UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

NOTICE OF PROPOSED RULEMAKING PUBLIC MEETING ON

RESIDENTIAL FURNACE FANS TEST PROCEDURE

U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585
Room 8E-089 Review Center

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AGENDA

P R O C E E D I N G S

MR. BROOKMAN: Please take your seats. Good morning everyone and welcome. This is the U.S. Department of Energy's Notice of Proposed Rulemaking Public Meeting on Residential Furnace Fans Test Procedure. Today is Friday, June 15, 2012 here in the Department of Energy in Washington, D.C. My name is Doug Brookman from Public Solutions in Baltimore.

We're going to start off this morning with welcoming remarks from Mohammed Khan.

Welcoming Remarks

MR. KHAN: Good morning everybody. My name's Mohammed Khan, Project Manager for this rulemaking activity. I just want to first say thank you. Really appreciate your attendance today for this important meeting. As many of you are probably aware, the rulemakings that we have done recently for new standards and such are basically amendments to existing standards and also test procedures. This one however, is a bit different. There currently is not a test procedure in place. There is also no standard in place. So that makes this

one unique. It's also unique in the sense that the product that we're talking about today, residential furnace fans, is a component of a product that we already regulate. So it's different in that sense as well.

So because of all of that, your comments and concerns and particularly written comments that you might want to submit later will be very, very beneficial to us. So I look forward to a good discussion. Thanks.

MR. BROOKMAN: Thank you. It's our tradition to start with introductions. So I'll start to my immediate left. Please say your name and organizational affiliation, and also you can get used to turning the microphone on and off as you speak, please

Introductions

MR. JAMES: Brian James, Southern California Edison.

MR. CHRISTIANSEN: Good morning. Adam Christiansen from the Appliance Standards Awareness Project.

MR. SACHS: Harvey Sachs, American Council for an Energy Efficient Economy.

MR. STEPHENS: Charlie Stephens, Northwest

Energy Efficiency Alliance.

MS. WALTNER: Meg Waltner, Natural Resources Defense Council.

MR. WITTINGHAM: Dave Wittingham, Allied Air, Lennox.

MR. WAGNER: Greg Wagner, Morrison Products.

MR. SMALL: Terry Small, Mortex.

MR. MESSMER: Craig Messmer, Unico, Incorporated.

MS. COX: Michelle Cox, … Blake Corporation.

MR. ROY: My name is Aniruddh Roy, Air Conditioning, Heating, and Refrigeration Institute.

MR. STAS: Eric Stas, DOE General Counsel's Office.

MR. KHAN: Mohammed Khan, DOE.

MR. WESTPHALEN: Detlef Westphalen, Navigant Consulting.

MR. JASINSKI: Sam Jasinski, Navigant Consulting Incorporated.

MR. LEKOV: Alex Lekov, Lawrence Berkeley National Laboratory.

MR. BROOKMAN: Thank you. Please.

MS. KEIL: Heather Keil, Navigant

Consulting.

MR. BROOKMAN: Jim?

MR. RABA: Jim Raba, Department of Energy.

MR. BROOKMAN: Once again, thanks to all of you for being here and giving us a timely start on the meeting today.

Agenda Review

MR. BROOKMAN: I'm going to do a very brief agenda review. As you can see, all of you received a packet of information as you came in the door today. If you have not yet handed off a business card to Brenda Edwards, please do so because the Department typically would make a photocopy of all the attendees and make it available to everyone here.

Immediately following this agenda review Mohammed's going to provide an overview, talking about the purpose of the meeting, comments submission instructions, regulatory authority and other rulemaking overview matters. Immediately following that, we'll have scope of applicability of reference standards and test methods by Sam.

We'll take a break mid-morning, round about 10:45 or so. Returning from the break, fan efficiency rating methodology and calculation.

Around about 12:30 or so, we'll take lunch around. When we return from lunch, rating examples and comparison, and then following that, certification compliance and enforcement overview.

There is an opportunity at the end of the day for additional remarks, closing remarks from anyone who wishes to do so, and as soon as Mohammed finishes his slides, his introductory slides, there is an opportunity at that point for anybody that wants to make opening statements, draw attention to issues from your perspective here at the outset.

I'd ask for your consideration. Please speak one at a time. We've -- the Department has tried to make these meetings accessible to folks via the web, and we're getting more and more folks joining via the web, which means we need to be a little more disciplined about using the microphones. We need to turn them on and off each time we speak, because what we've heard is that if you leave them on, then it provides feedback in the system. So I'm going to be trying to remind you to do that as the day goes on today.

If you would, please speak one at a time. Turn the mics on and off. Say your name for the record each time you speak. You don't need to say

your organizational affiliation unless that's what you would like to do. I'm going to be cuing individuals by name to speak. There will be a complete transcript of this meeting posted on the DOE website. I'm going to be cuing individuals by name as best I can to speak. I also wish to encourage follow on comments, the back and forth is sometimes very useful to the Department as they try and figure out what the best pathway is.

If you please be concise. Share the air time. And if you keep the focus here, turn your cell phones on silent mode, limit sidebar conversations if you can, and we'll have a very productive meeting. Questions and comments here at the outset? Okay, then, to Mohammed Khan. Overview.

Overview

MR. KHAN: Thanks. Good morning everyone. Welcome, and thank you for participating in today's meeting on the U.S. Department of Energy's proposed test procedure for residential furnace fans. My name's Mohammed Khan and I'm the project manager for this rulemaking activity.

Today's meeting serves multiple purposes. Mainly, our goal is to have a two-way discussion.

We want to convey the key points and concepts associated with this rulemaking, as well as to hear and listen to your thoughts and potential concerns.

- So first the Department wants to present its approaches for a furnace fan test procedure.
- Second, DOE is seeking comments on its proposed test procedure.
- This is also a forum for all interested parties to hear and discuss issues raised by others.
- And again, because your feedback is very important, I encourage everyone to fully participate and urge that you submit any relevant data that might aid the Department in developing the best possible test procedure.
- And lastly, we want to describe the steps in the rulemaking process.

Comments. Your comments are essential to the success of this rulemaking. All participants are encouraged to submit summary comments and raise any additional issues relevant to the rule, and as indicated in the NOPR, which was published one month ago, the close of comment period is

July 30th.

This slide represents a sample of the call out boxes we will use throughout our presentation to identify certain issues the Department seeks detailed information on. And for reference, please note that numbering of the issues boxes correspond to the issues listed in the NOPR.

As I mentioned earlier, feedback is very important to the Department and I want to make sure everyone is clear on how to submit the comments. This slide provides the postal, courier, and e-mail addresses which are appropriate for submitting the comments. Please include the information here at the top so that your comment is properly identified and catalogued. While not provided on this slide, you also can submit, via www.regulations.gov, your comments. Regulations.gov is a new online tool for submitting comments on all federal government proposed rules. Let me also point out again, the comment period ends on the 30th of July

This slide outlines the meeting agenda. Following my introduction and overview, we will discuss the scope of applicability. Next we will take a look at the applicable reference standards and the sections of those standards that are

considered relevant. Next we'll describe the parameters that are in the FER and look at some examples and how that applies to different kinds of products. And before closing remarks, in the last section of the presentation, we'll consider a possible approach for certification, compliance and enforcement.

The Energy Policy and Conservation Act directs DOE to establish test procedures for furnace fans and at 42USC6293.B.3, EPCA charges DOE to promulgate standards for furnace fans by December 2013. EPCA also says that test procedures must be reasonably designed to produce test results which reflect the energy efficiency or energy consumption of a product during a representative average use cycle, and shall not be unduly burdensome to conduct.

The final point on this slide is that the furnace fan test procedure must also account for standby mode and off mode energy use. EPCA, after being amended in 2007 by the Energy Independence and Security Act, requires that the energy use associated with standby mode and off mode be integrated into the energy conservation standard unless the existing standard already accounts for

them or integration is not technically feasible. If integration is not technically feasible, EPCA requires separate standards for standby mode and off mode energy use.

Okay. As I said at the outset of our meeting, there's currently no test procedure or standard for the furnace fans. DOE kicked off the furnace fan effort with a framework document for standards in June 2010.

So, where are we today in our rulemaking process? Last month DOE published its NOPR for the furnace fan test procedure. Today we're holding the public meeting to receive your input. Again, I cannot over-emphasize the importance of your verbal and written comments. And once again, please submit comments and any relevant data by the deadline.

In developing the final rule, DOE will carefully review the transcript of today's meeting, together with all comments that it receives, and we anticipate issuance of the final rule by December 31st.

So at this time, as Doug mentioned before, if there are any opening remarks by anyone?

MR. BROOKMAN: Yes, briefly before we do that, I want to also extend a welcome to those that

are joining us via the web. The Department of Energy is trying hard to make these meetings accessible and successful via the web, and they are hoping that if you're joining via the phone you can submit questions or comments by raising your hand in the "go to meeting" software or via "go to meeting", use the question window in the "go to meeting" to submit a question that will be relayed to me, the moderator, and we'll try very hard to incorporate those comments and questions during the flow of the meeting itself, and that will be a part of the transcript, the record of the meeting. So welcome to those joining us via the web. How many do we have joining us via the web? Twenty-two, it's a lot of carbon saved.

So then opening statements here at the outset? Yes, please. Your name.

Opening Statements

MR. ROY: My name is Roy, AHRI. Our opening statement is the scope of this NOPR does not follow the original intent of the Energy Policy and Conservation Act. The test procedures should have been limited to fans within residential furnaces only. Also the proposed reference system in the NOPR specifies external static pressures that are

too high as compared to the external static pressures in the federal test procedure for furnaces that are currently in place. Hence, this NOPR essentially leads to different external static pressures for measuring AFUE and FER for residential furnaces.

We also feel that DOE should consider adopting the e-sub-b metric that our industry proposed earlier, since it allows for relative electrical performance comparison of furnace fan without imposing unnecessary burden of air flow measurement at additional external static pressures.

MR. BROOKMAN: Thank you. Other comments here at the outset? Harvey Sachs.

MR. SACHS: Harvey Sachs, American Council for an Energy Efficient Economy. I am disappointed. I am disappointed because the plain text of the 42USC reference Mr. Khan has given us says that we shall have standards for electricity use for purposes of circulating air through duct work, hereinafter referred to as furnace fans. On the very most minor level, I'm disappointed that this document, the test procedures doesn't have a definition of furnace fans that I found. I did find it in the RFI. We did comment on it at that time.

And despite what I regard as fairly clear instruction from Congress, although there is some ambiguity and we recognize that, the Department has chosen, as far as I can tell, to construe the requirement as being a narrow box around the sheet metal, its motor, impeller, and the shroud. The Department's own research carried out by Ian Walker over a period of years, the LBL, has I think demonstrated fairly clearly that a large fraction of the electricity consumption of these devices has to do with the aerodynamics of the air handler cabinet.

That, as one simple example, if within a product family, however we define that, we choose to use a longer fan within the same cabinet as other models might have a shorter fan, we've dramatically reduced the clearances between the inlet to the box and the fan itself. This does not make moving air happy. Consequently, we proposed earlier, that the unit of interest is the air handler, a virtual appliance. Ironically, were we to treat it as the air handler, this would completely remove the concerns that Roy has expressed on AHRI's behalf, because we now would have an electricity measurement for air handling without having to touch either the furnace or the air conditioner rating method.

We all know that for 30 years we have used a really unrealistic, mythological set of values for external static in the air conditioner test procedure. If we want to have any kind of realism, anything better than relative values, anything that will be use of modelers and specifiers -- for modelers and specifiers -- we need to do something about this. And a smart rule on air handlers would give us the ability to capture that without having to retest the hundreds of thousands of air conditioner models that are out there.

So I have a sense that proceeding down this track is a missed opportunity. Now, the regulations also require that this shall be reasonably designed to produce test results which reflect the energy efficiency or energy use of a product. And I think there's an affirmative obligation that the Department has to show that just looking at the shrouded fan will give realistic results, given the results that the Department's own research has shown. And I don't think we're meeting that burden. So I think we're going down the wrong track, and I think it's going down the track that will impose a fair amount of burden on people to make almost totally irrelevant measurements.

So, other than that, I like everything you all have done.

MR. BROOKMAN: Thank you. Other comments here at the outset? I was wondering, Roy -- may I call you Roy?

MR. ROY: Yes.

MR. BROOKMAN: Since Harvey referenced your comments at the outset, do you want to respond to what he just said? No? Not at this time.

MR. ROY: Not at this time.

MR. BROOKMAN: Perhaps in writing. Yes. Okay. So -- Harvey.

MR. SACHS: This is Harvey Sachs. I will certainly provide comments, but please send me an e-mail to remind me so you all have time to play with them. Thank you.

MR. BROOKMAN: Yes, please. Craig Messmer.

MR. MESSMER: Yes, I'd like to take this opportunity to once again ask the Department to please consider the small duct high velocity classification.

MR. BROOKMAN: Hang on just one second, okay. I didn't hear that last thing, so would you say it again, please?

MR. MESSMER: You're right. Hello. This is Craig Messmer. We make small duct high velocity equipment and this particular NOPR does not include any language for small duct high velocity. We operate at much higher static pressures than conventional blowers. And to Harvey's point, I think we actually have pretty realistic values in our test standards, so I would like the Department please consider that in the rulemaking.

MR. BROOKMAN: Okay. Thank you. I think it's especially helpful here at the outset to hear from members of the industry if they have anything to say at this point. Yes, Dave.

MR. WITTINGHAM: Yes, this is Dave Wittingham from Allied Air, Lennox. Just to ask the Department please consider the burden that the test procedure as outlined will impose upon manufacturers. Across our organization, we have hundreds, if not thousands of products that could be classified as furnace fans, and the time and cost and ongoing cost of this test procedure as outlined would be unduly burdensome.

