give me an example. I  
22 don't understand, because they, it, it's blue or green.

23 MR. SMITH: About an air over motor?

24 MS. ARMSTRONG: That is like the worst example.

25 MR. JASINSKI: It doesn't have a fan.

1 UNIDENTIFIED MALE: It doesn't have a fan cover.

2 MR. JASINSKI: Or furnace.

3 MS. ARMSTRONG: Yeah.

4 MR. JASINSKI: If, if it's a fan in a furnace that  
5 has a condenser in it, you can identify a secondary heat  
6 exchanger, so you know that one is subject to the standard  
7 for the condenser, not, you know, the, the, uh, non-  
8 weatherized condenser on a stand rule, standard --

9 MS. ARMSTRONG: I mean --

10 MR. JASINSKI: - as opposed to if there is no  
11 secondary heat exchanger, you know that the fan and that  
12 non-condensing furnace is subject to the non-condensing  
13 furnace fan standard.

14 MS. ARMSTRONG: Yeah, I mean for clothes washers,  
15 it is something as simple as, um --

16 MR. SMILEY: Where the door is or what?

17 MS. ARMSTRONG: Where the door is, is it  
18 differentiating feature for, for discriminating a standard,  
19 but for discriminating applicability with our models and its  
20 size, so certain top loading up to a certain cubic size is  
21 in, so that's when it gets back to the point of, um, that  
22 Wade was making earlier, you know, one of, one of the  
23 pillars, I guess, of the, and for discussion to date for the  
24 Committee to then think about, the working group to think  
25 about, is the one to two, four hundred horsepower. And

1 that's pretty easy to figure out. One to two hundred  
2 horsepower. I mean, it could be a little more, it could be  
3 a little less. Whatever we decide to go with it, that's up  
4 for discussion. But that's a discrete characteristic that  
5 doesn't require a label, that, you know, that's one --

6 MR. SMILEY: Well, only if there's a motor  
7 incentive. I mean that's a, that's a counter-example. We'll  
8 get to that.

9 MS. ARMSTRONG: But you see what I'm saying, I  
10 mean that's where we're, we're going for a discrete  
11 characterization, so that you can do it the same as Sam, as  
12 myself. Um, if somebody else wants to come look at it that  
13 they can figure it out. And, and it, a label can be an  
14 important tool in that, in helping that, um.

15 MR. SMILEY: I'm just having a hard time trying to  
16 picture what it could be.

17 MS. ARMSTRONG: Exactly why we're here.

18 MR. SMILEY: And I think, well the first thing  
19 that comes to mind, of course, is a label, because  
20 everything you buy has labels on it that define something  
21 about it.

22 MR. LIN: This is Paul Lin of NEMA. So we've,  
23 we've had a lot of discussion the past few days and actually  
24 passed, uh, passed meetings and so forth, and a lot about  
25 exemptions. We haven't even allowed the process to work

1 out, even to talk about what is included in this, in this  
2 general work, working group. So we're asking for exemptions  
3 to things that we don't even know what's included. So let's  
4 let the process work out and then if you need an exemption  
5 within that, that, that definition, let's put it in there.  
6 So if it's a 200 horsepower limit to, to the fan, then let's  
7 put that in there. We just haven't, I mean, we're, we're  
8 sitting here arguing about things that we don't even have  
9 the time to find a definition for. We're just wasting time.  
10 Let's let the process work it out.

11 MS. ARMSTRONG: With that, do you want, do you  
12 want to switch the stage?

13 MR. LIN: Let's do it.

14 MS. ARMSTRONG: Sure.

15 MS. ARMSTRONG: Um, so we're going to move off of  
16 scope discussions. I think there's a variety of people in  
17 the group that have some homework. We'll send out a new  
18 homework sheet, um, at the end of tomorrow. Um, with that  
19 being said, we're going to a little bit about motors. One  
20 of the things we talked about at the last meeting, um, had  
21 to deal with nominal efficiencies and full load efficiencies  
22 and nominal values. And if I don't test everything in the  
23 wired air configuration, um, how will I then get my full  
24 system efficiency based on nominal buckets. And if I do it  
25 that way for rating purposes and DOE were to test wire to

1 air and they get a different value, kind of what happen, so  
2 I don't think Dan's going to address the what happens part,  
3 but he's going to shed some light on the, uh, motor kind of  
4 nominal of system approach and, and maybe help all of us  
5 better understand where the motor regs are based on and then  
6 if it, how that may translate to this nominal calculation  
7 approach that I think would be really helpful to you guys,  
8 so that you don't have to test every configuration.

9           So Alex, can you switch us up. It's the  
10 presentation that --

11           UNIDENTIFIED MALE: Yeah, that starts with NEMA.

12           MR. DELANEY: So I'm Dan Delaney, Regal. I'm  
13 representing NEMA. I'm one of the Section Committee  
14 Chairmen, okay.

15           So we put together a list of topics here. Uh,  
16 these are topics apparently we missed, um, an opportunity,  
17 you ask me, were some good discussions on motors. I think a  
18 lot of good questions. So I think, I think we got most of  
19 the slides in. If not, just feel free to interrupt with  
20 questions again. I'm sure Rob will, as he likes to say,  
21 pontificate at time to time, and add some more, uh, key  
22 words and I'm, I'm sure I'll miss.

23           But anyway, the three topics that we thought, one  
24 of them is the concept of a metric that combines this motor  
25 and control together. Um, so we'll go into that. That's an

1 involving standard. Some of you may be aware of that going  
2 on in IEC. NEMA membership is active, very active in that  
3 development, but it addresses a long time issue. We'll talk  
4 about what we did, um, supplying data to the pump, uh, ASRAC  
5 Committee, and maybe how we can do something similar like  
6 that too for, for the fan side here, fan blower.

7           And then lastly, a key topic we're going to talk  
8 about a lot, air over. The key topic has a lot of these  
9 points of data. Clearly, it is direct drive fan or air over  
10 products, so we'll talk a little bit about that.

11           So the first thing we come up to here, uh, this  
12 is, um, uh, an image that we've been using for some time in,  
13 um, the IEC. We'll we put boundaries around different  
14 things. Uh, this term, extended product, came about, if you  
15 go back, um, right to the very beginning when motors got  
16 regulated, uh, we were no different than anybody else at the  
17 table. Hey, you really should be looking at the driven  
18 system. They're the ones that really are more, uh,  
19 efficient, right. Keep pushing down that way. Well we  
20 finally got our wish and here we all are, right.

21           So, um, so what we now are finally talking about  
22 is this driven equipment here on the far right hand, uh,  
23 side of that slide. But we've been regulated as a motor  
24 since '92. It was the first EPCA legislation. Really '99  
25 is when it fully came into compliance. We've been through

1 multiple revisions, noting June 1st, 2016 will be in our,  
2 our latest one. Well essentially, really cleans the slate,  
3 as, as Rob pointed out earlier, have a lot of issues with  
4 compliance. Massive amounts of issues with enforcement, so  
5 our goal in that last regulation is to simplify as much as  
6 possible.

7           Basically, you got a very short list of excluded,  
8 if it's not on the list, it's in. It's very simple. Uh,  
9 but leading up to that point was very complex. Um, so when  
10 we did a look back, what we're trying to do here with this  
11 extended product approach was to develop a system. It could  
12 be variable speed, which more likely it typically is. But  
13 it combines a, a CDM, a complete drive module in this motor.  
14 So together they make up this power drive system. This is a  
15 terminology that was developed, um, by the Europeans.

16           Um, some of you might be familiar with EN 50598.  
17 That standard is a satellite standard. The European  
18 standard was developed for the pump regulation 547. And  
19 what that was done, is, is to develop a, a system where the  
20 motor and the drive, uh, can be put together. I won't go  
21 into details here on the bullets, but could be put together,  
22 uh, to give a nice little package. So there's default  
23 losses that can be determined, as well as it can be tested  
24 if you're greater than those and you want to take the  
25 benefit of the higher PDS system. So maybe you have a less

1 efficient pump or fan, you can take the, the benefits of the  
2 higher PDS system. So we'll go into detail on a few slides  
3 on that.

4           But it also, it's, it's a robust enough system  
5 that allows, that's, let's say, just a straight across the  
6 line start type product. So at the bottom, you see motor  
7 system, you know, uh, drawn around the PDS. It can also  
8 evaluate a straight across the line system against a PDS  
9 too, which is a nice option, because sometimes a straight  
10 across the line, uh, fixed speed system is adequate enough.  
11 But it takes into account the losses of that other system as  
12 well too.

13           So obviously, on the far right where we've been  
14 today, um, you know, with fans, there's a lot of metrics  
15 going on. We don't mess with them, because this is what's  
16 nice about our system. We give you a nice little package  
17 that you can pick up, you can use for any, any metric you  
18 come up with, uh, whether it's an index, whether it's a  
19 straight, uh, input/output method. Whether it's power,  
20 static, total, um, it, it allows it to be independent,  
21 giving you guys the data that's necessary.

22           So I talked a little bit about the history, um,  
23 talked about the second bullet.

24           Third bullet, now what's nice about this system,  
25 it's a defined set of test points. So we do an output/input

1 test method. You don't have to do that, but obviously many  
2 manufacturers, if we have, let's say advanced technologies,  
3 improved efficiencies of what you buy off the shelf it makes  
4 sense that we or the controller or maybe even US  
5 manufacturer would want to do that testing to prove greater  
6 efficiency. It allows those same base set test points. Um,  
7 and then next, you guys probably aren't going to really so  
8 much care about the specific test points. You're going to  
9 care about your performance point.

10           So it has a defined interpolation, extrapolation  
11 equation. One that everyone uses to get to points you're  
12 most interested in, right, to do your own evaluation. And  
13 then --

14           MR. BOTELER: Technology neutral.

15           MR. DELANEY: Um, that is technology neutral. So  
16 this obviously can be variable speed induction. Certainly,  
17 it can be PMAC motors, uh, ECM, switch reluctant,  
18 synchronous. Anything we can dream up in the future, um,  
19 it'll be in there, because it just evaluates performance at  
20 the set points, and then can be obviously interpolated or  
21 extrapolated to the key points you want.

22           And then lastly, it does have what's a big benefit  
23 in ADM method. The Europeans were very much against, uh,  
24 the concept of a math model for many years. It just, their  
25 concept of it was, uh, just test it if there's a question.

1 You know, we validate that it meets the levels and you just  
2 test it. Well they got, I started to understand this basic  
3 model concept when you have proof of product line, you're  
4 not going to test that, right. You use a math model to  
5 validate, like everyone in the room. If you're six trillion  
6 and our, I, I guess an infinite number, because there is,  
7 somebody's always coming out with another product, you slap  
8 on a motor a vibration sensor, a chaff seal, so, um,  
9 infinite numbers. So in the motor industry, creation of  
10 models happens obviously, hundreds even a day can occur.  
11 Um, so let's talk a little bit about a couple little details  
12 of these.

13           So the test points, um, on the left here, you see  
14 the EN standard. I didn't mention this before, but the EN  
15 standard obviously is based in 50 hertz, who support pump  
16 regulation, euro pump, picked it up. They used it for the  
17 MEI metric, uh, that's regulated. Now they're in their  
18 second phase of their, um, of their index level now. But  
19 they have eight points. And they had, uh, um, a crane  
20 manufacturer, a guy who made, made cranes and he wanted  
21 three zero speed points, right, so, because he does constant  
22 torque type of applications. We don't. We're not looking  
23 to use that in, in the U.S., or I should say with the IEC  
24 version. So obviously, we've harmonized that to include 60  
25 hertz efficiency levels reference tables. But we've also

1 taken away those zero points, um, and given a random  
2 sampling.

3           Um, we have a gentleman. His name is Mark  
4 Doppplebuyer [sp]. He works a university in Germany, uh, but  
5 he used to be with, uh, a motor manufacturer and he did an  
6 extensive, uh, statistical evaluation between 20 points and  
7 all the way down to at least five points and found literally  
8 no difference in the end value interpolation/extrapolation.  
9 So, um, a lot of, a lot of information and work was put into  
10 validating these five points are good, are accurate and can  
11 be extrapolated, interpolated, uh, with good accuracy.

12           Um, as I mentioned before, obviously, both  
13 methods, um, allow for you then to take that with a defined  
14 equation, that would be provided in a, let's say, a set  
15 Excel spreadsheet, a locked out Excel spreadsheet. Anybody  
16 can take the number, put your values in, pop out those  
17 performance points that you care about, uh, for the  
18 reference losses. And then obviously manufacturer can  
19 provide, let's say, if you wanted to test a higher PDS  
20 rather than the references losses that are given in a  
21 standard, that can also be done there as well too.