Also, I think, as far as the external static points that are proposed, there are products where the proposed static pressures would take the

product out of its safe and reliable range of operation, and I think a manufacturer's intended installation or safe and reliable operation needs to be considered in any type of test procedure. Thank you.

MR. BROOKMAN: Wendy, we got that okay? Yes.

MR. SMALL: This is Terry Small with Mortex, and I would like to echo what Dave just said. We're a small manufacturer of some of these products and there would be a disproportional burden on us. The cost required to initiate the test and the ongoing cost to perform the test. If you have fairly burdensome testing spread across tens of thousands of units, that's one thing. If you have burdensome testing spread across -- you know, we have some products we may only sell 100 or 200 a year. That is ridiculously burdensome. So I'd just stress that this needs to take into account the full array of manufacturers of this type of product in terms of coming up with the test procedure that is administratable and performable.

MR. BROOKMAN: Thank you. I'm sure those of you that are familiar with these DOE proceedings realize they're on a constant quest for data. And

so your data, related to the burdens that you're likely to face, as your project this test procedure, will be very helpful to them, so sooner rather than later, and in detail will be helpful to the Department. Okay. Harvey.

MR. SACHS: Harvey Sachs, ACEEE and I want to reflect Dave Wittingham's comment and I can't think of any person who would object to test procedures that would allow the manufacturer to map out an installation not recommended zone, so that his testing would not be as -- would not be attempted in areas where the product is clearly unsuitable. That would seem to be a reasonable accommodation. Exactly how it would have to be done, I have no idea.

MR. BROOKMAN: Okay. I guess we're going to get into -- we will, of course, as the day progresses, get into considerable detail on the proposed test procedure. However, it does seem at the outset at least one person in the room think the Department's taking the wrong approach here. So I'm not sure how we incorporate that, if we stick entirely with the content that's here in the proposed test procedure. So let me just entertain any additional comments on that score right now?

Nothing additional at this time. Okay. Just thought I'd try.

We have a comment, and hopefully this will work, someone who's joined us via the web, Jim Vershaw is joining us via Go To Meeting, I guess. Jim, we hope to hear you speak. If you unmute your phone or line.

MR. VERSHAW: How's that?

MR. BROOKMAN: That's good. We're hearing you. Speak loudly.

MR. VERSHAW: I guess as we look at this, we're having a hard time seeing -- well, there's a feedback, I'm not sure --

MR. BROOKMAN: We can hear you okay. Just keep going.

MR. VERSHAW: Okay. It's hard to determine how the homeowner or consumer would use this metric in order to make a purchase considering that it includes electricity that's already put in the heater or the air conditioner, and is -- the testing is done with test procedures that are different than the other tests are put in. It includes the … that most people don't use, and is a very difficult scripture to understand. It's hard enough to understand FER and HSPF and AFUE. But

this is one of the struggles we're having. It also uses a test procedure from ASHRAE, the air conditioning use … so it's a lot to deal with. Thanks.

MR. BROOKMAN: Okay. So we're about to move into the more detailed content in the slide packet. Final comments here at the outset before we turn it over to Sam? Okay. Sam Jasinski.

Scope of Applicability

MR. JASINSKI: Good morning. I've had the pleasure of meeting some of you in previous -- the framework public meeting and maybe some other rulemakings, but for those of you who don't know me, my name is Sam Jasinski from Navigant Consulting, and I've been working on the furnace fan rule pretty much since its inception.

So to start off, I will begin by providing an overview of the Scope of Applicability of today's proposed test procedure. Pursuant to the EPCA language that Mohammed described earlier, the Scope of Applicability of this proposed test procedure is single phase, electrically powered devices that are used to circulate air through ductwork in heating, ventilation and air conditioning products, with heating capacities that are less than 250,000 BTU

per hour, and coolant capacities that are less than 65,000 BTU per hour.

You'll notice that these criteria are consistent with the current DOE definitions for residential furnace and residential central air conditioners. DOE finds that HVAC products that meet these criteria, typically have air flow capacities that are less than 3000 cfm, which is cubic feet per minute. In addition, DOE proposes to exclude any non-ducted products which include whole house ventilation systems that don't have duct work, CAC condensing unit fans, room fans, and the furnace inducer fans -- draft inducer fans.

Before I move on, does anybody have any questions or comments regarding the Scope of Applicability or proposed Scope of Applicability?

MR. WAGNER: Yes.

MR. BROOKMAN: Greg.

MR. WAGNER: Yes, I would just say that back to the definition --

MR. BROOKMAN: Get close to the microphone, Greg.

MR. WAGNER: Back to the definition. This is different than what was outlined under the legislation, the EPCA. In 6295F, it clearly defines

furnaces as what they are and this is different than what was included in that language.

MR. BROOKMAN: Can you say how it's different?

MR. WAGNER: It clearly says that it's for furnaces and boilers. It doesn't include central air conditioners. And it excludes certain other items that want to be included in the scope of this.

MR. BROOKMAN: Okay.

MR. WAGNER: So if you go back to the language of that, particularly under 4D, it covers that, and we've commented on this before and will supply those comments again, but it's expanded beyond what was originally written in the legislation.

MR. BROOKMAN: Okay. Roy?

MR. ROY: I Support what Greg Wagner is saying. Again, Aniruddh Roy with AHRI. If you look at the title of 42USC 6295F, it says, "Standards for furnaces and boilers." And we feel that just the heading and all the sub notes that follow, everything covers either furnaces or boilers, and the last sentence, D, is what's being referenced, and we feel that what's being told to us in terms of the Scope of Applicability just pertains to

residential furnaces only.

MR. BROOKMAN: Okay. Thanks for remembering to turn off the microphones. That helps. Dave, do you have a comment here? No. Additional comments before we move on? Okay.

Reference Standards and Test Methods

MR. JASINSKI: Thank you. Next I'll describe some of the primary reference standards that we are incorporating by reference in the proposed test procedure. In the framework document, and in the framework public meeting, a large focus of the discussion relevant to the test procedures focused on identifying and finding relevant existing industry standards. In comments from the framework document meeting, and in subsequent work by DOE and subsequent conversations with industry participants, we've identified ANSI/AMCA 210-07 as a standard that's very well known and used industry-wide to measure performance of furnace fans. So for that reason, DOE is proposing to incorporate by reference ANSI/AMCA 210-07 to measure the active mode performance of furnace fans in this test procedure.

And as Mohammed described earlier, EPCA also requires that we consider standby and off mode electrical consumption, so for that reason we also

have to establish -- DOE is also proposing to establish DOE-established test methods for measuring the standby and off mode electrical consumption of certain products that this test procedure would be applicable to. There's a little bit of a spoiler here in the parenthetical for hydronic air handlers only. As we'll get into detail a little bit later, DOE is already considering and covering standby and off mode electrical consumption in other rulemaking activities for some products that would meet the criteria outlined previously for this test procedure.

MR. BROOKMAN: Craig.

MR. MESSMER: Hello, this is Craig Messmer. I'm hoping you do elaborate more on why it's just hydronic air handlers that have this. I understand the gas furnaces are already measuring this in another way. I wonder why they just didn't have the same metric, FER, for everyone that includes the standby and the off mode. So will that be answered later?

MR. JASINSKI: Well, I will mention it. If you look at the sub bullets here, the proposed reference standard for the hydronic air handlers will be to adopt the DOE standby and off mode test

procedure already in place or being finalized for residential furnaces, which incorporates by reference, the IEC standard 62-301, second edition. But we will go into a little bit more detail about the specifics of the rulemaking activities that are applicable to standby and off mode for these products.

MR. BROOKMAN: Charlie Stephens, and Jim Vershaw is next in the queue. Charlie.

MR. STEPHENS: Charlie Stephens. I'm a little confused here by what seems to be a bit of a schizophrenic approach to what the covered product is. I'm not sure how we leap from furnace fans to air handlers here. I can understand standby energy use by an air handler. I think that's pretty much the case, a furnace or an indoor unit for a heat pump system or a hydronic air handler. But I'm not sure that applies to a furnace fan. It seems to me that the product here -- it's either an air handler or it's a furnace fan, and DOE has gone to some trouble to exclude including air handlers and yet here we're doing standby power for an air handler, and I have to admit to being a little confused by that.

MR. BROOKMAN: Okay. Thank you.

MR. JASINSKI: Can I -- just a follow up question for that, Charlie. Would you mind just kind of providing, since it is a new rule and there aren't really established standard industry definitions for a lot of the things that we might be talking about, can you kind of provide your distinction between an air handler versus a furnace fan and so forth, just so everybody can really understand the comment.

MR. STEPHENS: Sure. Charlie Stephens. I kind of regard the furnace fan as a component of an air handler, kind of like a pump is a component of a clothes washer. It's -- the clothes washer has standby energy consumption, but the pump probably doesn't. It's a -- that's the kind of distinction I'm making here, and I think we recommended in our comments in the original framework proceeding, that air handlers be considered the covered product, and it seems DOE has gone out of their way not to consider air handlers the covered product, and has resorted to a fairly simple, including their diagrams, of a furnace fan as not an air handler. And so I'm trying to understand why, in a furnace fan rulemaking, when they've done that, we're now considering standby and off mode for an air handler,

any kind of air handler.

MR. BROOKMAN: Okay. Jim Vershaw is next. Jim, unmute your machine, and talk loudly.

MR. VERSHAW: Okay. Talk loudly. All right. Jim Vershaw, Ingersoll Rand. The first comment I have has to do with the ASHRAE 51. It was stated that that was used for furnace fans, and I would disagree with that. If you look at the test procedures that are required for air conditioning and heat pump … AHRI has authority, which incorporates ASHRAE 37, ASHRAE 37 does incorporate part of ASHRAE 51. However, the way the equipment is -- the ductwork -- the way the static pressure is measured, is totally …, and if we continue down this path using 51, we're going to have to -- all the data we currently have on our books won't be applicable. We'll have to redo all of it. And I don't think that the way the equipment is used is primarily conductive, you don't have to worry about velocity pressures at a later time. So that's a real issue for us, and I think you need to reconsider using 51 for this testing.

As far as standby power goes, one of the interesting things that happens with standby power is you go to high efficiency motors and all of a

sudden your motor has standby power because there's electronics, so there's kind of a catch-22 on this whole thing. Thank you.

MR. BROOKMAN: Jim, are you finished? So Jim, you had addressed both scope issues and the burden issue, so I'm certain the Department would appreciate your detailed comments in writing.

MR. JASINSKI: I also just have a quick follow up for Jim. My question is sort of a clarifying one. Jim brings up that to test air conditioners they use, I think he mentioned ANSI/AMCA 210-240 which references ASHRAE 37. One distinction or clarification I'd like to make is that while those products may be tested to -- according to those reference standards, a lot of the product literature provides information about the performance of fans used in the products mentioned. And it's DOE's understanding, based on comments from the framework document, and also footnotes in some of the -- a lot of the product literature, that those -- that that data which is usually in the form of air flow measurements across a range of external static pressures, that those are provided in accord with -- or measured and provided in accordance with ANSI/AMCA 210. I was just wondering if Jim and

other manufacturers in the room could either confirm or correct me if I'm wrong about that.

MR. BROOKMAN: Jim, you want to start with that?

MR. VERSHAW: Hi. Jim Vershaw here. The nozzles and the plenum, and the way that the air flow is measured is the same whether it's 37 or 51. the way you measure static pressure according to units of what the nozzles -- and we follow both 37 for ours, even though we do do a sweep of static pressures and flow.

MR. JASINSKI: Okay. Thank you.

MR. BROOKMAN: Other comments? Yes, Greg.

MR. WAGNER: Greg Wagner. AMCA 210 is for testing of fans, and not for appliances. I believe you're trying to capture the energy use and performance of appliances here, and that's where this difference lies. ASHRAE 37 is done for the testing of appliances and would be more apropos to this type of a setup.

MR. BROOKMAN: Thank you.

MR. WAGNER: And that's what they tested, by the way.

MR. BROOKMAN: Okay. Thanks. Do you have any questions?

MR. JASINSKI: No. Any other comments or questions before I move on. Okay. So in these subsequent slides I'll talk in a little more detail about exactly which parts of ANSI/AMCA 210 DOE is proposing to incorporate by reference.

DOE is proposing to incorporate by reference only the sections of ANSI 210 that are required to calculate the proposed metric, which is the fan efficiency metric, or I'll refer to it as FER, and I'll get into more details about the specifics of the metric later.

The sections that DOE is proposing to incorporate and exclude are listed here. I won't read all of them to you, because you have them for reference, but the main take-away here is that the sections that DOE is not incorporating are related to the mechanical measurement of fan input power. ANSI/AMCA 210 has provisions that measure fan input power using a dynamometer and other mechanical methods. And in the proposed test procedure, the DOE proposed test procedure, we are actually going to -- DOE is proposing to make modifications and additions to replace those methods, as well as some other additions.

So the additions that DOE is proposing to

make to ANSI/AMCA 210:

- First, to specify the range in increments of external static pressure at which determinations are made. ANSI/AMCA 210 defines the determination as a complete set of measurements at a given operating point. For the purposes of the proposed test, DOE proposed test procedure, a determination includes the measurement of air flow, electrical energy consumption or input power to the furnace fan, as well as external static pressure. So any time you hear me refer to a determination, I'm referring to that set of three measurements which are used to describe the performance of the fan at a certain operating point.
- Secondly, DOE is proposing to add a specification for measuring the input power to the furnace fan using an electrical meter with a plus or minus one percent accuracy of observed readings. And as I mentioned before, those are mainly to replace the methods in Section 4.4 of ANSI/AMCA 210 that are mainly mechanical methods of measuring

input power.