22           MR. HAUER: Hello, Dan.

23           MR. DELANEY: Yeah, sure.

24           MR. HAUER: I'm Armin Hauer.

25           MR. DELANEY: Yeah.

1           MR. HAUER: What's in the graph there, the X-axis  
2 and Y-axis. That is the torque or the?

3           MR. DELANEY: The speed torque. Yes, speed  
4 torque, yeah.

5           MR. HAUER: Not constant power or anything?

6           MR. DELANEY: That's correct, yeah. Yeah, so it's  
7 just, it's just points, points of operation on a speed  
8 torque, correct, yeah. What I wanted to mention before,  
9 this isn't the first time this has been developed back in,  
10 um, I guess somewhere around 2007, uh, '06. At CSA, we  
11 developed a standard that had 20 points. And the concept  
12 there is, let's not do interpolation/extrapolation. Let's  
13 just do 20 points or the closest, using next closest, um,  
14 and basically, if you look on the left, 20 points across the  
15 grid, right. For every low point, you had five points  
16 across. Well you had four points across, five different,  
17 uh, points.

18           Um, so the concept here is let's reduce the burden  
19 of number of tests and just use interpolation/extrapolation  
20 since they use a mathematical version. So basically, you  
21 get the same result, whether you test 20, 30 points or you  
22 test these five.

23           MR. HAUER: I'm bringing that up because I've got  
24 to a seven we have that's based on constant power, so  
25 there'll be a X-axis or a Y-axis for the power into the

1 torque.

2 MR. DELANEY: Okay. Yeah, this has, this has been  
3 torque speed from beginning. This is, um, I'm trying to  
4 remember if this is in the 61800-9-2. So that's the, that's  
5 the new name of the standard. I don't think I mentioned  
6 that. I do here, right here. Um, but, yeah, it's always  
7 represented in a torque speed relationship like this, but  
8 obviously depending on, obviously what you see on the right  
9 is more of a, let's say, variable torque relationship.  
10 Obviously, that's a points of concern for a pump and a fan.  
11 And on the left there, on this, on the zero axis of, of, uh,  
12 speed it's a constant torque application.

13 MR. FERNSTROM: And this is Gary. For those of us  
14 that aren't familiar with it, what do you mean when you say  
15 torque speed?

16 MR. DELANEY: Yeah.

17 MR. FERNSTROM: Those are two different things.

18 MR. DELANEY: Yeah, yeah. So, so when we, as  
19 motor guys, we talk in relationship. I should probably just  
20 brought a, a typical, but I'll just use my hand here to, to  
21 demonstrate.

22 When we talk about the characteristic of a motor,  
23 right, from its locked rotor, it's up here high on its zero  
24 speed, up here. So it's in locked, or when it first starts  
25 or gets in locked or a situation that's very high, it

1 usually dips. And there's a breakdown point. That's where  
2 you guys really care about, making sure your fan point is  
3 within that knee of the curve that we typically talk about,  
4 so that we're always operating within the performance torque  
5 of the characteristic and it drops off.

6 So when we talk about the characteristic of a  
7 motor, we're talking about how the envelope, uh, works. If  
8 your operating point's outside of that, you can't run it.

9 MR. FERNSTROM: So, just let me.

10 MR. DELANEY: Yeah.

11 MR. FERNSTROM: You're talking about a graph where  
12 on one axis, its torque, and the other is speed.

13 Uh-huh, uh-huh, right.

14 MR. DELANEY: Correct, yeah. The Y-axis torque,  
15 sorry, yeah, X-axis speed.

16 MR. SMILEY: Here's what, here's what it fits in a  
17 motor curve looks like.

18 MR. FERNSTROM: Yeah, I, okay, I understand now.  
19 Thank you.

20 MR. DELANEY: There you go. Thank you.

21 MS. MAUER: Dan, this is Joanna. I just try and  
22 understand kind of where you're going with this. Do you  
23 have concerns with the NODA approach in terms of --

24 MR. DELANEY: Yeah.

25 MS. MAUER: Are you looking for --

1 MR. DELANEY: That's a good question, yeah.

2 MS. MAUER: -- default values or --

3 MR. DELANEY: So, so what, on the motor, I'm  
4 sorry, on the pump side it was concern that, look, they're  
5 going to go ahead and, they recreated this for us now, so  
6 whether it was, um, with PNNL, essentially used this EN50598  
7 as the, as the version. You see AMCA and others try to  
8 recreate this. It's done. What we're trying to tell you,  
9 it's done. We'd like you just sit there and adopt this.

10 MS. MAUER: And you say it's done, um, do you  
11 fault --

12 MR. DELANEY: Here we go. We got a couple of more  
13 stuff, yeah, a couple of more slides, you'll see, see what  
14 I'm talking about here, okay. So yeah, the, the whole point  
15 of this is to introduce this power drive system, this motor  
16 and control. They don't really want, um, the fan groups or  
17 anyone else to start redeveloping something that's already  
18 done for you, define losses. Now we understand the issues  
19 of, of efficiency and try to use that. So what are we  
20 talking about in really reducing kilowatt.

21 MR. SMILEY: Dan, this Bill Smiley of Trane.  
22 This, this assumes a specific type of inverter or speed  
23 control variable frequency drive and a specific type of  
24 motor combination, correct?

25 MR. DELANEY: No, not really.

1           MR. SMILEY: Or is this based on kind of an  
2 average of everybody in the world's inverter and everybody  
3 in the world's motor and you get a real wide banner of data.

4           MR. DELANEY: Yeah, let's just look at that.  
5 Let's just, yeah, exactly right. So that's what, that's  
6 what these two tables are. So the top table here, um, is,  
7 is just taking the, we've already defined that, right. We  
8 already have international efficiency levels. No reason to  
9 survey that. It's already defined for us. We're regulating  
10 that in the United States and Europe and others. So we  
11 already know the defined motor losses. You can pick any  
12 motor up today, IEC 36 hertz equal a NEMA, premium 12, 12  
13 tables on and on, right.

14           So we can, those are set for us, right. So that's  
15 not terribly difficult. Uh, down here though, drives never  
16 have. So drives did go together and did collect data and  
17 did define a minimum loss, reference loss for the drives.

18           MR. SMILEY: Okay.

19           MR. DELANEY: Yes, so that was really a, a big  
20 development on that side.

21           MR. PERSFUL: Trinity Persful, Twin City Fan, when  
22 you say, or when you talk efficiency, are you, you're  
23 talking minimum efficiencies or nominal efficiencies?

24           MR. DELANEY: Good, good question. We're not  
25 talking about efficiencies anymore. We're talking about

1 basically index levels and losses. So we're no longer  
2 talking about efficiencies in this metric, because what  
3 we're trying to do with variable speed systems, we're trying  
4 to reduce kilowatts, right. That's the whole goal of this  
5 program, is to stop talking efficiency, right, and start  
6 talking reduced kilowatts. So in all this is loss, so it's  
7 kilowatts of loss, okay. Let's back up for a second.

8 MR. PERSFUL: So is that, okay, and maybe another  
9 way to ask the question.

10 MR. DELANEY: Yeah.

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

12 MR. DELANEY: Uh-huh.

13 MR. PERSFUL: The actual loss or nominal loss.

14 MR. DELANEY: So we'll, we'll get to that. We'll  
15 get to that, okay. So, so basically --

16 MR. DIKEMAN: Are you talking to Ashley.

17 MR. DELANEY: You guys are trying to, uh, to, uh,  
18 gang up here, aren't you. We're going to get, we're going  
19 to, we're going to, let's, let's hold off on nominal,  
20 because I got that in the air, air over and some of the  
21 other slides. Because it's, it's important. I do want you  
22 to understand that. It is, it is a little more complicated  
23 to somebody who obviously, where you don't read nominal or  
24 you do it the first time you assume that that's one number.  
25 There's test method of banding. There's a lot of things

1 that go into it, rather than just a point, right. So we'll,  
2 we'll get into that when we get through this, and then we'll  
3 come back to that.

4 MS. ARMSTRONG: Let me make a point.

5 MR. DELANEY: It is a testable configuration for  
6 Ashley.

7 MS. ARMSTRONG: That you get a point.

8 MR. DIKEMAN: It is a point.

9 MR. DELANEY: We'll, we'll come back to it. The  
10 calculation method, this is one way to look at this. So I  
11 found my motor manufacturer. If I'm a drive manufacturer, I  
12 don't make a motor. I don't make a drive. You're a fan  
13 guy. I can pick up the set defined loss tables and I can  
14 put together a system, a PDS. That's definable loss. If  
15 that's acceptable to you with your high efficiency fan,  
16 you're set and ready to go. You already got your defined  
17 loss tables.

18 Now if you need more. Let's say you're pushing  
19 the limit of that fan. You want to keep that fan market,  
20 you may want to go to manufacturer and decide can I get a  
21 more efficient PDS, right. So that's an option. So this  
22 system allows you to say I can use my default losses for  
23 motor control. I don't have to talk to a motor guy. I just  
24 got to know that those products are those default reflective  
25 losses of that product, or I can go to a drive manufacturer

1 or motor manufacturer and have them provide those points and  
2 get a more efficient PDS that's necessary.

3 MS. MAUER: Points that are certified to DOE?

4 MR. DELANEY: Points that are defined for a test  
5 standard that obviously would need to be accepted. Just  
6 like Sara Widder did in, in the pump rulemaking, they did  
7 their own definition. She has the exact same similar points  
8 that we have in, within this method. This is, think about  
9 what was done in the pump --

10 MS. ARMSTRONG: Direct measure is not necessarily.  
11 It depends on what type of motor are we're talking about,  
12 because not all of them are --

13 MS. MAUER: Right.

14 MR. DELANEY: Well let's just back up for a  
15 second. Nothing is regulated in this market, because this  
16 is an unregulated market. This is variable speed motor  
17 control product, right. So this is unregulated period.

18 MS. MAUER: So we don't need a DOE test procedure  
19 in order to test.

20 MR. DELANEY: And we're saying when we have it, we  
21 want you to adopt it. That's what, that's our proposal  
22 here, is saying, well this is an international method that's  
23 being stamped by international. This is just a small, this  
24 is like 30 manufacturers of motors and drives here. Um,  
25 the, some of the largest would probably provide the list. I

1 think we've provided the draft to where it's at now. John?

2 MR. BOTELEER: Let your mind, let your mind wonder  
3 to NEMA premium PDS.

4 MR. DELANEY: It allows, let's say, regional  
5 acceptance of this, and let's say regional marketing of that  
6 program like that too, right, because there's base levels.  
7 It's defined standard. Now, we want to incentivize the  
8 premium. People over these defined minimum losses, right.  
9 So it gives the metric for this PDS for the first time.

10 MR. BOTELEER: So if Gary had a NEMA premium PDS,  
11 what would he do on it?

12 MR. DELANEY: Don't answer that, Gary.

13 MR. FERNSTROM: I'd probably punt on 4th down.

14 MR. DELANEY: So, well as, as we go back and we  
15 look at these defined losses -- yeah, oh, sorry, Bob.

16 MR. FLY: What does PDS stand for?

17 UNIDENTIFIED MALE: Power drive system.

18 MR. FLY: Okay, thank you.

19 MR. DELANEY: Yeah, yeah, so back, just, just, I,  
20 I know I throw these terms back at you again, inside the  
21 red, red circle, the motor plus that control, okay.

22 MR. FLY: Got it.

23 MR. DELANEY: Okay.

24 MR. FLY: Thank you.

25 MR. FERNSTROM: So, so this is Gary. What's the

1 association of electrical and mechanical imaging equipment  
2 manufacturers?

3 MR. DELANEY: That's our NEMA. They're selling  
4 their imaging greatest.

5 MR. FERNSTROM: Imaging?

6 MR. DELANEY: Yeah, yeah, yeah.

7 MR. BOTELEER: Yeah, that's us too.

8 MR. DELANEY: Yeah.

9 MR. BOTELEER: You're in medical, you didn't know  
10 that, huh?

11 MR. FERNSTROM: No.

12 MR. DELANEY: Yeah, sometimes we found that out  
13 two weeks ago. We said the same thing. Hey, how did they  
14 get up there? We should have a motor up there. Jumped  
15 ahead a little bit.