- And lastly, we're adding -- DOE is proposing to add the specification of an electrical supply that is maintained within one percent of the highest nameplate voltage. There are some products that meet the criteria for the Scope of Applicability that may have two nameplate voltages, one at 230, one at 208, and this just specifies that it be maintained at one percent of the higher. So 230 in that case.

Do we have any other comments or questions before I get into the specific requests for comments that DOE has.

MR. BROOKMAN: Yes, Adam, you're next.

MR. CHRISTIANSEN: This is Adam Christiansen from the Appliance Standards Awareness Project. Just so I'm clear of where the boundaries for the measurement is occurring. AMCA 210 uses, as you mentioned, the mechanical means of input power, the shaft power to the fan. But it also a part of that test procedure that you can calibrate the motor in order to measure electrical input power, but transform that measurement into a mechanical shaft

power.

MR. JASINSKI: Sure.

MR. CHRISTIANSEN: Is the Department suggesting that kind of calibration of the motor as well?

MR. JASINSKI: No, that would be part of Section 4.4 and 4.5 which DOE is excluding.

MR. CHRISTIANSEN: So you're going from the wires to the air pressure valve, that's the kind of measurement you're talking about here.

MR. JASINSKI: The product itself would be metered. The input power to the product would be metered, yes.

MR. CHRISTIANSEN: Thanks.

MR. JASINSKI: Any others?

MR. BROOKMAN: Brian.

MR. JAMES: Brian James, California Edison. Just to be clear, when you have like ECM motors, that's going to provide the potential, in some circumstances, some THD values that will throw off a standard electrical meter, and so there's certain meters that can handle that, and you'll still obtain the plus or minus one percent accuracy. But there are other meters that you're accuracy is going to be totally thrown off and your measurements

are going to be useless if you have a THD as a result. So just -- a THD, a total harmonic distortion for that.

MR. JASINSKI: Can you provide maybe a suggested tolerance or accuracy that should be included in the specification to avoid any issues with that?

MR. JAMES: Yeah, we can submit that in our comments.

MR. JASINSKI: Okay. Thank you.

MR. BROOKMAN: I guess both of the last two comments you were kind of questioning what I thought was essentially the method, so detailed comments on that would be very helpful.

MR. JASINSKI: Any others?

MR. BROOKMAN: Yes, Greg.

MR. WAGNER: The difference, again, in the 210 versus the equivalent ASHRAE 37, they have velocity pressure difference and doing those calculations et cetera, are just unnecessarily -- makes it complex and the ASHRAE 37 has a method for doing a straight pressure method, which simplifies this methodology.

MR. BROOKMAN: Okay.

MR. JASINSKI: I think Greg provided a

pretty good segue to an issue that DOE is specifically requesting comment, and that has to do with a couple clarifications regarding the definition of external static pressure. In a lot of product literature and conversations with industry, the term external static pressure is used. However, that term is not defined or explicitly stated in ANSI/AMCA 210, and DOE is specifically requesting comment on whether when manufacturers use the term external static pressure, that they're actually referring to what is defined as fan static pressure in ANSI/AMCA 210.

And I provided here the definition from ANSI/AMCA 210 of fan static pressure as well as the proposed definition in the Notice of Proposed Rulemaking for external static pressure which are meant to be consistent with one another.

So the first question before going into details of the definitions is just the clarification from the industry participants as to whether or not, when they refer to external static pressure in product literature, are those values in accordance with ANSI/AMCA 210's definition of fan static pressure?

MR. BROOKMAN: Craig.

MR. MESSMER: This is Craig Messmer again. We use ASHRAE 37, which is defined by just the measure, external static pressure subtracted from the supply and the return. We do not use AMCA, and we don't see any need for that either. We specify what the duct sizes have to be used for each air handler and it's not a fan standard. We're not --

MR. JASINSKI: I think the next slide will provide a little bit of clarification that seems to be necessary.

MR. BROOKMAN: On this point, on issue 8, Jim Vershaw has had his hand raised. Jim, you're next. And Jim, if you can get close to whatever the microphone is on your system, you were kind of breaking up the last time you spoke. No? Jim's not on, so we'll hear from him later, perhaps. Craig, keep going.

MR. MESSMER: I'd like to make -- this is Craig Messmer. I want to follow up with what I was just saying. We compare the two differences in the equations for external static pressure, and there is a difference, and there is a significant difference, and it makes the product look worse than it really is. So we would again encourage you to use ASHRAE 37.

MR. JASINSKI: As a follow up to these -- to Craig's comment, I will just draw attention to the part of the definition of external static pressure that specifies that it's the difference between the total pressure at the air outlet and the total pressure at the air inlet, less the velocity pressure. And on the next slide, I think this will help because it provides a little bit more visualization of exactly what we're describing.

And I think, to Harvey's comment earlier, as well as some other comments about wrapping our heads around exactly the Scope of Applicability and the scope of the measurement, so to speak, you'll see in the diagram here -- this is Figure 12 from ANSI/AMCA 210, and this is the test setup that DOE finds is very popular for taking the types of measurements that we're describing in this test method. And you'll see all the way to the left, a box labeled "fan," and I think a lot of confusion results from the fact that maybe -- maybe some interested parties are misunderstanding that DOE is not suggesting that the fan component be removed from the product and tested in this setup. In fact, the Notice attempts to explicitly state that the fan be kept inside the HVAC product. So where you see

fan here, it would probably more appropriate to label that as HVAC product. And then, so consider that as either a furnace or a hydronic air handler, or whatever else -- whatever HVAC product that incorporates a furnace fan, would be in place of the fan in this schematic.

And also pay attention to the planes are labeled at the top, one, two, seven, and five. So the pressure measurements are actually taken at plane seven and plane one, and so the scope of the measurements that a lot of people are referring to with the modification that I just explained, these measurements are actually taken outside of the HVAC product, the product being the entire furnace, or the entire modular blower, or the entire hydronic air handler.

So, in fact, when we define and talk about external static pressure in the context of the proposed rule, we're actually talking about the pressure drop across the entire HVAC product, not just the fan inlet and the fan outlet which is interior to the HVAC product, like prior to the heat exchanger or whatever other appertances may be downstream within the envelope.

MR. BROOKMAN: Thanks for that

explanation. Greg first.

MR. WAGNER: I don't want to speak completely for the rest of the folks that do this kind of testing, but I think they understand that difference. What's different is that the 210 test methodology, correction factor, all those things, are designed for fans themselves.

MR. JASINSKI: Okay.

MR. WAGNER: ASHRAE 37 is designed for appliances, and it's a different test standard. It's one they conduct today and it makes sense for that type of an appliance. AMCA 210, ASHREAE 51 makes sense for fan only. But I think they understand what you're representing as a unit.

MR. BROOKMAN: So to be explicit, what are you suggesting the DOE do in this case?

MR. WAGNER: Well, there's a lot of things I suggest they do, but --

MR. BROOKMAN: On this specific issue.

MR. WAGNER: I can echo a lot of things I already heard earlier today, but in this particular thing, the 37 is more applicable to what you want to accomplish along this path, than the 210.

MR. BROOKMAN: Okay. Harvey, you're next.

MR. SACHS: Sam, that diagram is really

important, and it has the term fan over there on the left side, and I think I heard you say that means air handler, is that correct?

MR. JASINSKI: Well, I'm not trying to redefine fan. All I'm trying to explain is that in the proposed DOE test procedure, which incorporates ANSI/AMCA 210 by reference, in this diagram -- in the ANSI/AMCA 210 diagram -- it's the -- the unit under test is labeled as a fan here, and what I'm trying to say is that when -- as it states in the proposed test procedure which can be considered a modification maybe to the methods that are in ANSI/AMCA 210, DOE is specifying that the entire HVAC product be the unit under test, that the fan is not actually removed from the envelope or the shroud, as you described it earlier, and then tested.

MR. SACHS: Sam -- this is Harvey Sachs again. I will apologize if that language is actually in either the RFI or in this proposed test method. I did not find it, and I feel I might have wasted an entire rant earlier this morning. So this needs to be -- if this is your intent, it needs to be very clear, because I think I'm not the only one in this room who misunderstood what you were

planning to do. As I read it in the RFI, it was the motor, the impeller, and the shroud around it. And I found no other definitions of the scope of this test method.

MR. JASINSKI: When you refer to the RFI, are you talking about the framework document?

MR. SACHS: Framework document, I'm sorry. This is the -- I think I'll stop.

MR. JASINSKI: Just the --

MR. BROOKMAN: Well, Harvey --

MR. JASINSKI: Go ahead, Doug.

MR. BROOKMAN: No, you go ahead, Sam.

MR. JASINSKI: Just kind of a distinction. In the definitions that are provided in the framework document -- the framework document is largely intended as a kickoff for the energy conservation standard, and we happy to use the framework document a little bit differently for furnace fans, because, as Mohammed stated, this is s somewhat unique rulemaking in that there are no established test procedures and there's no current standard. So the test procedure section and discussion in the framework was beefed up a lot because we wanted to use it as an opportunity to get some preliminary feedback in regard to the test

methods. So I'll just say that in definitions in the framework document, those definitions and Harvey keeps referring to the specific components that were listed as typically part of a fan, the intention of that definition versus the Scope of Applicability of the test procedure are -- they serve somewhat different purposes.

MR. SACHS: I'm sorry -- this is Harvey Sachs again. I've just leafed through the test method again. There is no diagram that would help me understand what you meant. There is no definition. And you have asked this community, including the manufacturers, to invest a great deal of time to think about what y'all might have been thinking about. I'm sorry, but it's disappointing.

MR. JASINSKI: If we can -- if I can find that specific language I'll forward that to Harvey after the meeting, and if it's not there, then I apologize for the misunderstanding.

MR. BROOKMAN: I'm trying to get as much understanding on the record, you know, sort of in a coherent fashion here. So what I think I'm interpreting, Sam's description using this figure in PowerPoint slide 19 of the fan being integral or part of the entire unit, that description I thought

that that was going to address some of the concerns we heard earlier. Charlie?

MR. STEPHENS: My interpretation of what I've heard just in the last few minutes is that DOE is proposing to regulate furnace fans but test air handlers. If they're proposing to test air handlers, I would suggest that the testing of air handlers is a lot more complicated than what's in this diagram. I mean you have to start specifying what appertances are now in the air stream in the air handler, among other things, and you start getting into things like cabinet leakage and all kinds of other things that DOE has said they don't want to deal with.

So I don't know how you can propose to regulate a fan and test an air handler. That's a little bit beyond me.

MR. BROOKMAN: Okay. Thank you. Do you have anything else at this point?

MR. JASINSKI: No, just to go back to --

MR. BROOKMAN: The comment box?

MR. JASINSKI: -- yes, the comment box.

MR. BROOKMAN: To the comment box. Do that. Because the Department still seeks additional comment -- Frank Stanonik.

MR. STANONIK: Frank Stanonik, AHRI, sorry I was a little late. Following up on Harvey's comment, I mean, yeah, it would have been nice to have this diagram but for some of us that are still trying to sort out exactly what's being proposed here, I would suggest that maybe we need a diagram of how you would make these measurements on the furnace. Yeah, this is all well and good, but if we're going to something like this on the furnace, you know, there's plenty of diagrams already in ASHRAE 103. I think, you know, DOE, if they're going to show a diagram of where these measurements would be taken and everything else, then we wouldn't have to guess about things.

MR. JASINSKI: Just as a quick follow up maybe to some of the industry participants can help me out. Is that -- in comments and in subsequent discussions, DOE learned that a lot of manufacturers use setups that are very similar to this. So if there's a manufacturer that uses a setup that's very similar to this, maybe in their written comment or even in a follow up comment here, maybe they can provide maybe some specific questions as to what's confusing. Because DOE found that manufacturers and industry participants and in also studies that were

conducted by industry participants that aren't manufacturers, that these are methods that were being used specifically to test setup. So maybe someone that has had experience with testing like this, which DOE did conduct some testing, so this is the setup that we used and there didn't seem to be this type of confusion. We were under the impression that we were using very similar methods to what was being used in industry to develop the performance tables that can be found in a lot of product literature. Maybe they can explain how what they're doing is different than this diagram.

MR. BROOKMAN: Yes, Roy.

MR. ROY: Aniruddh Roy with AHRI. I want to echo what Jim Vershaw and Greg Wagner said with respect to the ANSI/AMCA standard 51 -- I'm sorry the ASHRAE 51 and also the ASHRAE standard 37. It all comes down again, to the scope, how the scope has been interpreted over here. With respect to central air conditioners and heat pumps, there are federal test procedure does reference ASHRAE 37 and so the external static pressure measurements by manufacturers are made using the ASHRAE 37 standard. Whereas now, just with AFUE and FER, we're now, for furnaces, manufacturers will have to use two

different static pressure measurements, even the central air conditioner and heat pump manufacturers will be subject to two different standards and two different external static pressure measurements. So we would encourage DOE to look into that a little further and we will submit comments on the differences in standard air and the ESPs that are referenced in 51 as well as ASHRAE 37.

MR. BROOKMAN: Okay.