16 Um, again, the biggest, probably newest thing  
17 that's in the standard is this defined control losses, okay.  
18 Very set parameters, so if when they're doing testing, then  
19 let's have greater. Have less losses than this motor, than  
20 I have a defined set of setup parameters and test  
21 parameters. It's essentially a glorified input/output,  
22 because there's no better way to do that at this point, when  
23 you do a system. But essentially, um, that's what is being  
24 used as the reference losses mean, the minimum. You can  
25 count on your drive being more efficient than that, that

1 product when your manufacturer says, yep, you're good. Um,  
2 and that is, that is what you would use as your minimum  
3 losses.

4 MR. SMILEY: Dan, I have a, Bill Smiley of Trane.  
5 I have a quick question. Is, is that the drive inefficiency  
6 or the losses of the drive, plus the effect that drive has  
7 on the motor efficiency?

8 MR. DELANEY: So they are separate.

9 MR. SMILEY: Combined or are they separate?

10 MR. DELANEY: They're separate. They are separate  
11 entities.

12 MR. SMILEY: Because if you have a, if you have a  
13 --

14 MR. DELANEY: You would only see that when you do  
15 the PDS five point test. Then you would see the  
16 calibration. We're saying that the losses together it is,  
17 is really an individual item that can be paired together,  
18 yeah, yeah. There's no way to do this, we'll say,  
19 definable, um, uh, loss that has all the, let's say  
20 accessory items and everything in it. So it had to be, do  
21 it individually as it reference losses.

22 MR. HAUER: Armin Hauer speaking. Do you go above  
23 60 hertz, 60 hertz speed on that induction motor?

24 MR. DELANEY: I'm sorry. Does it go above? No it  
25 does not. So that was one of the contentions that, so we,

1 we debated this. We wanted to include a, let's say, a  
2 constant horsepower, but unfortunately, we just ran, ran out  
3 of time, because we wanted this in 2016. We wanted a lot of  
4 things, right, but in order to get the standard out there to  
5 try to help influence all this system regulation, we really  
6 thought, okay, that's, we're going to immediately start  
7 adding things like constant horsepower above, you know,  
8 base, um, frequency. We were going to add, uh, an attached  
9 Excel spreadsheet that you'll be able to run your equations,  
10 defines. So you don't do your own Excel spreadsheet with  
11 your own equation in it, using it. You'll have one that'll  
12 attach to the standard, and you'll be able to use that as a  
13 referee method. Wade.

14 MR. SMITH: Well I, I thought I was tracking you  
15 until Bill asked that question.

16 MR. DELANEY: Sure.

17 MR. SMITH: I thought that this, I thought that  
18 you really, it was impractical for rate the performance of,  
19 um, variable speed drive, unless you couple it with a motor.  
20 And so that's what I thought this was.

21 MR. DELANEY: So --

22 MR. SMITH: But if you separate it from the motor,  
23 don't you get a different performance level, depending (a)  
24 on which motor you attach it to, and (b) on how it's  
25 configured?

1 MR. DELANEY: So the concept here --

2 MR. SMILEY: (Indiscernible)the harder it is.

3 MR. DELANEY: So, let me, let me tell you what our  
4 concept here is, is defining the worst case setup that you  
5 have for losses, so the whole concept is the worst case  
6 position that that motor and drive would produce. Now is it  
7 perfect in every case, no.

8 MR. SMITH: So, so if I were to test them all, the  
9 worst one is the one that's represented.

10 MR. DELANEY: No, no. The idea is, is a worst  
11 case setup on a drive and a worst case setup on a motor the  
12 least inefficient. Not, not how you repair this worst case,  
13 because, you know, many manufacturers, many and if you setup  
14 something wrong, it's going to give you a completely  
15 erroneous result, yeah.

16 MR. SMITH: Okay, forget about those setups.

17 MR. DELANEY: Yeah.

18 MR. SMITH: Don't different motors have different  
19 performance when coupled with a VFD?

20 MR. DELANEY: Yes. It, it, it definitely is the  
21 case. Now as one of the things that is a side project of  
22 this, is actually to develop a separate motor IEC standard  
23 that'll address the details.

24 MR. SMITH: A standard what?

25 MR. DELANEY: Uh, so this is, lives inside of the

1 61800 series, the, the drive standards. 61800 is the drive.  
2 60034 series is the motors.

3 MR. SMITH: Tell me what you said before so I can  
4 understand that.

5 MR. DELANEY: 61800, that's the drive standards.

6 MR. SMITH: And before that.

7 MR. SMILEY: Before you start giving us the  
8 standards.

9 MR. SMITH: Yeah, I'm not interested in that.

10 MR. DELANEY: No, come back, come back to your  
11 question here.

12 MR. SMITH: My question is, aren't different  
13 motors, don't they behave differently, --

14 MR. DELANEY: Yeah.

15 MR. SMITH: - when coupled with a VFD?

16 MR. DELANEY: Yeah, so --

17 MR. SMITH: How did you account for that?

18 MR. DELANEY: Yeah, so the only way you can do  
19 this, you can do this logically from a base set of losses is  
20 a definable set of losses. So no one really knows what that  
21 is specifically. That's why there's efficiency level. So  
22 every manufacturer is still going to have to define that  
23 says, I have a losses that meet that table. You're going to  
24 still use that definable losses, if it still validate with  
25 them. Does your motor meet these losses at that I2, I3

1 table.

2 MR. SMITH: The manufacturer of the motor is going  
3 to tell us how their motors perform to the VFD?

4 MR. DELANEY: Yep.

5 MR. SMITH: And VFD manufacturers are going to  
6 tell us how their VFD performs with the motors.

7 MR. DELANEY: And that's done by our calculation,  
8 our, our, basically what we're saying, is we have an  
9 approved AEDM just like the Department of Energy does for  
10 this. The approved calculation method allows them to. Yes,  
11 those tests involved to calibrate it, but --

12 MR. SMITH: So if I, if I, if I, if I take those  
13 two numbers.

14 MR. DELANEY: Yep.

15 MR. SMITH: And it happens to be the particular  
16 combination that I'm shipping out today. I can calculate  
17 from those two numbers the efficiency of the PDS.

18 MR. DELANEY: Yeah.

19 MR. SMITH: The full, the full motor drive system.  
20 I can add that to the inefficiency or efficiency of the fan  
21 and get a wire to air.

22 MR. DELANEY: Very good, yeah.

23 MR. SMITH: And, and, and you believe that if I  
24 test them, the wire to air, that I'll get the same result.

25 MR. FLY: Or better.

1           MR. DELANEY: You should be better, that the whole  
2 concept of this is the worst case losses, right. That you  
3 can count on, that if you test the PDS with the combination  
4 that you purchased, it should be there or better.

5           MR. SMITH: And why should it be more better?

6           MR. DELANEY: And the whole concept is the drives  
7 has the worst case losses and the manufacturers calculation  
8 method here is guaranteeing they have minimally that those  
9 losses are maximum those losses, I should say it that way,  
10 yeah.

11           That's the whole, that's the whole pretense of  
12 this. And it's, as, as you see from the standard, it  
13 started very thin. It's a very thick standard. It's a,  
14 it's a tough read at this point. It really needs a  
15 simplification. It's, it reads more as equation to  
16 equation. That's why the second revision is really going to  
17 take it down to a, let's say, a layman's working document  
18 that can be used almost as an Excel spreadsheet so you can  
19 run through the equation. But this first one is very  
20 technical.

21           MR. PERSFUL: Trinity Persful, Twin City Fan.  
22 The, what's the order of magnitude from say this is the  
23 worst case to, uh, something that we may test? Is it, are  
24 we talking, is it five percent, eight percent, ten percent?  
25 What's that? Just not pulling anything.

1           MR. DELANEY: Yeah, um, I can't even talk in those  
2 terms because of the loss. I'd have to back work, you know,  
3 so I'd really have to give specific examples. We've done  
4 some test data. Um, man, I, it's tough without having,  
5 because you have a, you have a set of 20 points, right. And  
6 have a bunch test data, a bunch of drive data. We're  
7 comparing those. I don't know if we have a lot of, you  
8 know, uh, best cases. There isn't quite a few presentations  
9 that are out there, been done some, but --

10           MR. PERSFUL: It's, it's, the reason I ask, if, IF  
11 we're to consider using this, I would want to know what that  
12 is, --

13           MR. DELANEY: Yeah.

14           MR. PERSFUL: -- because if I'm also interested in  
15 testing and, and doing something better or more aggressive,  
16 I would like to know is the effort worth it at the end of  
17 the day.

18           MR. DELANEY: So, so what the problem that's most  
19 interestingly about this standard, um, which is, you know,  
20 it has the typical IC format. You got to the base. It has  
21 the tolerance limit there. The tolerance is, uh, pretty,  
22 pretty wide in this. It's going to be, it's going to be at  
23 10 percent. It's at 15 percent I think below, um, 90  
24 kilowatt. I think the 90 is where they picked the point for  
25 this one and above. Uh, it's 10 percent above 90 kilowatts,

1 uh, 15 percent below. It follows the same method that the,  
2 uh, the motor side does. So it's a pretty, that's your,  
3 that's your gap that you're going to play with. That's your  
4 tolerance. And you can count it being in that tolerance,  
5 right. You're not going to count on the high end of that  
6 tolerance. You're going to count it in the middle or down  
7 at the bottom of that tolerance.

8           For a manufacturer to hold it, we're going to have  
9 to have a nominal minimally in the middle of that to  
10 guarantee that tail never leaves the bottom end of that  
11 tolerance. So it's probably at least, uh, seven and a half  
12 to 10 percent tolerance probably within those numbers.

13           MR. CATANIA: So just to follow-up on that -- Tom  
14 Catania. So you said that the test is designed, um, to, to  
15 model the worst case, the worst result.

16           MR. DELANEY: So the test, the test is the worst  
17 case if the actual. The, the, uh, calculation method is the  
18 worst case, yes.

19           MR. CATANIA: So how does the calculation method,  
20 how is it affected by the manufacturing, or did it  
21 manufacture tolerance?

22           MR. DELANEY: I would say it this way. Um, just  
23 like any AEDM method, it, and again, this is an IC test  
24 method, so there is, today, you know, in the beginning there  
25 is no third-party approval. It's, it's a manufacturer.

1 It's, it's how Europe operate, right. It's, it's your, it's  
2 your, it's your name on the mark, right.

3 MR. CATANIA: Sound certification, no markets  
4 around.

5 MR. DELANEY: Exactly. That's our standard. What  
6 we're saying here when we put this inside the DOE and other  
7 things, that's the robustness. It gets added. It gets  
8 added as a result of the regulation, whatever it said on top  
9 of that.

10 MR. CATANIA: I'm just wondering if there's a, if  
11 the manufacturing tolerance applied at the bottom end of the  
12 range has a multiplier effect when you add, when you add  
13 equipment in.

14 MR. DELANEY: It's a good question. I'll say  
15 this. It's a little early for me to really give some good,  
16 good definitions, because what I have is, I have test data,  
17 uh, that I can speak to specific points. I can't talk about  
18 populations yet. It's still too early for me really to give  
19 you, say, hey, this is what. We're just still finishing the  
20 standard still. It's just actually, uh, it goes out for a  
21 vote, because it just got translation. Actually it just  
22 went out for a vote I think last week. Um, and that's two  
23 months, and then, um, September we'll come back with  
24 comments. And we hope to have, we can hopefully not have  
25 any major technical time that we have to revise the

1 standard. If so, it'll go for at least by December of this  
2 year.

3 MR. SMITH: Is this in the public domain where we  
4 can go find it?

5 MR. DELANEY: We can certainly, um, ask the  
6 convener, it's our NEMA, um, IMSGTC, uh, Chair. So I can  
7 certainly ask if we can post this and have it accessible to  
8 the, the whole ASRAC. I know we provided it to the  
9 Department of Energy, so we just have to ask to make sure we  
10 could provide that to the whole ASRAC as well.

11 MR. SMILEY: Uh, Bill Smiley of Trane. It would  
12 be interesting to see sort of a statistical distribution of  
13 what the true values are to show where you're locating the  
14 minimum.

15 MR. DELANEY: Yeah, yeah.

16 MR. SMILEY: So, so we, you know, I mean, you may  
17 be quite a ways from being able to get to that point.

18 MR. DELANEY: We have some, we have some charts  
19 that were done in development. I know, I remember it, yeah.

20 MR. SMILEY: But you could, you know, if we're  
21 going to pick something to use to represent a motor or a  
22 motor variable speed drive, I don't want to always pick the  
23 lowest possible that could never be any lower than that,  
24 because I might have to make up for that low value by  
25 adjusting my fan efficiency.