MR. JASINSKI: As a follow up to that, I'd also ask that in the written comments, referring to my earlier request, that you also provide -- it sounds to me like Jim Vershaw said that there are a lot of similarities between the actual equipment and test setups that are used in 37 and 210, and while Roy brings up good points about their being differences in how you adjust for standard air and the external static pressures, if you could also provide information about how maybe the test setups in ANSI/AMCA 210 vary from what's being used as specified in ASHRAE 37, as it pertains to specific equipment, placement of the sensors, all those sorts of things, because it's important to understand also that the preliminary analysis that's in progress is based upon the proposed test procedure that we have

here. So if there are differences in the test setups between ASHRAE 37 and ANSI/AMCA 210, and those differences might result in differences in the values of ESP and air flow performance that are provided in product literature, it's important for DOE to understand why those values might be different. And if they're not, we also need to know that they're not different. And that was really the driving motivation behind this question, is to understand whether or not the values of ESP and air flow performance that are provided in product literature are different than what would result from ANSI/AMCA 210.

I think I remember specifically some comments saying that the actual values that you measure using the two different test setups would not be different.

MR. BROOKMAN: Greg.

MR. WAGNER: I will just comment that AMCA 210 again is designed for testing fans. It's not for appliances. It does have a different test methodology. The way that standard air is corrected for is different than ASHRAE 37, and the output will be different, so literature will be different than what you're looking for. Again, AMCA 210 is a fan

industry standard for fans, separate from appliances.

MR. BROOKMAN: Okay. Jim Vershaw wishes to comment. Jim, please get close to the microphone on your machine and speak loudly.

MR. VERSHAW: Okay. I'm on a cell phone and --

MR. BROOKMAN: It's coming through. Yes, that's better now, just speak loudly.

MR. VERSHAW: Okay. I'm going to reiterate that 37 is correct. If you look at the figure that's on the screen, 37 doesn't include the PF7 measurement, that measurement is made closer to the unit, that's the way it's done in 103 for the test standard for furnaces. That's the way it's done in the … calculation, and we do not measure velocity pressures because fundamentally you have … but they cancel out so there's no need for it, and that's where the key difference is, as well as the correction factors on the air. I think we did it the other day, about half a percent difference in air flow which … that up when you start doing enforcement on this. … look at, because the nozzles and everything to the right are all the same, but it's the high external static pressure and

high stressed air flow, high … unit which is key here and that's what we want to be doing the same we have to be doing for all other regulations. Thank you.

MR. BROOKMAN: Okay. Thank you.

MR. JASINSKI: Thank you. That was sort of what I was getting at, is comparing the test setups, so more comments like that in written comments would be very much appreciated.

MR. BROOKMAN: Are there any additional comments that you see there, issue box number 7, about the ANSI/AMCA 210-07 setups?

MR. JASINSKI: We're not quite there yet, even though this conversation --

MR. BROOKMAN: Sorry, I flashed forward.

MR. JASINSKI: That's okay. I just didn't want to provide more --

MR. BROOKMAN: We're talking about issue 8 which is on the previous slide --

MR. JASINSKI: One more clarification, and this is related to the second part of the request for comment, which is to provide feedback on the actual definition that's proposed, and just to provide a clarifying factor. A lot of -- some clarifying information -- a lot of the comments back

are referring to negligible velocity pressure, and I do just want to point out that -- or make sure to clarify that in DOE's proposed definition, we're also proposing a definition that excludes inlet velocity pressure, and I sort of provided some equations here above that describe, theoretically, how someone -- how one would calculate an external static pressure drop or static pressure difference. And then below that I provided equations that describe how the proposed definition in the NOPR, as well as the definition in AMCA 210, describe how to calculate this pressure -- a static pressure difference. And I've highlighted in red the inlet velocity pressure to show that that's excluded from both the proposed NOPR definition and the ANSI/AMCA 210 definition, which, if I'm hearing comments from interested parties correctly, that's accurate to describe how it's done -- how these measurements are taken currently, whether it be for ASHRAE 37 or ANSI/AMCA 210.

MR. BROOKMAN: Let's just let that slide sit for a moment. Those equations are not in the PowerPoint deck.

MR. JASINSKI: Oh, I apologize.

MR. KHAN: There's been some sort of --

Mohammed Khan, DOE. We certainly apologize for the, I guess, printer error here. I think if you go to our web page and pull this presentation up, you will definitely see all the terms to the equations there. So, as you think about it and develop your written comments, and want to refer back to this, please go to the web page and pull it up. Thanks.

MR. BROOKMAN: So now with these equations here, are there any additional comments before we move on? Do you have anything else?

MR. JASINSKI: Yes, the ultimate question, and whether someone wants to comment on this now, or at least provide it in written comment later, the ultimate question again is, there are a lot of terms being thrown around for the static pressure, but what's important to the Department of Energy is to pay attention to the definition that we provide and what that means for how these measurements were taken, and we want to make sure that that's appropriate, number one, and also if it isn't appropriate, why? And if it is appropriate, we also want to verify that the definition that we're proposing, regardless of what we want to call it, is consistent with how these measurements are -- the measurements that are published in product

literature. So those are the two main points. Is that we can call it something different if you'd like, but the definition, how DOE is understanding that these values are calculated and whether those are consistent with how it's done in the industry, those are the important aspects of this comment.

MR. BROOKMAN: Okay. We're about to move on. Final comments on issue box 8, on slide 18. Okay.

MR. JASINSKI: Thanks. And also, I think there's a lot of slides that have equations or things that may have gotten messed up when printing them, so if that's the case, just let me know so I can spend a little bit of extra time explaining them if you need to, because since you haven't had time to look at them previously.

So the next request for comment, which is closely related to the one we were just discussing, there was a lot of overlap, is that DOE recognizes that ANSI/AMCA 210 includes 16 different setup variations. DOE did not propose a specific variation in the proposed test procedure. DOE expects that the blow-through setups, such as the test setup in figure 12, which was the same figure that I showed in the previous slide may be more

appropriate than pull-through setups, like setup number 13, because the blow-through setup is more representative of how a typically HVAC installation.

So the request for comment, DOE would like some feedback on which of the ANSI/AMCA 210 setups are best suited for the types of testing that we are proposing, and if there are any that are inappropriate, whether they should specifically be excluded from use in the proposed test procedure. And this might be a good time to identify any that are as closely related -- are more closely related to ASHRAE 37 than others.

MR. BROOKMAN: Roy.

MR. ROY: We brought this issue up with our industry and it looks like as far as blow-through units are concerned, it might apply to non-weatherized gas furnaces, but in the case of weatherized and electric furnaces you do have some units where there is a pull-through. And so we were wondering how DOE, or whether DOE can provide some specific data and justification before any test setups are eliminated altogether from the final rule.

MR. JASINSKI: Provide specific data about?

MR. ROY: In the sense that -- in this case it looks like the blow-through is going to be the preference as far as the setup is concerned. But you have, obviously, in the industry, units that also do the pull-through. So how would we test for those?

MR. JASINSKI: That's what we're asking you. We would like to know if there are specific setups that are, you know, you say that there are both blow-through and pull-through. Is there a specific setup variation in ANSI/AMCA 210 that the industry prefers, or already uses for blow-through and a different one for pull-through? And if so, what are they? And explain why those specific ones are used. And if there are setups in -- if any of the 16 setups are inappropriate, we can explicitly exclude those also.

MR. BROOKMAN: Craig.

MR. MESSMER: Craig Messmer. I think the confusion is is that you're referring to something that you use when you test the fan through AMCA 210. When you do an air handler or furnace, it's a unit, it's an appliance. Where we put the fan inside of that box is up to us, depending on what kind of appliance it is. That determines whether it's blow-

through or pull-through. Test setup itself doesn't really take that into consideration, doesn't really care.

MR. JASINSKI: As a follow-on to that, maybe I should provide more clarification on what we mean by blow-through and pull-through. In this particular case, what I'm understanding Craig is saying is that he's looking at blow-through and pull-through in relation to where maybe the fan is within the product related to the heat exchanger and other things. When I refer -- when we refer to blow-through and pull-through here, we're talking about whether or not the fan is blowing air through the duct work and central system, or whether it's pulling it through that duct work or the central system.

MR. BROOKMAN: Craig.

MR. MESSMER: Okay, let me -- most air handlers do both. They have supply and return duct system, so it's hard to distinguish whether you're talking about a blow-through and pull-through system. For sure, the supply side usually has the higher static pressure, so a pressure drop. So if that's your consideration on a blow-through, then you would be accurate.

MR. BROOKMAN: Do existing test methods specify -- do they differentiate between blow-through and pull-through?

MR. MESSMER: No.

MR. BROOKMAN: They do not. Okay. Yes, Adam. No?

MR. CHRISTIANSEN: I think AMCA 210 usually just has a ducted inlet or a ducted outlet, and that's kind of how they prefer things. So instead of it being -- I don't remember their being a pull-through or a blow-through language. I could have missed it if --

MR. JASINSKI: I think there are certain setups where, I think in this case, the fan would be -- the setup would be reversed and the air flow would be reversed. That's what we mean by the pull-through. Okay.

MR. BROOKMAN: NO, Craig, talk to us. Confirmation is useful.

MR. MESSMER: I'm just going to agree with what you're saying. I believe you're talking about the test setup with the nozzles.

MR. JASINSKI: Yes.

MR. MESSMER: Okay. You're not talking about the unit itself, whether you want to test the

fan on the left side or --

MR. JASINSKI: Yes.

MR. MESSMER: -- the right side of the air nozzle chamber.-- the right side of the air nozzle chamber.

MR. JASINSKI: Yes, thank you. I'm sorry I wasn't more clear about that.

MR. MESSMER: That's what you're trying to say --

MR. JASINSKI: Yes.

MR. MESSMER: -- I would have to agree, from my experience, what you show on the slide there, which is in the AMCA 210 standard, that's where the drawing comes from, that's probably the most common setup.

MR. JASINSKI: Thank you.

MR. BROOKMAN: Okay.

MR. JASINSKI: Any other comments regarding the test setups?

MR. BROOKMAN: Yes, Roy.

MR. ROY: One clarification that we are seeking is with respect to the filters. Does DOE want the testing to be done with or without filters?

MR. JASINSKI: No, filters are included.

MR. BROOKMAN: Jim Vershaw, are you with

us, Jim? You're next.

MR. VERSHAW: Yes, this whole conversation is really moot in my point. I don't think any of the 16 setups are appropriate because they're not in ASHRAE 37. If you use ASHRAE 37 this is the issue, it's all defined how you setup the unit and how you run the test. Now, as far as filters go, a lot of furnaces are not shipped with filters, so what are you going to use for filters if you have to put the filters?

MR. JASINSKI: I'll make a clarification. The --

MR. BROOKMAN: Not yet.

MR. JASINSKI: Sorry.

MR. BROOKMAN: Not yet. He's making a very broad comment here and I want to see if anyone has follow on. In fact, Jim, I noticed you were nodding your head. I don't want to put you on the spot, not really.

MR. STANONIK: Frank Stanonik, AHRI. And again, I'm trying to catch up here and that's my difficulty. But also the lines of what Jim Vershaw was saying, and what Charlie Stephens said, yeah, I'm trying to -- I'm still trying to relate this to a furnace, and sitting here thinking I'm trying to

picture these residential installations that somewhere in the system I've got this fan drawing all the air through my duct system, and I'm having a hard time envisioning those, because again, I just keep taking -- I thought we were talking about a furnace rule, and most of the furnaces I know, they come with a fan and blower, and I think it's pushing the air through somewhere.

MR. BROOKMAN: So this is a broad conceptual point. Before we get to Sam's clarification, additional comments on that? Yes, Greg.

MR. WAGNER: Greg Wagner again. Yeah, I think what Jim Vershaw said, we're starting from the wrong standpoint. 210 doesn't apply to these appliances. So doesn't matter what figure you choose, should just go to a standard that applies to how you test a furnace.

MR. BROOKMAN: Now, Sam, you were going to clarify.

MR. JASINSKI: Sure. A couple. So to Frank's comment, I think Craig did a better job of explaining what I meant. I wasn't referring to furnaces that pull through air through the entire system. I was talking about, in relation to the

setup, whether the fan would be -- whether the furnace would be to the right or to the left. So, thank you, Craig, for that.

And then the other clarification I wanted to make is that, to Roy's comment, and also Jim mentioned that the filters being included. I misspoke when I meant that the test setup included a filter. I'll go -- later on in the presentation, I'll refer to how filters are incorporated, and actual physical filters, not necessary in the test setup, but filters -- the pressure drop across a filter will be included in the results of the test, based on where we set the reference system external static pressure. So the results will reflect performance as if a filter was present, but it doesn't need to be present -- it won't be present during the test of the unit.

MR. BROOKMAN: Terry.

MR. SMALL: Terry Small, Mortex. So Sam you're saying -- now I'm really confused. You're saying that if the product doesn't normally ship with a furnace, not to worry, it will be adjusted for that.

MR. JASINSKI: Filter.

MR. SMALL: If the product ships with a

filter -- I'm sorry, I meant filter -- then take the filter out before you test it, because it will be incorporated later in the calculations. Is that right?

MR. JASINSKI: Yes. And this might be a good opportunity to --

MR. SMALL: And you all will be sure in the enforcement phase to pull a filter out of there before you test it?

MR. JASINSKI: If I'm there, I'll make sure it's out.

MR. BROOKMAN: I'd like to make certain that in this meeting today, to the extent possible, everybody that's commenting can say what they think the Department should do, how they should address these issues. We're on that pathway some. I want to make sure we stay on that path. Additional comments on this series of issues? Okay. We're going to move on.

MR. JASINSKI: The final question, or request for comment regarding ANSI/AMCA 210 is related to barometric pressure specifications. DOE is aware that barometric pressure changes may have an impact on the test measurements, and DOE notes that ANSI/AMCA 210 standard does not appear to

include a correction for this effect. Well, it might be more appropriate to say that the language in ANSI/AMCA 210 is not strong enough to indicate that it's a requirement to adjust for standard air and therefore correct for any variations in barometric pressure.