1           MR. DELANEY: So, so the whole key is that you  
2 guys can count on that as a minimum, right. You need to use  
3 the minimums, right. For, for the defined references you  
4 got to use the minimums, right? You might if you really  
5 want to say, well I think that's better and you're confident  
6 you have the ability to test, you'll have the data, you can  
7 extrapolate to the key points that, let's say, are the, you  
8 know, we have to negotiate with those test configurable  
9 points are. But those are the kind of points you would  
10 interpolate and extrapolate at those points that are key to  
11 you.

12           MR. SMILEY: Well the other problem that I might  
13 run into is locate and I've done inverters whose sole  
14 purpose is to reduce tremendously the amount of energy I'm  
15 using blowing air around, because I can take the diversity  
16 of the system and the requirements of the occupied space  
17 when blowing lot less air. But I'm going to start out at a  
18 disadvantage, because the components I use to be able to do  
19 that and use less and less and less energy starts out at a  
20 lower efficiency.

21           MR. DELANEY: Yeah.

22           MR. SMILEY: So, and, and maybe it's probably not  
23 really the right place to be talking about it, but I just  
24 want to bring it up, is we might need a little relief when  
25 talking about VAV create a variable speed system, because I

1 could have add a low efficiency fan --

2 MR. DELANEY: Yeah.

3 MR. SMILEY: -- with just a motor and not a VFD.

4 MR. DELANEY: Right.

5 MR. SMILEY: And, you know, that meet the  
6 (indiscernible).

7 MR. DELANEY: And you still might, and you still  
8 might be able to do it.

9 MR. SMILEY: Yeah.

10 MR. SMITH: The, the idea is to give an allowance  
11 --

12 MR. SMILEY: Yeah.

13 MR. SMITH: -- when these things are added, so  
14 that you aren't penalized.

15 MR. SMILEY: Right.

16 MR. SMITH: As he just described.

17 MR. SMILEY: Right, right.

18 MR. DELANEY: The question is what, what, what  
19 that allowance should be.

20 MS. ARMSTRONG: Wait a minute, wait a minute.  
21 Explain that?

22 MR. DELANEY: You, you --

23 MR. SMITH: It's from your charts.

24 MS. ARMSTRONG: No, explain that.

25 MR. SMITH: Okay, you got a fan shaft and the fan

1 meets the requirement. The fan meets the requirement with  
2 default values from wire to air meets the requirement.

3 MS. ARMSTRONG: Yeah.

4 MR. SMITH: Because the default values are in the  
5 numerator and the denominator, the fan meets the  
6 requirement. The calculated wire to air meets the  
7 requirement, right.

8 MS. ARMSTRONG: Yeah.

9 MR. SMITH: Right, okay. So the point is that in  
10 that default values that get you wire to air --

11 MR. DELANEY: Yeah.

12 MR. SMITH: if you have a speed control, it's in  
13 there, in the numerator and the denominator. It's not  
14 material.

15 MR. DIKEMAN: It was --.

16 MR. SMILEY: Or you're saying, you're saying the -  
17 -

18 MR. SMITH: No, it's, it's the efficiency  
19 requirement is diminished by the default loss.

20 MR. SMILEY: You're adjust, you're adjusting the  
21 target to compensate for the additional inefficiency of the  
22 components.

23 MR. SMITH: Exactly, exactly.

24 MR. SMILEY: Because you don't want it discourage  
25 the AD.

1 MR. SMITH: Right, exactly.

2 MR. DELANEY: Well, I'd say this. I'd say this.  
3 I'd say this. When you look at your metric, that's what you  
4 want to have your metric take account for. You want duty  
5 cycling in there, right. You want to have that ability, if  
6 it's variable speed you want to be able to count that.  
7 You'll have the losses. You can use them now, right. That  
8 decision how you want her to use in your metric.

9 MR. SMITH: Well, that's something we want to talk  
10 about.

11 MR. DELANEY: Yeah, back in the back, yeah. You  
12 have a question back there?

13 MR. MATHSON: Tim Mathson, Greenheck Fan. I want  
14 to ask a question about 360 hertz, so and you don't have  
15 that covered.

16 MR. DELANEY: Yeah.

17 MR. MATHSON: I'm assuming everything under 60 is  
18 like, you got a 10 horse motor, 20 horse drive, 45 hertz and  
19 only three break horsepower, you can tell what the  
20 efficiency is.

21 MR. DELANEY: Yeah, correct.

22 MR. MATHSON: And everything under 60 is losses.

23 MR. DELANEY: Zero, yeah, the losses is of each of  
24 those operating points --

25 MR. MATHSON: Below that constant torque curve,

1 everything below that can occur.

2 MR. SMILEY: What about 160 or 120 hertz?

3 MR. DELANEY: So, no, no. So nothing above base,  
4 nothing above base, but it'll be added. It'll be, it'll  
5 just have to go back. You have to create it, because it  
6 doesn't exist in the marketplace today. There's no  
7 efficiency level for that.

8 MR. PERSFUL: Trinity Persful, Twin City Fan.  
9 Would an EC motor be considered a PDS?

10 MR. DELANEY: So that's, that's one of those  
11 areas. Yes, so yes is the, is the quick answer. It wasn't  
12 designed around that, meaning we did not go to ECM, uh, type  
13 of manufacturers and get their losses, right, to determine  
14 those. So that is one area that the ECM market, um, and it,  
15 it varies all over the place.

16 As it goes smaller, it's gets, as it goes really  
17 small, it gets really difficult for some of them to get to  
18 those. They may have to always do the test. It'll  
19 differentiate themselves because their control may wag  
20 behind reference losses. So they may have to test as a  
21 result. So as a control gets really small, the  
22 inefficiencies reasonably pretty small, and that losses are  
23 there. I just don't want to say across the board, yes.  
24 Many of them will say yes. Be above and beyond. Because  
25 let's say, let's say, if I give you a generic number, such

1 about 95 percent efficient. That's pretty conservative for  
2 most drives. So that's kind of the drive. Now when you  
3 take that and divide the losses by the different points,  
4 it's about 95 percent efficient, give or take.

5 MR. SMILEY: Bill Smiley of Trane. If I used an  
6 ECM motor on a product, I'd have to test the motor in there  
7 because we're aren't going to have a usable default number  
8 to use.

9 MR. DELANEY: But you won't have to do it. You go  
10 to your EC manufacturer and say give it to me.

11 MR. SMILEY: It's got to be done.

12 MS. MAUER: That's in the DOE test procedure,  
13 right? And the tested according to the DOE test procedure?

14 MR. DELANEY: Well, of, of course, that's, that's  
15 why we're proposing this in there, but, but even if it's,  
16 well something's going to have to be in there for variable  
17 speed, right. I mean, if we're going to have, we're not  
18 doing this at just fixed frequency right. We're saying  
19 variable speed is part of that. That's what we've been  
20 discussing. There has to be a test method. There has to be  
21 something that accounts for multiple points that will end.

22 MR. SMILEY: Well, Bill Smiley of Trane again.  
23 If, it got to be some encouragement to use ECM motors too,  
24 because they're typically more efficient than typical  
25 (indiscernible) motors.

1           MR. DELANEY: Especially at the below one  
2 horsepower, yeah.

3           MR. SMILEY: So if we don't have some mechanism  
4 that, uh, shows the benefit of that, you know. It could be  
5 you'll have a problem with it.

6           MR. DELANEY: Keep moving along here, um,  
7 following the model as the, the motor side, so obviously our  
8 European, um, I shouldn't say European, IEC counterparts,  
9 uh, developed IU. IU levels based upon the NEMA levels, uh,  
10 creating their own 50 hertz versions off a smooth curve.  
11 They used their 60 hertz versions for a step curve for pull  
12 counts. So there're identical to 60 hertz, um, but they've  
13 now created an IUL for inverters, what they call converters,  
14 what we call inverters or VFDs, right, on the left-hand  
15 side. And then translating that into a power drive system,  
16 you'll notice there's, there's a reference underneath on the  
17 equation, right. So greater than one would be the greater  
18 than, than, um, than the base reference losses, so that's  
19 what you'd be after if you did a PDS test the greater than  
20 one factor on that.

21           So those are defined. This will, will be  
22 released. That is pretty new to the standard you can see.  
23 It only does I-2 right now, so many drives just would  
24 normally just probably fall into I-2. There is I-1 drives.  
25 I don't want to say there isn't, but I'd say they're much

1 more specialty drives.

2 MR. PERSFUL: Two quick questions: One, I'm  
3 thinking about. This is Trinity, Twin City Fan. Thinking  
4 about the ECM motor piece, so not picking on Armin, but this  
5 technology where he has the, uh, the motor drive and fan  
6 are, are one unit, or --

7 MR. DELANEY: All integral, yeah.

8 MR. PERSFUL: -- are all integral. Would that,  
9 uh, would that be considered, you know, his, uh, where you  
10 draw the box.

11 MR. DELANEY: Yeah.

12 MR. PERSFUL: Would that be considered a, a PDS,  
13 or in your mind would, um, could him or one of his  
14 competitors use this? You know, let's say if this is, uh,  
15 he gets a better result than what he normally would. And I  
16 don't know if hat would be the case or not. Could, would  
17 he, in your mind, would, would he --

18 MR. DELANEY: So he would have the same decision  
19 any manufacturer of a supply control motor think separately  
20 or an ECM motor with a fan, or any other situation. He  
21 would still have to decide, is my base motor and drive  
22 together, greater than those reference losses. Do I want to  
23 take advantage of that? Do I want to test that and give  
24 that to another guy who says, hey, my efficiency's great.  
25 My losses are less than, than the other ones. So if he

1 wants to compare himself to a PDS, because it, you know, he  
2 can certainly use the full metric too. He could say wire.  
3 You know, he could either one on that, depending on which  
4 metric you're going to go to, right. Every, every corner of  
5 the world has a little different metric on this, so he could  
6 do either one or both. But yeah, yeah, it, take, take any  
7 configuration. Obviously, it can be more difficult to  
8 couple up, but you have to be at a, obviously, a low source  
9 dynamometer typically.

10 MR. LIN: So, this Paul Lin with, with NEMA, so on  
11 the pump rulemaking from the working group, they allow for  
12 the default calculations. And then you also allow to test  
13 it. Do you believe that your, your, your system is going to  
14 beat that calculated method as well. So there's two paths  
15 to that.

16 MS. MAUER: This is Joanna. I believe the  
17 proposal if you're selling a pump with an ECM motor was that  
18 you have to do a wire to water test, because of default.

19 MR. LIN: Because there's no default because of  
20 that, so you always get a test option to, to, so that you  
21 can show that there's differences in your efficiencies.

22 MR. SMILEY: This is Bill Smiley of Trane. Let me  
23 ask, uh, think it was some question. I'm not trying to be a  
24 troublemaker. But if you, uh, add a fan assembly with a  
25 motor and drive and you test it, and it was a, it was

1 basically the motor and drive that was used to develop the  
2 standard default metric.

3 MR. DELANEY: Okay.

4 MR. SMILEY: And your testing showed that it  
5 worked better than the default metric, are you going to be  
6 held to use the default metric, because the next top, the  
7 next, uh, one of exactly those same things you don't test,  
8 but the motor efficiency's a little lower or the drive  
9 efficiency's a little lower. And that's what gets tested.  
10 Are you going to get hooked for that, or what?

11 MS. ARMSTRONG: Let's table that discussion for  
12 the next agenda item --

13 MR. SMILEY: Okay.

14 MS. ARMSTRONG: -- which is how do we come up with  
15 ratings and kind of --

16 MR. DELANEY: Yeah.

17 MS. ARMSTRONG: I was thinking about discussing it  
18 at more about high level.

19 MR. SMILEY: Okay.

20 MS. ARMSTRONG: But obviously, that, because I  
21 want you guys to understand what we were, will require of  
22 you and what the different components of that are. And then  
23 opposite of that, kind of what it looks like on the back end  
24 when we do starting doing some market surveillance type  
25 things. And so let's have that discussion there, because it

1 might inform the options you want to consider for how you  
2 test, how you come up with ratings, you know, the nominal  
3 approach versus a tested approach. The, what I would call  
4 manufacturing production line variations that a bunch of,  
5 you know, so let's table that for a second and let him get  
6 through this and then we're going to talk about it in a  
7 broader sense.

8           MR. DELANEY: So, what's nominal about this,  
9 obviously, it follows the same kind of method that's already  
10 out there in the marketplace today, and allows the ability  
11 to now, you know, let's say incentivize greater than, let's  
12 say your, you know, let's say your default losses, which are  
13 basically represented by IE-2 and IES-2 levels.

14           So most drives and most motors today that you can  
15 buy on the market, European or U.S. regulatory, are going to  
16 meet that level or greater. So you're going to feel pretty  
17 confident, if you're buying, excluding the products that  
18 we're going to talk about next, air over, right, you're  
19 going to expect obviously that those efficiencies be  
20 greater.

21           So to back it up, this is where we'll talk about  
22 some of the NEMA nominal stuff, but as a part of some of  
23 this discussion. So, as part of the pump ASRAC we supported  
24 them with, some part load loss data. And pump's a little  
25 different the way they run their set points. I think it was

1 75 to 100 and 115 to 125, I can't remember. So we supported  
2 them with what is part load loss data. They had some very  
3 old data, so we gave them some more recent data to update  
4 them. Basically, they were using pre-EPCA type data, pre-  
5 '92. We gave them, let's say, 2013-type data representing  
6 what motors today are. And that was two and four pole.  
7 That's really what they care about. Just at fixed speed,  
8 though. So this isn't variable speed type of information  
9 that's out here.

10           So we talk about how we come up with test data.  
11 We have a very specific test method. IEEE 112, method B.  
12 That's a segregated loss method, very different than the  
13 input/output method. Its accuracies obviously are very  
14 repeatable, even between laboratories, whether it's, you  
15 know, competitors or third-party labs. That's our methods  
16 used by the Department of Energy. Then 25 years mature,  
17 continues to keep going through revisions and improvements,  
18 through the years, the newest one will be out here in a few  
19 months.

20           But NEMA provides the metric. The metric being  
21 NEMA nominal, okay. NEMA nominal is a definition that says,  
22 the large population of motors, what is that? Well, it's  
23 kind of defined by that manufacturer. You build five of  
24 those a year, 10 a year, thousands, it depends, right. So  
25 the large population is really determined by what the

1 manufacturers determines as a large population, but that  
2 population has to be within the nominal or what kind of,  
3 what's, if you will, like an average.

4           Now, that doesn't mean, though, that they're all  
5 within there. There's a band, okay. And just like any, you  
6 know, average or statistical, you have standard deviations,  
7 right. Well, NEMA has a 20 percent of losses, okay. So  
8 there's, each band in NEMA, if you go to our table, is 10  
9 percent of losses. So that that nominal 10 percent of  
10 losses is one band, two bands being 20 percent. That's NEMA  
11 a minimum guaranteed.

12           So you pick up a motor, you test that motor, every  
13 one of those motors, if you ever found a motor that's below  
14 that, then you have a motor that's does not meet regs. It  
15 would be in violation. I would challenge you to find one in  
16 the marketplace today. Maybe not with a reputable  
17 manufacturer, but I would say, that would be very difficult.  
18 I would say that would be very difficult, because if you  
19 find one like that, don't get me wrong, they can exist,  
20 right. Statistical anomalies can exist, but with --

21           MR. BUBLITZ: Time-out. This is Mark Bublitz with  
22 New York Blower.

23           MR. DELANEY: Sure.

24           MR. BUBLITZ: What statistical process method are  
25 you using to guarantee that the lower limit of that

1 manufacturing deviation is within that second band.

2 MR. DELANEY: So, a lot of that is obviously the  
3 manufacturer's experience.

4 MR. BUBLITZ: You'll find that with every  
5 single --

6 MR. DELANEY: Oh, no, absolutely not, of course,  
7 not. I mean, we're talking about thousands and thousands of  
8 motors a month. And, you know, to test a motor it's almost  
9 a day, you know, it's at least a day usually, to  
10 thermocouple and by the time you test it, yeah.

11 MR. BUBLITZ: So that's my question. How do you  
12 guarantee that distribution of product that's produced in  
13 some statistical distribution is guaranteed to be above a  
14 threshold.

15 MR. DELANEY: Well, our DOE did that for us. They  
16 defined what a ADM method is.

17 MR. BUBLITZ: No, you didn't answer the question.  
18 How did you do it?

19 MR. DELANEY: But if we want to go back to what  
20 each manufacturer does.

21 MR. BUBLITZ: I want to (indiscernible). You just  
22 said --

23 MR. DELANEY: Yeah.

24 MR. BUBLITZ: -- I can't find a motor in the  
25 market that is below that second band. Prove it.

1 MR. DELANEY: You, you mean the NEMA nominal, or  
2 minimum guarantee?

3 MR. BUBLITZ: I don't know what you just asked.

4 MR. DELANEY: Okay.

5 MR. BUBLITZ: But you, didn't you just say that  
6 there's two bands of error, there's a minimum efficiency or  
7 whatever loss is. And I cannot find a motor in the  
8 market --

9 MR. DELANEY: Yeah.

10 MR. BUBLITZ: -- that's below that.

11 MR. DELANEY: Yeah.

12 MR. BUBLITZ: How do you prove that?

13 MR. DELANEY: Well, but the, how do I prove it?  
14 You just go test it. I mean, I guess, you'd have to find  
15 it. But how do I prove it? It'd be a matter of, so every  
16 manufacturer have to have its tolerances.

17 MR. BUBLITZ: Why is this hard to --

18 MR. WOLF: Maybe you better rephrase.

19 MR. DELANEY: Okay. Maybe -- I'm not there to --

20 MR. WOLF: How are you so confident in that  
21 statement?

22 MR. DELANEY: So every manufacturer, it has  
23 typical, a calculation, but not every manufacturer. There  
24 are some that choose just to do tests, right. So I don't  
25 want to speak for every manufacturer, but most of us have a

1 calculation method. And you have to have a buffer of this  
2 calculation. Not only does that calculation have to  
3 guarantee that you're always within the legal requirement,  
4 right. But it also has to guarantee that you're within 10  
5 percent of what you estimate. So it has to guarantee two  
6 things, okay, when you go through that.

7 Now, I'm not sure where you're testing motors --

8 MR. BUBLITZ: We're not, we're not even on the  
9 same planet, I mean.

10 MR. DELANEY: Okay.

11 MR. WOLF: Let me --

12 MR. DELANEY: Go ahead.

13 MR. WOLF: Mike Wolf, Greenheck. So, I think  
14 maybe what Mark is driving at is, how do you, how does that  
15 tie back to manufacturing tolerances and your testing  
16 tolerances to come up some statistical significance in your  
17 confidence, you know, 98 percent confidence level, 99  
18 percent, whatever.

19 MR. DELANEY: So every manufacturer has a  
20 different method to ensure, but in the end that calculation  
21 by which is proprietary to every manufacturer, that what's  
22 responsible for them. Just like ever math model that's DOE-  
23 approved in the system, they come and actually evaluate your  
24 program with a number of tests and actual evaluation.

25 MR. WOLF: So, Mike Wolf, again, just because

1 Mark's probably still going. So it's really up to the  
2 manufacturer to set their own tolerance levels.

3 MR. DELANEY: oh, absolutely.

4 MR. WOLF: And you're --

5 MS. ARMSTRONG: Can I cut in?

6 MR. WOLF: Sure, go ahead.

7 MS. ARMSTRONG: For a second. So the way that  
8 (indiscernible) talk about. But, the way this works is that  
9 DOE dictates the types of representations motor  
10 manufacturers and, to that extent, other manufacturers must  
11 meet. And the DOE system, I would argue, I might also take  
12 issue with that statement, but that being said, the way this  
13 in theory works is, DOE has confidence limits and sets up a  
14 way that you are supposed to making representation of your  
15 model's efficiency. One, so for example, let's just say  
16 your motor --

17 MR. PERSFUL: They can't hear you right now.

18 MS. ARMSTRONG: Seriously, okay. I'm just going  
19 to make numbers for a second. Say, I'm Ashley, and I said I  
20 tested out at 10. And if I run typically DOE requires a  
21 multi-unit sample to be tested to come up with a rating.  
22 And say because of the rating statistics, the confidence  
23 limits which will be influenced by the production variations  
24 that you feel are appropriate for your industry, say I make  
25 you de-rate to an eight, where consumers would favor higher

1 values. So I won't let you rate above an eight.

2 It is then your responsibility to make sure that  
3 the things coming off your line are that or better. So we  
4 make manufacturers, when they certify ratings,  
5 conservatively rate. We do it the opposite on enforcement.

6 Enforcement, we put the burden on us. We make  
7 sure that we test a multi-unit sample, except there are some  
8 provisions that'll allow us to test the single unit sample  
9 for custom equipment. But we make sure we are absolutely  
10 certain that your product is non-compliant with standards.  
11 So when you're asking him, I mean this may not answer  
12 specifically your question, but we basically make you de-  
13 rate. And then from that, the production variances, which  
14 are within your purview, it's up to you to make sure your  
15 units, your population, we understand every unit may not,  
16 but that population coming off that line, that number  
17 represented by that model complies with the number actually  
18 that you generated.

19 MR. BUBLITZ: A hundred percent of the time.  
20 That's interesting for a mass-produced manufacturing --

21 MS. ARMSTRONG: So I understand some nuances,  
22 which is why I wanted to start the discussion of how we do  
23 things and then let's talk about how it may apply to fans,  
24 because I get that there may be nuances. And to answer your  
25 question, we get, no, the answer is no. We understand that

1 every single unit doesn't always hit the rating, but if we  
2 pull a unit. I know this is going to, this is coming --

3 MR. BUBLITZ: It's got to hit the rating.

4 MS. ARMSTRONG: Well if we put, it doesn't always.  
5 Let's be honest. Every unit that I test doesn't always come  
6 up with the same number that's on the rating. In fact, it's  
7 probably, most of the units I test, of the hundreds I tested  
8 last year, most of them, they fall above, they fall below.  
9 It really depends on how, the manufacturer's strategic  
10 decision on how they rate. Some people rate very  
11 conservatively. Other's do not. They push the limits. We  
12 allow, within a certain range, we allow that to be the  
13 discretion of the manufacturer. That being said, if we pull  
14 a unit, and I'm not speaking necessarily for our enforcement  
15 team, but the way this in theory works is, we pull a unit  
16 and we have test data from a single unit test that gives us  
17 reason to believe that either your rating may not be quite  
18 what it's, you know, chalked up to be. We'd probably say,  
19 hey, we tested your product. Look at our test data, check  
20 yours.

21 Because you're required to maintain records and  
22 you're required to maintain your testing or your  
23 calculations or your AEDM or whatever the, the basis for  
24 your rating, you're required to maintain that and you better  
25 have those records if DOE asks.

1 MR. SMITH: So on the motors, there is the minimum  
2 and the nominal?

3 MS. ARMSTRONG: Oh, here we go.

4 UNIDENTIFIED MALE: Just think of it as banding.

5 MR. DELANEY: As banding. You have a minimum and  
6 you have a nominal.

7 MR. SMITH: Can I ask you a question?

8 MR. DELANEY: The motor's going to  
9 (indiscernible). Yes.

10 MR. SMITH: Thank you. So there's a minimum and a  
11 nominal. And the minimum you've already explained what that  
12 is and how that's enforced and, so that's what we can count  
13 on basically, right. Do you define what the manufacturer  
14 can say or represent as nominal?

15 MS. ARMSTRONG: No.

16 MR. DELANEY: No, short answer, no. You provide  
17 levels for them. That's it, yeah.

18 MS. ARMSTRONG: Motors, motors is not necessarily  
19 a good example of this.

20 MR. DELANEY: Well, we're talking about motors,  
21 though, right, so.

22 MS. ARMSTRONG: No, I mean, he's asking with  
23 respect to fans.

24 MR. DELANEY: Generically.

25 MS. ARMSTRONG: Right?

1 MR. DELANEY: Okay.

2 MS. ARMSTRONG: I mean so really there's not going  
3 to be a minimum and a nominal for fans. You're going to end  
4 up with a rating.

5 MR. DELANEY: Yeah.

6 MS. ARMSTRONG: And that rating has to be, has to  
7 be developed pursuant to our procedures. You're not going  
8 to have this idea of minimum and nominal. Motors are the  
9 only product where we have this kind of hand we've been  
10 dealt with by statute, which is a little different than the  
11 rest of the world. The other 60-plus products, we define  
12 how you make ratings. And those ratings govern  
13 representation, and it's going to be a single point number.  
14 And we're going to discuss how we get there and what that  
15 means. But once we say this is how you find your ratings,  
16 we're going to say, this is the upper end. And, I guess you  
17 can call it a range. You can always conservatively rate  
18 back down from that, if you wanted to.