So DOE requests comment on whether any limitations on the barometric pressure range, or any additional adjustments should be specified in ANSI/AMCA -- in the DOE proposed test procedure.

MR. BROOKMAN: Greg.

MR. WAGNER: AMCA 210 does clearly define standard air and does have a correction for barometric pressure. It is not an option. It is a requirement.

MR. JASINSKI: Okay. In Section 7.9, I think the language was something that air may be corrected for something, so there may be is where we're taking issue is that the question might be is it -- if it's a standard industry practice to correct for standard air, we want to verify that, and also in the proposed DOE test procedure, if that's an important part of the testing method, which we suspect it is, we want to make sure that we explicitly state it, or make that language stronger.

MR. WAGNER: Okay. It is in the standard -- it says it shall be --

MR. JASINSKI: Okay.

MR. WAGNER: -- it's not arbitrary that you do that, so it is written in that language. I have a copy of it here if you want --

MR. JASINSKI: Now this might be a good time to raise the question of what and how -- the impacts of the differences between how -- how you correct for standard air according to AMCA 210 versus ASHRAE 37, which, you know, if someone would like to provide an explanation now or just in written comment, that's something that sounds like will be important.

MR. WAGNER: I'll go again -- Greg Wagner again. AMCA 210 does a -- it treats the correction factor as a constant volume machine that you're pumping out a constant volume of air, and so it assumes that if you correct to standard density that you adjust it as if it's constant volume. The ASHRAE 37 corrects it as a constant mass flow equation, so it adjusts differently, so the two of them go in opposite directions, and so that may be why you see some differences between the numbers you've been looking at versus what you see in

published literature. Neither one of them are wrong. They're just differences on how it's done from a fan perspective, it should be treated as a constant volume device. From a stand alone appliance, it is power limited, it should be treated as a mass flow device, which is really what you're trying to figure out from a heat transfer standpoint in a furnace, air conditioner, et cetera, you want a mass flow …

MR. JASINSKI: Thank you.

MR. BROOKMAN: Thank you.

MR. JASINSKI: Yeah, I'd just like to point out that that's a model comment, because explanations like that really help us in, not only figuring out the appropriate way to do things, but also why they're being done. So comments that are detailed like that are very appreciated. Thank you, Greg. Any other comments regarding the barometric pressure adjustments?

MR. BROOKMAN: And particularly if there are any comments that have a different perspective. Nothing additional. Okay.

MR. JASINSKI: Thank you. So moving away from the active mode reference standard, I'll speak a little bit about the standby and off mode test

procedure. As was mentioned earlier, pursuant to EPCA, DOE is proposing to establish standby and off mode electrical energy consumption test methods. In this test procedure, however, DOE is already addressing standby and off mode electrical energy consumption in many products that are included in the Scope of Applicability. Those products generally fall into the category of residential furnaces, and residential CAC.

So this table here provides a brief summary of DOE's latest rulemaking activities. There are a lot more and there's a similar table in the actual notice that provides a lot more detail about the history of the rulemaking activities as they relate to standby and off mode for residential furnaces and CAC. However, DOE does not currently have test procedures or a standard that considers standby and off mode consumption for hydronic air handlers, so as a result, DOE is proposing to establish those methods in this test procedure.

MR. BROOKMAN: Terry.

MR. SMALL: Terry Small, Mortex. And maybe this was discussed in the framework, but that was two years ago, but I'm trying to understand. It seems to me, and correct me if I'm wrong, but the

standby and off mode was something that DOE was required to include, but only for those products that are in the scope that they covered, product classes. And I've yet to find where it says that hydronic air handlers are in a product class or ever even mentioned at all. So I guess what I'm trying to understand -- am I wrong, or is this something that it's not a product class but it's being made applicable to what we're talking about today? Maybe this is an authority thing. I don't know.

MR. BROOKMAN: Eric Stas.

MR. STAS: Eric Stas, DOE. I mean the EPCA requirements says that in any final rule for standards after July 1, 2010, the standards have to account for standby and off modes. So any product standards we're setting after that time -- if we're setting a product standard that includes the air handlers, there has to be standby and off accounted for.

MR. SMALL: Well, Eric, I'm wondering, though, I thought that pertained to the product classes that are being regulated. Or the product classes that are spelled out in the regulations that come before. See, hydronic air handlers, I don't believe have ever been considered. It's a different

beast, I believe, than anything that's ever been listed as a product class.

MR. JASINSKI: I'll just --

MR. SMALL: Maybe I'm wrong about that.

MR. JASINSKI: No, you're not wrong. I'll just remind everybody that the product classes are something that are established as part of the Energy Conservation Standard, which is a separate, but obviously very related rulemaking, which is being conducted simultaneously. And the preliminary analysis which will identify product classes is something that's being finalized now. So you're not wrong in saying that hydronic air handlers have never been identified as a product class, but that's something that will occur.

So to your question, though, I think is that hydronic air handlers are an example of something that meets the Scope of Applicability criteria that I outlined earlier, and it meets that criteria, but DOE does not have any current activities to set energy conservation standards or establish test procedures for standby and off mode for those products. So that's why they're singled out here.

MR. STAS: Eric Stas again. The specific

language of the statute says "any final rule establishing or advising a standard for a covered product," so that doesn't speak to a specific product class. So if we have authority to cover hydronic air handlers as a covered product at all, then they have to account for the standby.

MR. SMALL: So you all have the authority to cover the product. It just hasn't been covered before. And what I'm hearing is we're talking about the test procedure today, which could be applicable to this type of product, which isn't covered yet, but you all have the authority to -- and the Energy Conservation Standards you're also working on will add it to the list, in effect? Or am I just really confused?

MS. STAS: I think that's a pretty good statement. So we'll look forward to your written comments.

MR. SMALL: Okay. Thank you.

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Harvey Sachs, ACEEE. Going back to slide 8, I think part of our confusion which will ultimately have to be resolved by the theologians and lawyers is the first sub bullet under 42USC dah-dah-dah-dah. Standards for

electricity used for purposes of circulating air through ductwork hereinafter referred to as furnace fans. So the real question underlying Terry's concern goes back to whether furnace fan is shorthand for air handler, which we've suggested we think it is, and certainly not everyone agrees. But I certainly am getting the impression from Sam as constructed from his presentation this morning, that the Department's interpretation is that furnace fan equals air handler, including its … Thank you.

MR. BROOKMAN: Go ahead, Frank.

MR. STANONIK: Frank Stanonik. Just a quick follow up to that because I was just looking at the proposed definition of furnace fan, and as I read that definition, it says "electrically powered device used in residential central heating, ventilation and air conditioning systems for the purpose of circulating air through the ductwork." So if I had a device that was only an air conditioner, only an air conditioner, and the device that's moving the air through that product has now been defined as a furnace fan.

MR. BROOKMAN: That last comment was from Harvey, and now to Roy. And Jim, you're next in the queue after Roy.

MR. ROY: My name is Roy, AHRI. One thing we want to point out here is since we are discussing the various HVAC products that are covered by the scope of this NOPR, with respect to SEER and HSPF for air conditioners and heat pumps, they're already capturing the electrical consumption of the furnace fan, or the air handler. So how does DOE propose to take that into account, given that now the FER covers those products as well?

MR. JASINSKI: So just as a follow up to that, I think will apply both to Roy's question and a lot of the other comments that we're receiving, is to provide a little background on the approach that DOE took to determine the Scope of Applicability. The Scope of Applicability in this case is taken directly from the statutory language. So as everyone has pointed out, the statutory language is sufficiently broad to include a lot of products, and the statutory language sort of translates up -- I'll go back to slide 8 -- here. So that broad language is interpreted by DOE to -- in this resulting Scope of Applicability.

And the approach for the test procedure, as Mohammed explained, this is somewhat of a unique project because it's never -- it has never been

regulated by DOE before. In a typical rulemaking process, you have the luxury of having either an established -- previously established standard, or a previously established test procedure in which the scope of coverage and all these other issues are -- there's at least a framework for them. That's not the case here.

So the approach for the test procedure was to come up with a Scope of Applicability that was sufficiently broad so as to not predetermine which products would be covered in the energy conservation standard. So the issue of scope of coverage of the SEER and other cumulative regulatory burden, and things of that nature, will be brought up in the preliminary analysis of the energy conservation standard.

MR. BROOKMAN: Craig.

MR. MESSMER: Thank you for the slide -- number 22. You point out modular blowers -- we don't make gas furnaces, so I wasn't paying attention to that SNOPR last year. What does that mean, modular blowers?

MR. JASINSKI: Modular blower in this case is essentially a fan -- in a lot of these products, such as a gas furnace, or even a central air

conditioner, within that product there is the furnace fan or the air that circulates the air through the ductwork, and then the other components include heat exchangers, and things of that nature. A modular blower in this case just refers to a fan box, essentially, where the component is limited just to the circulation fan, which is designed to either stand alone or be paired with the coil -- a central air conditioner coil only unit.

MR. MESSMER: Craig Messmer again. Does that mean that it's not addressed in this rulemaking at all?

MR. JASINSKI: A modular blower that meets the criteria of the Scope of Applicability would be -- this test procedure could be applied to a modular lower that meets those criteria.

MR. MESSMER: Can you repeat that again? I'm sorry.

MR. JASINSKI: The short answer is this test procedure, yes, could be -- you could use this test procedure to rate the performance of modular blower.

MR. MESSMER: Okay. So this test procedure applies to modular blowers?

MR. JASINSKI: Yes.

MR. MESSMER: Thank you.

MR. BROOKMAN: Terry.

MR. SMALL: Sam, am I hearing --

MR. BROOKMAN: Just a second.

MR. JASINSKI: I think Eric wanted to --

MR. STAS: Eric Stas, DOE. I think the confusion might be here that this is talking specifically about the standby and off mode. All these things would be included in the standards, but the hydronic air handler is the only one that's needing a separate piece for the standby. Does that help?

MR. MESSMER: Yes, it clarifies that, although I would now make a recommendation that the standby losses be -- the modular blowers be put under the same standby loss measurement as the hydronic air handlers.

MR. BROOKMAN: Okay. Mohammed.

MR. MESSMER: Don't treat them separately.

MR. KHAN: Mohammed Khan, DOE. Can we go back to slide 13, Sam, please?

MR. JASINSKI: Sure.

MR. KHAN: And I appreciate your question and concern, and I understand why there might be -- well, I understand the basis of the question. And

on slide 13 at the top here, we indicate heat capacities of 225,000 and cooling capacities of 65,000, right. And as Sam already described what a modular air handler is, those seemingly would not apply.

And then we also talk about a CFM, which certainly would apply. So to answer your question, yeah, it's not just limited to the heating and cooling capacities, but also the air flow, volumetric capacity as well.

MR. BROOKMAN: Craig.

MR. MESSMER: Yes, Craig Messmer. Thank you. I think I'm clarified on the test procedure for the fan efficiency rating, or whatever that is. But this is -- to your point, this is about standby losses?

MR. JASINSKI: Yes, the slide that we were on, yes.

MR. MESSMER: Okay. It's being addressed in a separate rule? I apologize, I'm not familiar with that separate rule, so I'm just going to make a recommendation that you just put the modular blowers inside the same box as hydronic air handlers. I think it would be better.

MR. BROOKMAN: Okay. Jim Vershaw, thank

you for being patient. You're next.

MR. VERSHAW: Okay. Jim Vershaw, Ingersoll Rand. I've got a question about the definition of a hydronic air handler. I read in the Federal Register and I'm wondering if a heat pump air handler that has an accessory that instead of putting electric heat in, you could put in a hydronic coil, would then that classify as a hydronic air handler? Or would it only be a hydronic air handler when it has the accessory in it, or would it be a hydronic air handler at all?

MR. JASINSKI: I think I'll have to look at the exact definitions in the CFR, but I think that the hydronic air handler definition describes it as -- defines it as a furnace, so it includes the official definition of a furnace. And I believe in the CFR definition of a furnace, there's a -- the operative word is it's primary function is to provide heat through various methods, and I think it lists, you know, electrical furnace, oil, gas. So in this case, I, you know, this is a proposed rule, so it's something to consider, but the intent here was that a hydronic air handler would be defined as something where its primary source for heating would be the hot water source and the hydronic coils. So

in the case of the hypothetical product -- well, maybe not hypothetical -- the product that you're talking about, a heat pump that has an accessory, that accessory, I think, would disqualify it as being the primary source of heat unless maybe the heat capacity of the hydronic coil or the use of the hydronic coil was significantly -- designed to be used significantly more than the heat provided by the heat pump.

MR. BROOKMAN: Jim, what would you suggest that the Department do with the product you described?

MR. VERSHAW: I'm trying to get the definition in my mind before I come up with a conclusion on this.

MR. JASINSKI: Well, if you want to provide a suggested definition in your written comment, that would be very helpful.

MR. VERSHAW: Yeah, I'm going to reserve that to the written comments. However, if it is included, just to beat a dead horse, 37 is the way to go because we're already doing all the other tests under 37, not 51.

MR. BROOKMAN: Thank you. Charlie Stephens.

MR. STEPHENS: Charlie Stephens. I've actually specified and overseen the installation of a number of these products from a few manufacturers, and to follow up on Jim's comment. It's the same product in many cases that would have a heat pump coil in it, or would have backup electric strip heat in it, only in some cases, or a hydronic coil. But this is a test procedure discussion and I'm wondering how the Department will specify that that product be tested, given that they're proposing to test an air handler rather than a fan. If you were testing the fan, it would be fairly simple. Once you're testing an air handler, which of those coils should be in it when it's tested, or does the manufacturer have to test it with each of them in it, separately?

MR. BROOKMAN: Terry.

MR. SMALL: Terry Small, Mortex. Are you aware, Sam, there's a product for instance, under 65,000 BTU it would be, I guess considered an air handler. It would have an A coil, an A water coil. It would be for a four pipe application where, you know, in the winter you're running hot water through the coil, i.e., a hydronic. And in the summer, you're running chilled water through the coil.

Under 65, maybe in an apartment building. Is that covered by this?

MR. JASINSKI: That would be considered a hydronic air handler by meeting the criteria for the Scope of Applicability, and also the proposed definition of hydronic air handler.

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Sam, you may be right, but if I'm understanding Terry's description, it might also be considered commercial product as a terminal unit.

MR. JASINSKI: You're saying these are installed in residences or --

MR. SACHS: It was stated to be --

MR. SMALL: In multifamily or, you know, duplexes, quadplexes, I don't know.

MR. SACHS: But by the time we're talking about a chilled water source, it's a unit that's very uncommon in residential applications, and he's talking about a four-pipe installation with separate chilled water and heated water loops, and this -- it doesn't sound to me like a widespread residential product, but it's your product.

MR. SMALL: It would not be, but it seems to me that if we're testing -- if we've got some hydronic air handlers that do not have cooling coils

in them, but then if we've got some hydronic air handlers that have a circuitry in the coil that is also for chilled water, those will be highly penalized for your IFER calculation, because the other ones don't really have a cooling coil in place when they're tested.

MR. BROOKMAN: I saw Frank Stanonik. You're next. Pardon me, for the record, that was Terry Small just speaking, now Frank.

MR. STANONIK: I just had a -- Terry raised a very interesting question, and what no one has said is, so if you will, what is the machine that's providing either the hot water or the cold water -- the cooled water, whatever. I mean, again, for multifamily installation, and you have whatever you want to call it, a commercial sized piece of equipment, boiler or chiller or whatever, that's circulating the equipment, then I'm really puzzled why this rulemaking would address that unit.

MR. BROOKMAN: Terry.

MR. SMALL: Terry again. Sam, aren't you really saying when you say 65,000 BTUs, hopefully you're talking about the capacity of the overall system that is pumping the refrigerant or the chilled water -- I mean this could be -- I mean you

have a veritable refrigerant flow commercial system, which the individual cassettes are 12,000 BTUs, but the unit sitting on the outside is ten tons. So, maybe the definition needs to drill down into the fact that the machine that's actually, you know, sending the water, sending the refrigerant, whatever, that that's what the capacity limitation is based on.

MR. BROOKMAN: Charlie. Charlie Stephens.

MR. STEPHENS: Yeah, I mean at the very least you're going to have to sort this out. I mean the ones I specify typically, the hydronic air handlers are -- it's one coil, hot and chilled water in the same circuit. It's a heat pump based system. But it might be a two roll coil, it might be a four roll coil. Capacity might range anywhere from 16,000 to 48,000 BTU per hour. And the coil is different. It fits in a pretty standard product, variable speed air handler from some of the major manufacturers that you can put a hydronic coil in or you can put a refrigerant coil, or you can put electric strip heat. It's the same fan, but it's got different stuff in the cabinet and I'm just wondering how many variations of this thing do you have to test in order to characterize the energy

efficiency of the thing.

MR. BROOKMAN: Harvey, can you summarize what the Department should do?

MR. SACHS: I think the most important thing the Department could do is decide whether it's regulating furnace fans or air handlers, and then test accordingly. Because what I'm hearing here is kind of a mixture of things, and if you're going to test fans, I would use a different -- I would reference different test methods and I would use different test procedures than if I was going to test an air handler. What I've seen so far is incompletely specified.

MR. BROOKMAN: Frank Stanonik.

MR. STANONIK: A couple points. I'm going to tie into Charlie's but you had the slide up about the scope of coverage, and Andrew informs me we had made a very general statement at the beginning, and you were citing what the CFR has as far as scope of coverage. But our reading of the federal law is that all of these requirements were under the headings of standards for furnaces and boilers. And so we've got a real -- and we will provide comments to better delineate this -- but we've got a real concern that what DOE has seen as the scope of their

coverage is not consistent with the authority that Congress gave them. And so tying into Charlie's comment, I agree, you know, you need to decide what you're going to address here and if you are going to address air handlers, which at this point necessarily you have the authority to do, but if you are going to address air handlers, think about it this way. These other things about hydronic air handlers, what -- those are all heat exchangers. Those are basically heat exchangers. So if you're going to address the air handler and you're interested in what that furnace fan -- what that fan is doing, then figure out a procedure to simply measure what the fan, combination fan/motor is doing and account for the heat exchanges that might be in the box. But to interject here requirement for hydronic air handlers or modulars that you've never addressed before in any other rulemakings is, as I will say, as part of what is significantly complicating this rulemaking.

MR. BROOKMAN: Thanks, Frank. Craig.

MR. MESSMER: Not to complicate -- this is Craig Messmer. Not to complicate it further, but the definition in the publication says hydronic is for heating air ducts. What about cooling only?

The water coil? Is that still a hydronic system?

MR. BROOKMAN: Okay.

MR. JASINSKI: As a general follow on, in terms of how to define hydronic air handlers, my recollection is that during the framework public meeting, this was a product that was brought to DOE's attention from interested party comments. I believe it was from Charlie Stephens, actually, and there was some back and forth about the commercialization of these types of products and what the nature of these products were, during that public meeting. So there is -- in essence, I think that over the past couple of years they have, I guess, become more -- more variations have become commercialized. So it's important -- and not just for hydronic air handlers, but especially hydronic air handlers, because they are somewhat of a new application, it's important to provide information like Terry did, about the different variations that are available in your written comments if you can highlight specific models so that DOE can consider all these variations and their impact on what the definitions of these products should be, and how they should be considered in the rulemaking. That will be very helpful.

MR. BROOKMAN: Greg, want to comment?

MR. WAGNER: Yeah, I just want to go back to the scope thing. This is going beyond what was defined in the law. As the folks at AHRI said, 6295F.4.D clearly defines what this scope is covering, and it doesn't cover a lot of the things on your list here, including the things we're having discussions about. And that's very clearly written in the law, despite what I heard a lot of ambiguity, and your representation of what the definition says in today's meeting.

MR. BROOKMAN: Thank you. Let's move on to the next slide.

MR. JASINSKI: I actually had one more follow up question, Doug. Frank, you mentioned -- you sort of provided a little bit of a guideline as to the different approaches that DOE could take, and it reflects some of the things that other people are saying, and I'm just wondering if -- there was some confusion as to whether we're just testing the fan, or we're testing the entire HVAC product, whether it be a furnace, hydronic air handler, or whatever. Do -- it would be good to hear from interested parties whether they have input as to which one we should be doing. Should we just be testing the fans

themselves and providing a rating specifically for the fan, and not the -- not while it's installed in the HVAC product, which is similar, I think, to one of the approaches you addressed; or the approach that's proposed in the Notice of Proposed Rulemaking, albeit maybe not explicitly enough, that the unit be tested with the furnace fan integrated in the HVAC product as it is in the factory.

MR. BROOKMAN: Terry.

MR. SMALL: I think what's interesting is that motors, which everybody would know -- nobody puts a -- plugs in a motor and just lets the motor spin without a load on it, right. It wouldn't work, probably. So motors are definitely a component that go in a lot of other products, et cetera. Fans, blower housings, fan wheels, and the motor -- I think most of us would consider as a component. And on one hand you're advocating doing something for a modular blower, which is really -- I guess that would be a blower housing, a blower wheel and a motor, maybe with or without a piece of sheet metal around it -- that's kind of almost getting very close to a component. And then on the other hand, you're advocating products that are not even covered yet -- and they're all so different. I really

wonder, and I'm not going to commit myself to it, but I do wonder if we're all very interested in the efficiency of a motor as a component, and that's been an important part of the energy efficiency effort over the years, maybe we should just consider the fan-blower-motor and, you know, because I mean, obviously, the motors get applied into products, the fan assembly and all that can get applied into a product -- probably make your rulemaking easier.

MR. BROOKMAN: Harvey.

MR. SACHS: Harvey Sachs, ACEEE. The approach that we've recommended in the initial -- in response to the initial framework document, was to think about this as the virtual appliance. Our interest, as an efficiency community, is not in maximizing the testing burden, but in opening the paths for the most cost-effective ways to improve efficiency. One of these, as Terry has noted, is of course the selection of motor type. We think there are also opportunities in fans. But clearly the Department's own research has shown that another major effect is simply the impact of the aerodynamics of the cabinet as it interacts with the fan.

So it would like to have a system which

encourages what might be relatively low cost ways to capture efficiencies there. We recognize that there are issues in terms of manufacturers desire to be able to have the air come to that appliance, say a furnace, from below or either side. We don't know that this is an easy engineering problem, but that was what has influenced our thinking. And from that thinking, our proposal has been that the Department consider assigning sort of standard, internal pressure drops for components that might be size-dependent, capacity-dependent, but an allowance for testing with some sort of a default filter that's defined, some sort of a default heat exchanger, and a coil that are defined. With that information, those who wish to move to higher performance, such as the ACCA contractors and who wish to utilize the kind of data that AHRI is committed to releasing, on BIN performance, for example, will have the tools and the manufacturers will have the encouragement for innovation that may lead to capturing some low cost energy efficiency opportunities. This doesn't have to be perfect. It does have to be usable.

And we encourage the Department to think about things that do provide that balance and do give us numbers that can be used to reference

alternative heat exchangers, for example, that have minimum testing burden and maximum applicability. We're not seeing progress in that direction. Thank you.

MR. JASINSKI: Well, actually I just have one follow up for that, is that I wonder if any manufacturers or other industry participants have any thoughts on the method that Harvey just presented, which was to, if I'm understanding correctly, maybe test the fan outside of the HVAC product but have standardized values for the external static pressure drops that would be representative of heat exchangers and other internal components included in the reference system.

MR. SACHS: Sam -- this is Harvey. Sam, I believe that you have completely misinterpreted what I tried to say, and that may have been my fault as the transmitter. I am extremely interested in the aerodynamics of the cabinet. I cannot get to that by testing the fan in vitro, removed from the cabinet. I'm quite happy to think in terms of standard pressure drops for the components downstream which, for example, means you can test it with those in place or with those removed. But the goal of those who adopted this in legislative

language does not seem to me to allow the approach that you just described.

MR. JASINSKI: Okay. So I'm just trying to put your approach in maybe practical terms. So instead, testing the fan while it's integrated in the HVAC product, but maybe moving the pressure sensors so that you don't capture the actual pressure drop of internal components, and instead, add in representative values so that you capture aerodynamics but also the pressure drop of the heat exchanger and other internal components?

MR. SACHS: This is Harvey. I may not have looked at enough furnaces and other air handlers, but in the six inches between the exit from the centrifugal fan and the heat exchanger for the furnace, I don't know what magic I would have to use to settle the air enough to make a measurement.

MR. BROOKMAN: Craig.

MR. MESSMER: Harvey, we wish we had six inches between the blower and the furnace. So from your lips to manufacturers' ears. But that's another story, for another time. To address the issue, I guess a little bit of what Harvey's getting at, the fan really does need to be part of a system, and the effect of the system components upon the

performance of the fan is highly indicative of how its energy consumption is going to be. And removing and testing it individually, I don't know how you would get a good enough value to determine whether or not it's good for any application at all. It really does need to be part of the appliance. In fact, you know, later on we're going to get into how it's being tested, but it's also important to test it in a way that's consistent with the way it's being applied, and that is tied to its capacity and not just tied to just some arbitrary CFM or static point.

Air flow is challenging. Getting good pressure measurements is extremely difficult, and all the data that I've seen from the field, and I'll just say 30-some years of testing fans, I don't believe pressure measurements, just as a rule. Just because they're notoriously bad and you can't get good ones.

So back to, you know, how to test this thing. Should it be as a system? Should it be --- I guess I'd liken it to do we want to rate air conditioners on cars for their efficiency? We can get the maximum efficiency air conditioner in a car, but it might weigh 1000 pounds and all of a sudden

your gas mileage goes from 30 miles a gallon down to five or ten because you've got this huge, giant air conditioner. I don't care about that. As an energy consumer, we want to understand what is the energy consumption of the entire appliance as it goes in my house, to heat my house, to cool my house, and not what individual bits and parts are. And I think that's what we need to figure out how we tie that energy consumption back to what the intended purpose of this device is so we can get the most energy use value, if you will, for any given product line, which is what we're about here.

MR. BROOKMAN: Mohammed.

MR. KHAN: Mohammed Khan, DOE. I just want to revisit with Harvey. I certainly understand what you were trying to explain about potential low cost opportunities, other methods of approaching energy conservation, and with the design of the internal part of the -- the cabinet being made such that it's very less -- low restrictive to achieve a higher energy -- lower energy consumption. But I'm not so sure exactly how the DOE could actually regulate such a thing. And let me also mention -- it wouldn't really stop there. You could even look at where the furnace is actually installed, what

kind of pressure drops are in the HVAC -- the duct system of the home itself. How could you regulate that? Or how could you influence that? So I just don't know, you know, it is certainly something to consider, and if we were in a perfect world to really look at everything under the envelope that affects the energy consumption. But we're just not, and I'm just not sure at this point how it could even start the regulation of the efficiency of the restriction of these air cabinets.