19 MR. SMITH: Upper it.

20 UNIDENTIFIED MALE: With losses.

21 MR. DELANEY: Upper end of losses, lower end of  
22 efficiency, is that what you mean?

23 MS. ARMSTRONG: So I was talking efficiency, but  
24 that's fine. You can't overrate, in other words. You can't  
25 say, you can't claim a higher efficiency than what we're

1 allowing you to claim.

2 MR. SMITH: And my, and my point is that that  
3 number, that one number for any given point --

4 MS. ARMSTRONG: That number, yes.

5 MR. SMITH: -- is, I mean, we have to meet it.  
6 You pull a product, it's got to meet it. And the fact, the  
7 fact that that is, okay --

8 MR. DELANEY: Yeah, because your ratio, because  
9 these are ratios. It's built all into the ratio.

10 MR. SMITH: Okay, so now, before we talk about  
11 manufacturing tolerances, because I think what you said is,  
12 manufacturing tolerances are on us, is that right?

13 MR. DELANEY: Think about this way, think about  
14 this way.

15 MR. SMITH: I'm asking Ashley. Manufacturing  
16 tolerances are --

17 MS. ARMSTRONG: So we have what we call  
18 certification statistics built in that are supposed to  
19 account for the variations you would typically see in fan  
20 manufacturing. So if you come back and tell me you surveyed  
21 your AMCA members, blah, blah, blah, and typically they  
22 experience a five percent range, blah, blah, blah, we'll  
23 throw on there a 97 and a half or something like that  
24 confidence level.

25 MR. SMITH: Is that right, okay.

1 MS. ARMSTRONG: And we'll make you rate with that  
2 in mind. And it's, what it's going to do is push your  
3 ratings down. But that, what it's going to protect you  
4 against is if I spot check your product.

5 MR. SMITH: Okay, so now --

6 MS. ARMSTRONG: That's how it works.

7 MR. SMITH: -- the following question is this.  
8 How do you deal with measurement uncertainty? So in the, in  
9 the, in the lab, in the lab, right, we're measuring flow,  
10 pressure and power.

11 MS. ARMSTRONG: Correct.

12 MR. SMITH: Right. So the power meter that's  
13 specified in 210 is plus or minus one percent. The flow and  
14 the pressure uncertainty is also graphically displayed  
15 inside at the 210. And it is the standard against which we  
16 accredit laboratories. They have to be able to measure that  
17 close. The point is it's not zero, and so how are those  
18 measurement uncertainties dealt with?

19 MS. ARMSTRONG: Okay, so I would say the  
20 certification tolerance should take into account  
21 manufacturing variability and test tolerances when testing  
22 with, by a manufacturer with his technicians in his lab.  
23 That's what the stats should take care of, stuff within your  
24 control. So whatever the cumulative effects of that, we  
25 should talk about it.

1           Fast-forward, because this is always what  
2 everybody cares about. Fast-forward to the other side,  
3 regulations are in. DOE pulls a product, or we tell you you  
4 have to ship a product to X-lab, a third-party lab  
5 typically. And you're not allowed to be there, and you're  
6 not allowed to run the test. We're having someone else run  
7 the test.

8           I'm talking to you and those behind you.

9           MR. SMITH: No, no, I know.

10          MR. WHITWELL: Been there, done that.

11          MS. ARMSTRONG: So fast-forward. We have an  
12 additional tolerance on the enforcement side that  
13 acknowledges that when you take a unit and you test it at a  
14 different lab, when you test it with different people, you  
15 may introduce another level of variability, test to test.

16          MR. SMITH: Test tolerance.

17          MS. ARMSTRONG: And essentially, if you fail that  
18 test, it's built that way to protect you. If we're going to  
19 define something that ends up being non-compliant and there  
20 are associated penalties, et cetera, with that, we want to  
21 make sure we're right. So on the enforcement side, the  
22 tolerances work against DOE and in your favor, or some may  
23 say to make sure that we've accounted for things that are,  
24 one could argue, beyond your control. Does that answer?

25          MR. MATHSON: Uh-huh.

1 MS. ARMSTRONG: So that was my ratings  
2 presentation. We can just --

3 MR. SMILEY: I'd like to do it again, I don't  
4 understand.

5 MS. ARMSTRONG: We can do it again. How about  
6 that?

7 MR. DELANEY: With slides.

8 MS. ARMSTRONG: Why don't you finish the motor  
9 stuff.

10 MR. DELANEY: Okay, one more.

11 MS. ARMSTRONG: But, ultimately, when we come, I  
12 mean, the reason why the minimum or the conservative  
13 approach is important is, you are going to be held  
14 responsible for that fan system rating. And so, once you  
15 add the pieces together, motor, drives, et cetera, whether  
16 you use the nominal approach or the wire to air approach,  
17 the responsibility is on the fan manufacturer.

18 MR. SMITH: And the representation that's in  
19 question here is the efficiency?

20 MS. ARMSTRONG: So we can have that discussion  
21 too. I know you guys are also concerned because you want to  
22 be able to make other representations, things that you  
23 normally do.

24 MR. SMITH: Flow and pressure --

25 MS. ARMSTRONG: Exactly.

1 MR. SMITH: -- and speed.

2 MS. ARMSTRONG: So --

3 MR. SMITH: And power.

4 MS. ARMSTRONG: Correct. Right. Typically, the  
5 way we do this is to say your energy efficiency  
6 representations are made by blah. That being said, or in  
7 accordance with whatever we spell out in the regs, right.  
8 There are certain instances where there are certain pieces  
9 of information that impact our standards, or that impact our  
10 product. So, for example, for those in the room, cooling  
11 capacity. Sometimes we've gone as far as to say, you know,  
12 representations of those need to be made in accordance with,  
13 you know, but typically it's the efficiency.

14 So we would have those, I mean, that's part of  
15 what this is all about. Let's get around a table and figure  
16 it out. But part of that, driving that discussion is going  
17 to be what are your actual production variations on an  
18 aggregate. I know that's something that no manufacturer is  
19 going to disclose, especially not to disclose to DOE. On an  
20 aggregate basis, are we talking 99 percentile, like we are  
21 about certain lighting products, are we talking 90th  
22 percentile for confidence limits. And that should encompass  
23 test variability when testing with your own technicians in  
24 your own lab.

25 MR. CATANIA: So before we leave this topic and at

1 the risk --

2 MS. ARMSTRONG: Did I explain it --

3 MR. CATANIA: Tom Catania.

4 MS. ARMSTRONG: -- close enough?

5 MR. CATANIA: At the risk of freaking people out,  
6 those principles, when applying to a standard, relatively  
7 straightforward, maybe not so easy to achieve, but  
8 relatively straightforward. But when they're tied to a  
9 voluntary market transformation program with financial  
10 incentives or other benefits, and commercial settings may be  
11 a little different than consumer settings, there is  
12 additional complexity and additional discretion, correct, on  
13 the part of whoever the Government is overseeing the  
14 program, whether it's something like Energy Star or utility  
15 rebate programs and so forth, so. It, and it's not without  
16 precedent that more discretion has been exercised in  
17 remedies and so forth and how you respond to violations,  
18 where you're claiming performance above the standard, but  
19 the basis for calculating it is the standard.

20 MS. ARMSTRONG: Right, I mean clearly, I think  
21 what you can tell by, so I'm not here in an enforcement  
22 capacity as a lawyer to speak about the Department's  
23 discretion and, you know, all that kind of stuff when it  
24 goes into enforcement cases. But that being said, I think  
25 what you would see if you look back at what cases the

1 Department has brought or has settled, they surround  
2 standards. I mean, we're worrying about people complying  
3 with standards. That's not to say that if we test your  
4 product and we get something that's 20 percent off its  
5 rating, we won't knock on your door and say, hey, what's  
6 going on, let's have a conversation. But you're also not,  
7 it's unlikely that, we would probably say, look at our test  
8 data and reexamine yours, something's not quite right. But  
9 if you're 30 percent more efficient than the standard, we're  
10 also not going to send you a test note and say, cough over  
11 units in five days. There are different processes for  
12 handling that.

13 MR. CATANIA: Thank you.

14 MR. FERNSTROM: So, Tom, this is Gary. If I  
15 understood your point correctly, it was that if you're doing  
16 better than the DOE standard and maybe utilities are  
17 responding to that with incentives, there might be a little  
18 more discretion involved in finding you guilty of not doing  
19 what you say you're doing.

20 MR. CATANIA: Correct.

21 MR. FERNSTROM: And I've got tell you that our  
22 public utilities commission, anyway, has been driving us to  
23 use more and more creditable information. When we started  
24 doing rebates, we just based them on manufacturers'  
25 specifications. And we found out maybe in some cases that

1 wasn't adequate. So, now we're being asked more and more to  
2 cite a report to a Government agency, the California Energy  
3 Commission, DOE. And I'm sure that the PUC would have the  
4 expectation that if it's reported, it is going to be just as  
5 accurate as anything else that's reported, without any  
6 additional discretion.

7 MR. SMITH: Yeah, I think, this is Wade Smith. I  
8 think the, this is a sobering discussion for our members,  
9 because so many of the products that are going to be covered  
10 by this regulation are so seldom manufactured. In other  
11 words, we got some members sitting here in a room who  
12 actually never make a product that they've ever made before.  
13 Every unit is peculiar. And they use AEDMs to rate these  
14 units, but the subject of manufacturing tolerances is  
15 interesting because it's one thing to maintain a tight  
16 manufacturing tolerance on a production line of similar  
17 products, dimensionally similar products. It's quite  
18 another thing to maintain that dimensional similarity with a  
19 unit that, you know, with a rating basis, the rating test  
20 unit. And so I think each manufacturer is going to come to  
21 this subject with a different answer.

22 MS. ARMSTRONG: Okay.

23 MR. SMITH: And I think what I heard you say is,  
24 if I'm a manufacturer and I'm making a stamp them out  
25 product and I do statistical analysis of my production and I

1 know what the performance is on a statistically significant  
2 distributive basis, I got the bell-curve. And I think I can  
3 be within two percent, just pick a number, you know, I'm  
4 taking, I'm taking two percent and that's it. And the next  
5 guy says, I'm going to be lucky to get 15, they're going to  
6 have to take 15. And you're not going to tell them whether  
7 they have to take 15 or two. You're just going to tell them  
8 if I pull a unit and test it, it's got to be right. Am I  
9 correct in that?

10 MS. ARMSTRONG: So the answer is mostly. I'm  
11 going to bound that range. I'm going to tell you what the  
12 lowest number you can rate at, which is going to be the  
13 standard. And I'm going to tell you what the highest  
14 number. Within that range, it's on you. But when I pick a  
15 unit --

16 MR. SMITH: Well okay, here's the issue.

17 MS. ARMSTRONG: I, I get everyone --

18 MR. SMITH: With the proposed rule, we're not  
19 talking about a single point of test.

20 MS. ARMSTRONG: Uh-huh.

21 MR. SMITH: We're talking about a complete range.  
22 So the description that you're making applies to an infinite  
23 number of operating points for any particular fan, right?

24 MS. ARMSTRONG: I understand.

25 MR. SMITH: So it's a sobering challenge to

1 contemplate all this at one point, or three test points.  
2 But it's a much more challenging subject when you say, no,  
3 it's the range.

4 MS. ARMSTRONG: So I'm not saying range is the  
5 same way you're saying range, I don't think.

6 MR. SMITH: (Indiscernible).

7 MS. ARMSTRONG: Take a single point in your range.

8 MR. SMITH: Yeah.

9 MS. ARMSTRONG: Um --

10 MR. CATANIA: There's a range in that.

11 MS. ARMSTRONG: There's a range in that single  
12 point value. If you were to make more than one of them. I  
13 get that some of these are custom built you'll never make  
14 but one of them, we have other regs to deal with that. We  
15 can talk about those. But let's say you decide to make a  
16 hundred and we can all, I think, agree that not a hundred  
17 are going to test out identical, right.

18 MR. SMITH: Sure.

19 MS. ARMSTRONG: That's the range I'm talking  
20 about. So what should that one point be represented as?

21 MR. SMITH: Right. So what I'm going to suggest  
22 to you is that the deviation from the norm in certain parts  
23 of the performance map are going to be much tighter than the  
24 deviation from the norm in other parts of the performance  
25 map.

1 MS. ARMSTRONG: Okay.

2 MR. SMITH: And the measurement tolerance varies  
3 across the performance range and is documented in the 210,  
4 never mind the fan's performance.

5 MS. ARMSTRONG: Yes.

6 MR. SMITH: So this becomes a subject that has an  
7 extra dimension of complexity because of the way we propose  
8 to have the regulation.

9 MS. ARMSTRONG: Fair enough. And so I think it  
10 would be, you know, it is, let's see, what time is it? It's  
11 4:30 now. We're wrapping up at 5:00 today. I think it  
12 would be good if you finish, Dan finishes his thing  
13 (indiscernible). No more talking about ranges and, and  
14 stuff with motors.

15 MR. DELANEY: I'd talk about it all night.

16 MS. ARMSTRONG: Perhaps give me some time to come  
17 up with an example of what this would look like and just  
18 kind of walk you through. If we were to do things the way  
19 we do normal business today, and overlay the potential  
20 regulatory approach as it is set out in the second NODA, how  
21 would, what would ratings look like?

22 MR. DELANEY: Uh-huh.

23 MS. ARMSTRONG: How would those ratings for each  
24 of those points be developed? And what information from you  
25 will we need. That way you can understand kind of how this

1 would work. But when you make a certified rating to the  
2 Department, I mean, we understand every test point isn't  
3 going to come out identical.

4 But, let's just say that, you know, we've done it  
5 in a manner that we think the consumer, or the commercial  
6 customer in this case, should get that or better performance  
7 for the most part. Otherwise, there's something off with  
8 your methodology or rating.

9 MR. SMITH: Dan, Bill Smiley, Trane, I have one  
10 real quick --

11 MS. ARMSTRONG: So that's generally the high  
12 level.

13 MR. SMILEY: -- question.

14 MR. DELANEY: Sure.

15 MR. SMILEY: And it surely has to do with what  
16 you're talking about.

17 MR. DELANEY: Sure.

18 MR. SMITH: Yes, sir.

19 MR. SMILEY: If you go back, well --

20 MR. DELANEY: Which one?

21 MR. SMILEY: -- back to that chart that had all  
22 the yellow on it --

23 MR. DELANEY: Yeah.

24 MR. SMILEY: -- which was your --

25 MR. DELANEY: Yeah, yeah, the motor, yeah.

1           MR. SMILEY: Your motor efficiency at various load  
2 points. And two things, one is, that's two pole and four  
3 pole, but we used a lot of six and eight pole as well.

4           MR. DELANEY: Yeah, and that's what I've noted  
5 here.

6           MR. SMILEY: And do you have that information?

7           MR. DELANEY: Yeah, yeah, absolutely. So what I  
8 was thinking before we even go do that. Let's really talk  
9 about what we really want. Do you really want fixed speed.  
10 What's really needed there. So before we go crazy, go  
11 getting it, we're ready need to talk about what's beneficial  
12 and got to get the metric. Got to do a lot of other  
13 decisions. Absolutely, we can go back maybe and deal with  
14 this.

15           MR. SMILEY: No, this is very good when you don't  
16 have a variable speed drive.

17           MR. DELANEY: Yup, correct.

18           MR. SMILEY: This is extremely good information  
19 and necessary. The question I have is, is this old motor  
20 data that's run like in 30 seconds on a whole speed work  
21 curve --

22           MR. DELANEY: No, sir, this is stabilized.

23           MR. SMILEY: -- or is this? Stabilized at some  
24 operating temperature that's --

25           MR. DELANEY: Full load.

1 MR. BOTELEER: -- per DOE test methods.

2 MR. DELANEY: Yes, per DOE test method.

3 MR. SMILEY: I don't know what that is.

4 MR. BOTELEER: IEEE 112 method.

5 MR. DELANEY: All you need to know is that's what

6 we're regulated at. Right, that's the regulated method.

7 That's what, that's what this all this data is provided at.

8 Okay, last topic I had. This is the one, the only one I

9 thought would be controversial.

10 MR. PERSFUL: This is Trinity, Twin City Fan. I

11 just want to make sure I understand that last point you just

12 said. So this, this table is at a 100 percent load.

13 MR. DELANEY: No, no.

14 MR. DELANEY: Yeah. So we go from a hundred to 25

15 percent at fixed speed, at fixed speed, because that's what

16 was desired by the pump guys

17 MR. PERSFUL: Well, I mean at, at --

18 MR. DELANEY: At 60 hertz or whatever your base

19 frequency is, yeah.

20 MR. PERSFUL: And so, so let's, I'm just trying to

21 think this in my head, so let's say if we're at 40 hertz.

22 MR. DELANEY: And change, and the efficiency would

23 less than comparing it to this, yes.

24 MR. PERSFUL: Correct --

25 MR. DELANEY: Yeah.

1           MR. PERSFUL: But is that going to be annotated?  
2 I mean, do we have a chart that goes, you know, 40, 41, 42?

3           MR. DELANEY: Right, so that's where the PDS  
4 discussion when you want that information, that's where  
5 that, that's where the reference loss is. That's where the  
6 equation. That's where I can test it. I can, then you can  
7 extrapolate it yourself. We can do it for you, right, so.

8           MR. PERSFUL: So we use the equations, so in cases  
9 where we just sell a bare fan, without the motor and drive,  
10 but it gets, let's say it gets tested with a, at least going  
11 to get tested with a motor.

12           MR. DELANEY: Yeah.

13           MR. PERSFUL: Is it, is it the, the, the thought  
14 of the working group that it, it's going to be tested using  
15 --

16           MR. DELANEY: So, I don't want to jump to that  
17 conclusion, because that is --

18           MR. PERSFUL: Will this equal value.

19           MR. DELANEY: -- that is certainly some of the  
20 discussion that needs to be still had here, but it, it  
21 certainly can be, right. It can be like the motor, like the  
22 pump guys decided. They just did equalized points; so they  
23 have a base, which was, like I said my memory, 75, 100, 125,  
24 just equally loaded at 33 percent each. Right, it's due to  
25 --

1           MR. PERSFUL: Because I'm, I'm thinking if I sell  
2 a fan at 40 hertz and so the DOE is going to survey that,  
3 that product to me at that point, you know, then do they  
4 reference a, a calculated method.

5           MR. DELANEY: We would have to have a table that  
6 would back that up; so whether that we provide that, whether  
7 we use that IC, right, we'd, one would have to be given  
8 this, because you always have to have a reference, right?  
9 You have to have a minimum that says you can't go below that  
10 for the motor. So how that would look, I, I don't want to  
11 jump to conclusions how it would look. Certainly, we could,  
12 we could come up with something, but we need to decide a lot  
13 of other things about how the metric and, you know, and then  
14 we certainly can put together some data to support that for  
15 you.

16           MR. SMILEY: Real quick, Ashley, Bill Smiley,  
17 Trane. Can you guys provide a link to the DOE motor test  
18 standard that defines the temperature and the process that  
19 you go through for that? I'd appreciate it, rather than try  
20 to find it myself.

21           MS. ARMSTRONG: Uh-huh.

22           MR. DELANEY: I'm surprised they didn't put it on  
23 there. Okay.

24           So, the last topic which, early on in this, you  
25 know, when I first came into this I assumed we had a lot of

1 continuous motors. Right, then I heard earlier on from AMCA  
2 and Wade most of, most of the motors are one horsepower and  
3 below. It's mainly air over direct drive motors, if you  
4 will, right?

5           So this is a product that has been on our radar  
6 for many years. It's out of the regulations. It's not  
7 going to be covered June 1st, 2016 either, okay? A lot of  
8 difficulties in doing this, if it was easy it would have  
9 been done long ago, okay? I'm sure many of you are familiar  
10 why it's difficult. And I'll just walk through a couple of  
11 items just for discussion. By no means are we giving up on  
12 this. This is an item that we're working on for our next  
13 regulation, which is small motors. And certainly, probably  
14 we'll have to work on it to support this regulation as well  
15 too. That's our hopes.

16           So just, just some of the reasoning, you know, and  
17 going to nameplate rating alone, that doesn't mean that much  
18 in the air motors. I'm sure a lot of you are shaking your  
19 heads yes; you understand that. It doesn't mean much. It's  
20 a current type thing. We give a sample. It's tested. I  
21 want to see that current within X amount, whatever your  
22 percentage is you want to see, they got, I got the right  
23 motor. Horsepowers don't mean nothing. What they do mean  
24 is at cold, we test them. They're assigned from the NEMA,  
25 break down torque. That's how we get the horsepower. It

1 means nothing. It's almost like a frame assignment to you,  
2 half with a half, a three quarter with a three quarter,  
3 right. It's almost like a substitution number. It's not  
4 really. It doesn't mean much. You don't care so much  
5 about. You care, does it move my fan within the operating  
6 parameter I need, okay? And that's why much of the air over  
7 market is sample.

8           And this isn't totally closed air. This is more,  
9 it includes that product. But I would say it's more of the  
10 open air over type product direct drive. Certainly  
11 centrifugal but it could be any prop fan or other.  
12 Certainly a lot of rooftop use, that's why there's belted or  
13 direct drive.

14           Obviously most people understand it doesn't have a  
15 fan on the back. It will overheat without that fan.  
16 Obviously the driven fan that's providing the cooling, some  
17 of the belted product works that way as well too. There is  
18 such a thing as, you know, they're kind of, they're created  
19 in the marketplace, so we can get continuous air over.  
20 Sometimes that's mean belted. You'll see a fan duty  
21 sometimes. It used to mean things in the past. It really  
22 doesn't mean anything anymore. It's legacy terms that kind  
23 of got carried over, but fan duty is to mean draft-induced  
24 or sometimes. It used to mean, used to mean belted in the  
25 past too. But the end result is, obviously at the air of

1 that product it's not that. It's not going to stay within  
2 that and get a good efficiency point, right? It's very  
3 difficult to do that on a dime.

4           Where does this all originate. You all understood  
5 this many, many years back. So they just do a cold point.  
6 Literally, it's the shortest time you can get that motor on  
7 the die now, get the current to stabilize. Done, you're  
8 done with the rating. Wherever you want assign? Whatever  
9 that torque does, that's the assignment of horsepower. It  
10 doesn't really mean anything. It doesn't mean anything to  
11 us. It doesn't really mean much to you, motor sampled. You  
12 want to make sure that current is repeatable, but when you  
13 put it in your fan, it's not within whatever your  
14 percentage. Usually 10 percent is the UL rule. And that's  
15 probably, probably similar to what you guys use to ensure I  
16 got the right motor or my motor's operating as it should be.

17           Test method, obviously there is none. No industry  
18 test method. The CSA C747, as a result of small motor rule,  
19 NEMA manufacturer revised that standard dramatically. Just  
20 improved, you know, many of the, we talk about power, you  
21 know, quality. There's really no good term for this. It's  
22 accuracy requirement says, what's your policy supply end has  
23 to be. It's what your torque requirement is. It's your  
24 accuracy haul, your measuring equipment. That's a lot of  
25 money. Motor manufacturers invest massive amounts of money

1 in our, in our motor test labs. And if you had do wire to  
2 air, you'd have to do very similar major upgrades. And I  
3 think some of you mentioned before, pump guy certainly saw  
4 it at the end of the rule and we're very concerned with  
5 that. You know, that's a major investment for you to have  
6 to measure both amp watts at the levels necessary to get the  
7 accuracies.

8           But, yeah, many, many issues and many, many costs,  
9 but even if they did, okay, so what is mainly the issue  
10 here. What we can't decide how you do the air over test.  
11 So if we're going to do it just air over motor, do a CFM at  
12 a static pressure. None of us like to do that, even though  
13 most of us can do it. It's not something we really want to  
14 do, is doing a bunch of blower testing or air chamber  
15 testing. Air velocity at a specific point, you know, we can  
16 put an manometer at a certain point on the motor and define  
17 it within a certain position. Then that let's the  
18 manufacturers do all kinds of crazy things on the fan and  
19 air, and that's probably not very good.

20           Another way to do it, you can do temperature  
21 stabilization. You can just say every motor has to  
22 stabilize at this point. That's not great, because then it  
23 makes the horsepower throw off as well too. A lot of air  
24 over motors are very cool, 45 C range. You would, you would  
25 penalize it by running that high, some a little higher than

1 that. Not many though. Many, many air over motors run very  
2 cool.

3           And then as far as classification at the bottom,  
4 air over motors, they're, they're probably the least  
5 efficient in the motor marketplace. There is no regulation  
6 on them today. Down and dirty as we've heard most of this  
7 marketplace is, right? Some PSCs are very efficient  
8 product, but cap start induction run product is definitely  
9 on the lower end of efficiencies. There's even shaded pole  
10 and some, not much, on the very, very low end. I saw the  
11 120 watts hovering around there, but mainly below 120 watts.