MR. SACHS: Harvey Sachs, ACEEE. And I appreciate what you're saying, Mohammed. To some extent I have the luxury of living in a more idealized world, and I recognize that reducing some of my dreams to practice can be challenging. We certainly recognize that the Department's authority is limited to the box. I may be the only person in this room who's return plenum, at the furnace, includes turning vanes. Our community has been concerned about the rest of the system, and in parallel with this process here, we've been heavily involved in a range of other processes from the -- ranging from the ACCA quality installation protocol to looking carefully at things like leakage from the cabinet and looking at the air leakage requirements

for new duct systems under Title 24 in California.

We only ask that DOE regulate what DOE has the authority to regulate. We are in that, working with the assumption that we know it's wrong, that we're getting an essentially laminar flow coming into -- from that return plenum to the unit. But we also know that from that turbulent flow that we're getting right behind that, at best, L-bend, we still have the opportunities for much more efficient and much quieter operation if we can influence how that air is entering the circulating fan. We believe this has significant energy impact. This has been shown by research at National Lab you all have funded. And that the air handler regulation should do its best to unleash the inventive capabilities of the industry to capture those consumer benefits and national energy savings.

MR. BROOKMAN: Jim Vershaw, you're next in the queue.

MR. VERSHAW: Okay. Jim Vershaw, Ingersoll Rand. First a couple comments. First one is you've got to test the appliance. You cannot test the blower out by the appliance. If you go back to the 1900's and I was working on fans, I had a great fan system that worked great on a 51 tunnel,

but when I put it in the unit, it didn't work any better than the one that was already in there. You've really go to work on the appliance, that's what you're working with here. That's what you're dealing with.

In terms of energy efficiency and the industry, I guess I'm going to take a little bit of offense to Harvey. If you look at the products that are available at the companies, you're looking at SEER levels in the 20s. You're looking at AFUEs in the high 90s, pushing 96, 97, 98. You're seeing these motors more and more out there -- we have to deal with what the homeowner builders associations are putting out there, some of the ductwork, and I'm sorry that we can't do anything in that area, but the equipment we're putting out is there. It's for homebuilders and other people to see that it works, and I think we really need to put that focus on what are we trying to do with this energy descriptive we're trying to create here, and what is it going to do to help people buy equipment smartly. If we've already got a SEER and the furnace is tied in with a SEER and why are we measuring the air flow and coolant? I'm at a loss in this whole thing in that respect, so I think as we get farther into this,

I'll have some more comments in that area. Thanks.

MR. BROOKMAN: Okay. Thank you. Harvey's next.

MR. SACHS: Harvey Sachs. Thanks, Jim, and just a clarification, or an apology for my life, I guess. We certainly have enormous respect for the innovations that the industry has made in really, really impressed with all of the progress. And you could complain that we're sort of walking around the edges of field looking if there's any more grain to be plucked up, going back to biblical times. But I think that there is another element here, that there is a significant fraction of people that are abusing your equipment by using it in continuous circulation mode. There are very substantial differences that I believe industry people have suggested are about a half a SEER point between a typical PSC application and typical permanent mag application.

So we think it's legitimate for the Department to be thinking about this, but we certainly want to make it a reasonable thing, that maybe I could say it this way, gets 85 percent of the potential benefits with much less than half of the frightening test burden that might be envisioned by some.

MR. BROOKMAN: We're pretty much due for a break. I want to finish off one more issue before we go to break, so Sam, let's do this one next.

MR. JASINSKI: Sure. So just a recap before the back and forth, we were discussing establishing standby and off mode test procedures for hydronic air handlers or, you know, in the future just any product for which those modes are not already being addressed in other DOE rulemaking activities.

DOE finds that the electrical systems, i.e., components and controls of hydronic air handlers are similar to those found in furnaces, therefore DOE is proposing to incorporate and adopt the method specified in the DOE test procedure for residential furnaces and boilers to measure the standby and off mode electrical consumption of hydronic air handlers. And there's a CFR reference there so you can find the specific provision I'm talking about.

So DOE seeks comment on whether the assumption that the electrical systems are similar, whether that's an appropriate assumption, and depending on the feedback we get on that, if they are similar, is it appropriate to use the DOE

standby and off mode test procedure for residential furnaces to measure the electrical performance in those modes for hydronic air handlers or any other furnace fan that might not be addressed in other rulemakings?

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: Charlie Stephens. Based on our field data, I would suggest that I don't see anything inappropriate in using the same methodologies.

MR. BROOKMAN: Roy?

MR. ROY: One comment we have with respect with the IFER metric that has been proposed in this NOPR is that hydronic air handlers could be viable, I guess, replacements for furnaces. And so in the case of furnaces, now you have standby and off mode levels that are specified different, and then an FER level that is representing the furnace fan efficiency. So what we would recommend is to decouple the IFER metric for hydronic air handlers and have those standby and off mode represented separately so that they can be a similar comparison done across the products.

MR. BROOKMAN: Dave, you want to comment?

MR. WITTINGHAM: Yeah, I would agree with

-- this is Dave from Allied Air -- I would agree with that comment. I think ultimately if you have products that have similar functions with some include off cycle power, some don't, some have separate off cycle power descriptors that ultimately that could lead to a confusion to the consumer.

MR. BROOKMAN: Okay. Yes, Craig.

MR. MESSMER: Craig Messmer. I want to agree with the -- Aniruddh's comment. We need to have one FER, not two, for everything -- standby losses, make them separate, just like they are with fans.

MR. BROOKMAN: Okay. Additional comments? Let's take a break -- Harvey, go ahead.

MR. SACHS: Just one final note on the consumer as decision maker. And I go back to comments from industry and a decade ago, about how consumers use even information like SEER. And what we're seeing -- what we hope to see and think we're beginning to see, is the ability of contractors to use DOE information for upselling, for establishing the value of premium products for their customers. And this doesn't have to be a perfect descriptor, but it ought to be good relative descriptor, and we're not convinced that the descriptor suggested by

AHRI is the right one. We think a number will matter and will help in the dominant replacement market -- the market of more right now, I believe, will help establish the value of the premium product. And both save energy and improve profitability for everybody, and it's changed, so I hope we can keep that in mind as part of this.

MR. BROOKMAN: Okay. Let's take a break. Don't go anywhere quite this moment. It's now 11:15, we're going to resume at 11:30. It appears as though we're kind of halfway through the content, so maybe we will work -- we'll just see how it shakes out in terms of the content and how quickly we move, but as opposed to taking a break for lunch.

In addition, Brenda Edwards requests the following individuals supply a business card as you head out for the break, and that would be Gary Wagner, Dave Wittingham, Terry Small, Craig Messmer, and Rachelle Cocks, if you can get a business card to her and then she can get a copy of everything.

You know, there are restrooms on both ends of the hall. There's a coffee shop on the ground floor just directly below us on the opposite side of the hall. You must wear this badge while you're walking around in the Forrestal Building. We'll see

you back here at 11:30.

(Whereupon, at 11:15 a.m., the meeting was recessed for a 22 minute period.)

MR. BROOKMAN: Now that we're going to return to talking on the record. So we've had a very productive morning. We've covered a lot of ground, and we're going to proceed where we left off which is with Sam and we are on 25, correct?

MR. JASINSKI: Yes.

MR. BROOKMAN: Okay. Let's resume.

Fan Efficiency Rating, Methodology and Calculations

MR. JASINSKI: So I'll pick back up where we left off by providing an overview of the methodologies and the calculations used for the proposed rating metric, which is the Fan Efficiency Rating, or FER for short.

Just a general description. FER is the estimated annual electrical energy consumption normalized by two factors, one, the annual rated operating hours, and two, the air flow in the maximum air flow control setting in standard cubic feet per minute. An operative word in the first normalization factor is "rated." It's important to note that the annual rated operating hours will vary depending on the product, mainly on whether or not

the standby and off mode operating hours are considered. But I'll point that out again in the future.

The estimated annual electrical energy consumption is a weighted average of fan input power measured separately in multiple air flow control settings at different external static pressures.

So the three important components of the estimated electrical energy consumption are:

- The air flow control settings proposed to be rated, and those correspond to operation in cooling mode, heating mode, and constant circulation mode. Many of you are probably familiar with constant circulation, but for those that aren't, constant circulation here means the mode in which the delivered air is not necessarily conditioned, but it's more for the purpose of providing ventilation. No? Well, we can get --

MR. SACHS: Harvey Sachs, ACEEE. In my experience there are very few residential air handling systems that have outdoor air coming in to provide ventilation, and consequently I'm forced to infer that the circulation mode is predominantly

about air filtration. It may be a lot of involuntary infiltration that results from it, but it's not the design characteristic.

MR. JASINSKI: Okay. Thank you. Ventilation and filtration, then.

- So the second factor is the power and air flow measurements are taken at ESPs that are determined by a reference system that is meant to represent national average ductwork characteristics.
- And lastly, the input power is weighted by estimated national average operating hours for each rated air flow control setting which correspond to the three modes that I mentioned previously.

In the subsequent slides, I'll go into a lot more detail about each of these aspects of the rating metric.

Starting with the rated air flow control settings. Doe is aware that furnace fans typically have multiple air flow control settings, anywhere from two up to five and in some high efficiency units, air flow can be modulated. DOE expects that each air flow control setting is typically

designated to perform a specific function, which are the functions which I mentioned earlier - constant circulation, heating and cooling -- and that these designations typically follow the following rules in that the lowest settings are typically designated for constant circulation; the median settings are typically designated for heating operation; and the highest settings are typically designated for cooling.

So DOE investigated, knowing that there can be more than three air flow control settings, DOE investigated whether or not -- or the appropriate number of rated air flow control settings, and determined that rating furnace fans using three air flow control settings is adequate to capture efficiency improvements while hopefully minimizing burden to manufacturers. And this table here provides a summary of the proposed rating air flow control settings, depending on different product types. So a product that is designed for single stage heating, the lowest proposed rated setting would be the default constant circulation setting. The second proposed rating air flow control setting would be the default heat. And then the final one would be the maximum, which I have in

here in parentheses, like we said, is expected to be typically designated for cooling.

For a multi stage or modulating heat, the proposed air flow control settings are essentially the same except for the median proposed rated setting, which is typically designated for heating, DOE is proposing to specify that the rated air flow control setting be the default low heat setting.

And finally for heating only products, these are products that are not designed to be paired with any type of cooling, so they're meant to be implemented in systems that provide heat only. Their rated air control settings would be the default constant circulation, there would be no median rated air control setting, and DOE expects that the maximum would be designated for heating. So for heating only product, there would only be two rated air flow control settings.

And as a clarification, default air flow control setting here is meant to be an air flow control setting that can be achieved in a factory-set control configuration, i.e., no manual tampering with the control setting other than through an interface like a thermostat.

MR. BROOKMAN: Let's take a few comments

here. Craig.

MR. MESSMER: Are we missing the cooling only?

MR. JASINSKI: Cooling only?

MR. MESSMER: We talked about chilled water, hydronic fan furnaces -- just to mix up a few terms.

MR. JASINSKI: So it sounds like you're suggesting that there are products that are cooling only, so --

MR. MESSMER: There are.

MR. JASINSKI: What --

MR. MESSMER: There absolutely are. Maybe not in huge numbers, but we sell them. So we need to know what to do with them. And we also have our fan controls are easily adjustable in the field by the contractor. We don't really -- we have a default, but it's not based on anything, so what do we base it on?

MR. BROOKMAN: So you, the manufacturer, does not specify a default?

MR. MESSMER: Not for a hydronic fan furnace.

MR. BROOKMAN: Okay. Charlie Stephens.

MR. STEPHENS: I would agree, we see quite

a lot of hydronic floor heating systems with cooling only systems that are not -- there's no default in these things. It depends on the cooling load, and you basically take the product and you do like you would with anything else, you get the right coil and the right fan speed, and then you get the right amount of cooling. So, they're going in quite a lot -- that's how you have cooling with hydronic heating.

MR. BROOKMAN: Does this structure that the table that proposes a lowest rating, medium rated, and highest rated, does this make sense to do it this way? Should they do it another way? Go ahead, Craig, and I'm coming back to you, Harvey.

MR. MESSMER: Well, I hadn't really thought about it a whole lot, and I'll make some comments on it since you asked. But, it may be more appropriate to put it in terms of BTU requirements for hydronic systems, rather than air flow requirements. For example, the small box systems we operate regularly at much higher static pressures, so that's not a really good way to compare our system to a more conventionally ducted system. More appropriate way would be based on the BTU content of that system. Because if you look at it in that way,

our watts per BTU differences is not much different for the fan than it would be if you compared watts per CFM. So, perhaps BTU for hydronic systems would be a better way to do it.

I'm sure the gas furnaces would have the same similar issue. They have delta T's across their heat exchangers so that really sets the sir flows more than anything. So I don't know if I have an answer for you on this, but calling it maximum, calling it default, I think is going to be problematic for the industry to figure out what that is.

MR. BROOKMAN: You can imagine that DOE was hoping to create -- let me just speak here -- trying to create something that was kind of a sort of a universal character, something that would have -- applicable and not differentiated unit by unit. So you can imagine what they're trying to do here. Harvey.

MR. SACHS: Harvey Sachs, ACEEE. And I guess what concerns me, and it's in the context of Craig's comments and your comment just now, Doug, about universality. Is that over a decade ago, or about a decade ago, we started to worry about unintended consequences for niche products such as

small diameter, high velocity air conditioners. And the industry went through the process of developing an anti-loophole specification, and I think the test method is complete now as well, and adopted, for these products. They don't fit under this goal of the universal thing. And my concern is that this prior activity doesn't seem to have been acknowledged and the reasons for it don't seem to have been acknowledged in this effort to get this universal air handler test method. It may well be that for some products that are true niche products, that aren't going to take over the industry, that we have to make special accommodations so they can meet needs. The bed of Precustes (ph) doesn't work.