12           The technologies obviously in the less than one  
13 horsepower. Many are single-phased and many are, as I  
14 mentioned, shaded pole. There's, there's still a  
15 significant number of split phase, PSCs certainly and the  
16 cap start induction run, which obviously are, are less  
17 efficient than the regulation for small motor today. And  
18 none of those motors could ever reach the small motor rule  
19 levels without growing a frame maybe even two frame sizes.  
20 It makes it uncompetitive, so it would essentially push many  
21 of those technologies, if we use that as a baseline. Or as  
22 we said here, maybe we just define a whole new efficiency  
23 level as a result of this committee that makes sense, that  
24 drives what's necessary, or maybe, if you'd like, maybe we  
25 have to develop our own set of efficiency levels based on

1 whether it's a certain type of single-phased technology.

2           Obviously, I didn't include the ECM. That is a  
3 higher efficiency product that obviously can meet many of  
4 the products, but complicated because you, you can't really  
5 use the test methods. It's not for an ECM motor to define  
6 the losses. You can do it. Don't get me wrong, but it's  
7 not intended for that use.

8           So that completes my stuff. Any questions about  
9 it?

10           MS. ARMSTRONG: No, just one comment.

11           MR. DELANEY: Yeah.

12           MS. ARMSTRONG: So Paul, welcome. Last meeting,  
13 DOE presented nominal values for TEAO motor. If you could  
14 look at them --

15           MR. DELANEY: Yeah, I --

16           MS. ARMSTRONG: -- and give us some feedback on  
17 them. You know, we have, I don't think I as a committee  
18 we've decided or made any decisions or expressed any level  
19 of comfort with these nominal values or even a nominal  
20 approach yet, but I think having some feedback, or we at  
21 least attempted to do it. We assigned some more of the  
22 catalog information we were able to collect. I think, you  
23 know, having your spin on what that might look like would be  
24 helpful.

25           MR. LIN: Okay. Now, now that last, I noticed

1 when I tried to go back and pull some of the other  
2 information. I was able to find the last, but it did get  
3 out on the, the --

4 MR. DELANEY: It didn't.

5 MS. ARMSTRONG: It may not be on the docket. I'm  
6 not really sure what parts of that I've been sending out. I  
7 sent it out, but it hadn't made it to the docket, but I'll  
8 send it again.

9 MR. DELANEY: Okay, I don't think.

10 MS. ARMSTRONG: No problem. But it's in the slide  
11 document --

12 MR. DELANEY: Yeah, absolutely.

13 MS. ARMSTRONG: -- you nominal values based on  
14 regulatory and then obviously nominal value. We attempted  
15 to do nominal values for these. We did not go further for a  
16 more, I would guess, the beginning part of your, what your  
17 beginning part of you representation will take care of, but,  
18 and that would be helpful.

19 MR. HAUER: I have a question back on the PDS.  
20 It's Armin Hauer speaking.

21 MR. DELANEY: Yeah.

22 MR. HAUER: Are there any electrical procedures  
23 included load side or line side on variable speed drive?

24 MR. DELANEY: It goes back to the PDS concept.

25 MR. HAUER: Yeah.

1           MR. DELANEY: The input/output is you're measuring  
2 input of a control, output of the, of the motor.

3           MR. HAUER: All right. But would you not be able  
4 to fetch your, basically artificially increase where  
5 efficiencies if you neglected to use load side filters?

6           MR. DELANEY: Yes, so, let's go back to that, yep.  
7 So that is accounted for in the test, in the test, obviously  
8 not reference, right. So obviously losses of the, I took  
9 that one slide out. It actually showed all the measurement  
10 points. It just got, I didn't want to get into too many  
11 things, but you see what that dotted line is. That's  
12 actually where we'll be polling voltage watts from as well  
13 to during the test. I know this isn't the representation of  
14 that, but it's measuring both in front and behind. It's  
15 isolating the CDM when you do the test. You have to know it  
16 includes any auxiliaries or filters upstream or downstream  
17 in the CDM.

18           So the CDM is the one that's penalized for it,  
19 because obviously they're the ones necessary probably to  
20 have the filtering, you know. So it's incorporated into the  
21 CDM test.

22           MR. HAUER: But okay some manufacturer will be  
23 here for AHRI 1210 certification. Now, one manufacturer so  
24 far has certified their products. And AHRI 1210 also judges  
25 about specs on the motor, and it also judges about how long

1 it's induced in the, into the line. And so you could  
2 basically boost your efficiency in the PDS if you left you  
3 left out the filters, so how would this change?

4 MR. DELANEY: Good question. So there is a base  
5 line test point set of carrier frequencies, a base setup  
6 that has to be repeated each time on the test. So it says  
7 regardless of what you want to use it and this is the same  
8 test. So if I go from one place to the next, this is the  
9 test setup that has to be done on the drive each time. So  
10 that's, that's the only way to make it fair, is to make a  
11 setup that each person has to repeat. So that's how it  
12 deals with that, okay.

13 MR. BUBLITZ: I have a question. Mark Bublitz,  
14 New York Blower. So there's DOE standard losses that were  
15 published, you know, published. And then there's this  
16 approach, right. Is this working group supposed to pick  
17 which one and what's that, what's the action?

18 MR. DELANEY: But we don't, we don't have a  
19 proposal, so I, I, just to make that clear. I don't have  
20 any proposal for air over.

21 MS. ARMSTRONG: No, no, but you have for the  
22 other, the rest of them.

23 MR. BUBLITZ: No, I'm talking about the whole  
24 product.

25 MR. DELANEY: I don't know.

1 MS. ARMSTRONG: We do.

2 MR. DELANEY: Do, for, you mean for this, for the  
3 PDS, yeah, yeah.

4 MS. ARMSTRONG: Yeah. So, yeah, and we would have  
5 to have that discussion about where we want to go. Do we  
6 want to do something like, and I'm not sure they are that  
7 different, but I think there are some, some differences in  
8 terms of for the nominal approach, do we would want to use  
9 something setup like this. I'm not sure Dan's process will  
10 actually be done in order for us just to point to by the  
11 time they may need it in the test procedure hearing. So we  
12 may have some timing issues there. But do you want it to  
13 move to an approach like this or do we want to do our own  
14 thing similar to what we did in pumps? And pumps used  
15 aspect of this, so they're not completely off and they're  
16 not different. They're pretty similar, but they're not  
17 exact.

18 MR. SMITH: Is this to set the default values?

19 MS. ARMSTRONG: It's to set the default values.

20 It's not the nominal values. And maybe you don't care, as  
21 long as you have that ability.

22 MR. SMITH: No, I don't care.

23 MS. ARMSTRONG: You care as long as you have that  
24 ability and care as long as they're setup in a way that, I  
25 think, A, provides you meaning results, but B, they also

1 protects you if DOE were to test, do actual testing that the  
2 rating is still, is equitable as being a nominal method and  
3 tested method. Anyway, you can hold that it, the answer,  
4 simple answer to your question is yes, that it's open to  
5 discussion and building on whatever else you want to do.

6 MR. DELANEY: It's a little complicated by the  
7 fact that if we said a majority of it is air over and you  
8 don't have an efficiency level, then you make big assumption  
9 to I3 or NEMA premium, and that's a big assumption that  
10 changed the motors you get today would dramatically change  
11 for you.

12 MS. ARMSTRONG: That's why that table is pretty  
13 important.

14 MR. DELANEY: It is, it's very important, yeah.  
15 That's very important. If we use that reference loss.

16 MS. ARMSTRONG: You could also say for certain  
17 types of motors, do they always have to get tested. And  
18 that's the other options. It's also, it's within your  
19 purview to have that kind of discussion here, depending on  
20 what you may want. So that's why some of the questions we  
21 had teed up from the last set of, and I know you guys both  
22 had some of them, but some of the questions we had teed up  
23 with regards to the last set - how do you test some of the  
24 answers to your questions and then nominal approach versus,  
25 um, wire to air approach. That's why some of those are

1 important. It gets to the heart of which way we want to go.

2 MR. SMITH: So let me ask you a question. Say  
3 I've got a fan that has maximum speed and sort of a worst  
4 case scenario, it, it carries 75 horse motor, but in its  
5 performance map it has, demands that drop all the way down  
6 to one, to one horse, right?

7 MS. ARMSTRONG: What do you do? Yeah.

8 MR. SMITH: So now I'm making that product and I'm  
9 selling it as a bare shaft band and I choose to, for those  
10 that ask, and they certainly will, I choose to use the  
11 default value to determine the wire to air efficiency of  
12 assembly. It has my fan and I don't know whose motor, so  
13 it's not my, not my problems.

14 MS. ARMSTRONG: Right.

15 MR. SMITH: Customer buys that stuff, packages it.  
16 He wants to know what the wire to air is. I give him the  
17 answer, life goes on. Is the default values used in that  
18 computation to a one horse motor since this fan can be  
19 applied with a one horse motor, and it's catalogued with a  
20 one horse motor?

21 So, so I, I mean --

22 MS. ARMSTRONG: Go ahead.

23 MR. SMITH: Or is this, uh, is this a matter that  
24 we'd have to debate and decide upon, or it, okay.

25 MS. ARMSTRONG: This was one of our items of

1 feedback, that we had to decide.

2 MR. DELANEY: So a key is that duty cycle. What  
3 do you want in that metric, right.

4 MR. SMITH: No, you're, you're not on the same  
5 wave length here because --

6 MS. ARMSTRONG: Motor --

7 MR. SMITH: We're proposing that, that --

8 MS. ARMSTRONG: It's motor -- right. I mean  
9 that's really what you're asking.

10 MR. DELANEY: No, that's independent --

11 MS. ARMSTRONG: It's just sizing.

12 MR. SMITH: I'm sorry?

13 MS. ARMSTRONG: It's sizing and we kind of --

14 MS. IYAMA: So I think what you're asking is what  
15 size motor do I pick when I'm calculating my rating.

16 MR. SMITH: As a default value.

17 MS. IYAMA: As the default value. And I think --

18 MR. SMITH: And I'm going to say that the only  
19 time this matters is, is when I want to represent a  
20 particular motor and drive combination that carries the  
21 default.

22 MS. IYAMA: Right, so I think here is the  
23 different, different situation.

24 MR. SMITH: Because the default value in my  
25 calculation shows up in both the numerator and the

1 denominator --

2 MS. IYAMA: Right.

3 MR. SMITH: It doesn't actually matter

4 MS. IYAMA: Right, so the -- .

5 MR. SMITH: The time that it matters, right, is  
6 when I certify a particular motor and drive with efficiency  
7 I'm going to claim is above the default, right.

8 MS. ARMSTRONG: So I, the answer is yes, but I  
9 actually will go as far as I think it does matter, because  
10 I'm not sure we're going to end up at an index. And even if  
11 we did end up at an index, I'm not sure that index is a  
12 moving index, in which case they would always cancel out,  
13 depending on how we go with this. So I think we should  
14 assume it does matter --

15 MR. SMITH: Well, it matters --

16 MS. ARMSTRONG: -- because I think that's the  
17 better way to go. That it could matter.

18 MR. SMITH: It could matter even in the default  
19 calculation?

20 MS. ARMSTRONG: Correct. Because I'm not sure  
21 we're going to end up with an index. I mean, I know you  
22 guys want an index for purposes of making representation,  
23 but the standard's not an index.

24 MR. SMITH: Whether or not, whether, whether or  
25 not it's an index, Ashley, if I'm a manufacturer and I'm

1 making a product and selling it with bare shaft, I do not  
2 want to be tested or held responsible for the performance of  
3 the things that I didn't make or sell.

4 MS. ARMSTRONG: Right, so I understand. You don't  
5 want to be held responsible for, I'll just say it, an  
6 underperforming motor, got it.

7 MR. SMITH: Well I don't sell motors.

8 MS. ARMSTRONG: Got it, that being said, that's  
9 why these issues are important. That's why the nominal  
10 values and the way they are constructed are important.  
11 That's why some of the questions we had teed up previously  
12 and the way we're trying to construct the nominal values are  
13 conservatives because of this issue specifically.

14 MR. SMITH: But when are we going to talk about  
15 the pros, cons and difficulties and challenges associated  
16 with the ratio FDIs?

17 MS. ARMSTRONG: So I guess this is a good time to  
18 talk about what may come tomorrow because it's almost 5:00  
19 and what topics does the working group really want to talk  
20 about tomorrow in this room again. So, you know, be  
21 prepared, mentally and otherwise.

22 MR. SMITH: And we're here at 8:00 in the morning.

23 MS. ARMSTRONG: We are.

24 MR. BOTELER: It's 8:00 to 3:00.

25 MS. ARMSTRONG: You can go off record now. We're

1 good. Thank you.

2 (Whereupon, the meeting was concluded.)

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