MR. BROOKMAN: Craig.

MR. MESSMER: Craig Messmer. To follow up with Harvey's -- we do have a separate test procedure for air conditioners and heat pumps. It would certainly be needed for fan furnaces as well. Higher static pressures, lower air volumes, whatever other characteristics we have. The difficulty, is how do you compare this type of product to something else, and that's really the -- what I'm driving at with the watts for the fans associated with the fan based on per BTU or KW output of the heater or the

cooling system, as opposed to watts per CFM, which would give us -- make it look worse for us when in fact, it is not.

MR. BROOKMAN: Greg.

MR. WAGNER: This gets to the question of some of the earlier suggestions by AHRI and others in the industry of tying the electrical consumption to the performance of the product itself. Because at the end of the day it does have to deliver a given amount of heating for a furnace-type product, and that's what this is about. Not CFM or some of these other derived, if you will. And so there was the proposal put forth to tie that together to avoid these kind of definitions and allow you to dovetail with what's already being done in terms of testing and evaluation of these products, and to use a similar standard that's already recognized by the DOE and others, and to then create an additional mechanism to evaluate the efficiency of performance of the fan system within that framework, rather than going and do some artificial kind of designation of trying to figure out what the CFM for a given unit is, which at the end of the day, people don't buy furnaces that are rated for CFM, they buy it for the heating capacity.

MR. BROOKMAN: Dave.

MR. WITTINGHAM: Just a question for clarification. I thought I understood you to say that the product would be tested as it was factory wired, and the controls -- there wouldn't be any field altering of those. And, you know, with our -- this outline for a typical gas furnace probably fits for most of those, but even if this is deemed to extend for air handlers or heat pump type products, there are variations that will only have one factory speed, and there may even be heating products that have only one factory speed. And there's probably ways that this calculation could be modified to allow for that. But those are in the market today and are in existence, and most heat pumps and heating and cooling in their primary operation will use the same speed for heating and cooling. And in a lot of instances those controls in those systems don't have a constant air circulation that's separate from the heating or cooling speed.

MR. BROOKMAN: Craig, you got some more?

MR. MESSMER: Well, in conversation with other manufacturers, for gas furnaces, sometimes the cooling air flows are lower because if it's in a northern climate, they may use a very small heat

exchanger there. I think in my perspective, we're kind of losing the point of energy for the house. Every house is uniquely different, the ductwork, the air handlers, the gas furnaces, and what I would think the Department would want is a tool for someone to just add them up, rather than try to have an efficiency rating that's based on some sort of average. Because, you know, in my house I may have one actual energy use, and that's really what's important to me, not really interested in rating. That way we could compare different, wildly different types of systems. Basically, add up all the fan watts plus the SEER watts, plus the EB and other energy metrics, add it up for each house. I have one.

MR. BROOKMAN: Charlie.

MR. STEPHENS: Charlie Stephens. We've got a bunch of data we'll provide to the Department on air handler energy use, external static pressure, and all the other metrics we want to know about air flows, by make and model of the equipment, and serial number if we really want to get into that far along, along with all the demographics and the house characteristics, including the heating loads and everything else. So -- but what we found, I can

tell you, because I've looked at some of the preliminary data -- and we've got about six months of data so far -- is that there is a marked difference in the electrical efficiency of delivering BTUs to all of these houses. You can get the right number of BTUs to these houses, two 80,000 BTU per hour furnaces, very nearly identical loads and external statics and yet one of them is a lot more efficient electrically than the other, you know, and I find the difference in the model number. And it's in the air handler, and, you know, same furnace section, different air handler.

So we are interested in that. We are interested in delivering those BTUs with as little electrical energy as we can. You know, I'm helping people plan. I'm helping 130-some utilities plan for the electrical loads in four states. We are interested in the electrical loads. So I want to know how we do this most efficiently, so I am interested in the individual metrics.

MR. BROOKMAN: Jim Vershaw has his hand raised. Jim, you're next.

MR. VERSHAW: Okay. Jim Vershaw, Ingersoll Rand. A lot of issues where. By bringing in cooling, it really comes down to this issue

because, you know, there are multiple tonnages you can hook up to a furnace, so if somebody's going to buy a furnace that's rated up to three tons, and is only going to put on two and a half ton, they're not going to use the same speed cap or cooling air as they are for the three ton. So the numbers they're looking at a furnace are not correct for their application.

A lot of the more efficient, newer furnaces with current magnet motors have maximum air flow on heating and not cooling. On a modulating furnace when you're running at that 35 or 40 percent of full load and you're going to use only lowest detap settings for the calculation, I'm wondering if there's some gamesmanship you could do where you'd only run -- that you run their -- it seems like there's opportunity to game the system by doing that. This is so broad, trying to do so much, we're really talking about furnace fan efficiency. It ought to be focused on the operation of the furnace fan and how it deals in heating.

MR. BROOKMAN: Thank you.

MR. JASINSKI: Just as a point of clarification. There's some questions going around and in these comments about exactly how these

specifications would be practically -- would be applied. And so we -- I don't think I can put it any better than how Doug framed it as trying to apply a universal set of specifications to account for these variations. In the Notice, for instance, this says default constant circulation. As I mentioned before, DOE expects that that's typically the lowest air flow control setting. If it's not, or if a unit doesn't have a default constant circulation setting, in the Notice it specifies that instead, the lowest air flow control setting would be used.

And conversely, on the other side of the spectrum, we're not -- DOE is not proposing to specify the default cooling setting, but the maximum setting. So in instances where a furnace is designed to be paired with a range of different air conditioning capacities, anywhere from one ton to five tons, for instance, the maximum air flow control setting which DOE would expect to be tied to the five ton setting would be one of the rated air flow control settings. So, this framework is intended to prevent gamesmanship, to use Jim Vershaw's terminology, so that it's not the default cooling, it's always the maximum. And in the case

where the default constant circulation is not the lowest that would be used, or it's not specified, it would be the lowest. So essentially, in most cases, you'll have the maximum speed air flow control setting, the lowest air flow control setting, and whatever the default heat or low heat setting is for multi-stage or modulating heat. So in cases where maybe the default constant circulation and the heat -- default heat setting are the same, then you would be rating in that one air flow control setting for that model.

Any other comments or questions? I hope that clarified it a little bit. Okay, so moving on to provide a little bit of context to the air flow control settings, this figure shows air flow and power consumption across a range of external static pressures for the different air flow control settings in a non-weatherized, non-condensing gas furnace that uses a four speed PSC motor. The solid curves at the top represent air flow versus external static pressure, and correspond to the primary Y axis on the left, and the dotted curves, at the bottom of the figure are input power consumption, and those correspond to the secondary Y axis on the right.

You'll notice that for this particular model there are four available air flow control settings. Based on the proposed specifications, the three that are in color would be selected. And if you see in the legend, based on the information that's provided in the product literature, the maximum air flow control setting is designated for cooling; the default heat air flow is the medium low setting there in red; and the default constant circulation air flow is in green, and that corresponds to the lowest air flow control setting. So this is an example of an actual model that meets the -- that validates the assumptions provided for the designation of air flow control settings to map to specific functions.

Another thing to note here is that you can see that the air flow and the electrical consumption -- I'm sorry.

MR. SACHS: Excuse me please. Harvey Sachs. The family of dotted curves is different from the family of solid curves, and what was the difference? That went by me too quickly.

MR. JASINSKI: The top curves are air flow, so that's a measurement of CFM versus external static pressure --

MR. BROOKMAN: The left axis.

MR. JASINSKI: Yes. And then the ones on the bottom are input electrical power.

MR. BROOKMAN: On the right axis.

MR. JASINSKI: Right.

MR. SACHS: Thank you.

MR. JASINSKI: Sure. And another point to take note of is that the colors correspond, and you can see that electrical power consumption reduces as you use lower air flow control settings. And DOE finds, in comparing data across a lot of different model, the same data, that the range of available air flow control settings or the difference between the highest and the lowest varies greatly, and also the magnitude of the reduction in electrical energy consumption as you move to lower air flow control settings is -- can be drastically different depending on the types of technology that are used.

So those are important factors in DOE's decision to propose a rating metric that's based on multiple air flow control settings as opposed to a single air flow control setting, which is typically specifying measurements in a single air flow control setting are characteristic of a lot of the proposed metrics that were mentioned in the opening

statements, like E-sub-b and also indicative of the methods that are proposed in some of the alternative reference standards that were mentioned, like AMCA 210-240.

So at this time DOE would like to request comment on the appropriateness of the proposed rating metric methodology, and the assumptions related to how air flow control settings are designated to provide specific functions, and then also how these designations are made for multi-stage products, or modulating products.

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Harvey Sachs, ACEEE. I think this is really a question for Eric and Mohammed, but I'm seeing the requirement for multiple air flow and power measurements and it seems to me the only way you can go. The question is, what will be certified? Each of those measurements, or the calculated FER? Because there's a very great difference in terms of the burden -- measurement burden for the manufacturers, depending on which way that's done. I think it has to be the single FER 'cause otherwise you're going down the multiple metrics path, much as I -- well, I'll stop there.

MR. KHAN: This is Mohammed Khan, DOE. As

Sam was describing, there is obviously a benefit and need to take the different values, but to come up with a value for regulation, all of that would be factored in. So would it be an average or just the FER, I think that's still open to consideration.

MR. SACHS: Okay, so the -- the assumption is that a manufacturer would not be in jeopardy of delisting or regulatory action if one of these values were in error, as long as there were compensating errors so the FER calculated was within your tolerance …

MR. KHAN: Mohammed Khan, DOE. That would seem to make very good sense.

MR. SACHS: Thank you.

MR. BROOKMAN: So you see the comment box. Let's see if we can get some specifics with respect to what's listed as issue one. Greg, it looks like you're almost ready. Roy, go ahead.

MR. ROY: Aniruddh Roy, AHRI. We'd like to again go on record stating that we feel the E-sub-b is more appropriate to rate the furnace fan efficiency. When we provided the proposal to DOE, we had to consider furnaces with single stage controls, two stage controls, as well as step modulating controls. And again, it comes down to

the scope definition, or the scope coverage point that we made earlier with respect to furnaces. But the reference system that's being discussed here, there could be cases where the rise range that is specified in the nameplate of furnace manufacturers could be beyond the rise range that is specified, and so it could cause safety concerns. I think either Dave Wittingham or Greg Wagner pointed this out earlier as well. So we urge DOE to consider that as far as this issue is concerned.

MR. BROOKMAN: Okay. Jim Vershaw, you're next.

MR. VERSHAW: This is Jim Vershaw, Ingersoll Rand. Back to my question about heating speed maximum being higher than the cooling speed. If I looked ahead, it looks like they're going to take the maximum air flow speed, multiply that by cooling hours. So if you have a heating speed that's higher than cooling speed, then you're multiplying the wrong numbers, and then that throws the whole calculation into some question as to the accuracy of it.

MR. BROOKMAN: Sam.

MR. JASINSKI: Yes, that's a very good point. If interested parties could provide

information regarding how prevalent the designation of the maximum setting for heating is, that would be appreciated. Again, the assumptions that we provide in terms of designated air flow control settings for specific functions are meant to represent the national average, or what is typically done. So if we get -- if DOE can get a sense of how significant that trend is in designating the maximum speed for heating settings, that is something that we definitely want to consider and want to account for. So if interested parties can provide information regarding that, that would be very helpful.

And on to his further point, that would also impact how the other calculations are considered.

MR. BROOKMAN: Harvey.

MR. SACHS: Harvey Sachs, ACEEE. I believe that our community will be very uncomfortable with consideration of E-sub-b as a replacement for what the Department is trying -- is groping towards proposing. At the risk of prolonging the discussion, E-sub-b was developed as a threshold mechanism for incentive programs that wanted to recognize efficient air handlers. For condensing furnaces only, it's not a bad

discriminator between ECM and PSC motored systems. I was unable to get a decent discriminator of that type when trying to analyze non-condensing furnaces. There was simply much more variability. And at this point, without a great deal more empirical data, I'm forced to conclude that this is an inappropriate metric for the Department's purposes, and that furthermore, any threshold metric, unless AHRI is proposing to extend it from just a two percent threshold to an actual value, will serve to discourage incremental innovations that would save energy, because there's only a single huge cliff to climb.

MR. BROOKMAN: And you're referring to E-sub-b?

MR. SACHS: I'm referring to the AHRI proposal of using E-sub-b instead of the kind of metric that DOE is proposing for which I may have different reservations.

MR. BROOKMAN: Charlie Stephens. Pardon me, Charlie, let's let AHRI respond. Roy.

MR. ROY: In defense to the E-sub-b metric, actually I think Harvey was alluding more to the little "e" metric, the bold, italicized little "e" metric.

MR. SACHS: Yes.

MR. ROY: Which is different from E-sub-b in the sense that that metric, in the numerator, it accounted for the furnace fan electrical consumption as well as other electrical consumption within the furnace. However, the industry took a look at that metric again and revised it substantially to remove other electrical consumption from the furnace, and only captured the furnace fan electrical efficiency.

MR. SACHS: But it's still a threshold value, or are you proposing to publish the actual value --

MR. ROY: No, we are not proposing any threshold value. It's just a ratio of the furnace fan efficiency over the total consumption, energy consumption of the furnace.

MR. SACHS: I certainly look -- Harvey Sachs again. I certainly look forward to looking at that and appreciate that you've addressed those issues.

MR. BROOKMAN: If I understand you Roy, you are providing essentially a rating?

MR. ROY: This was a proposal that we submitted because we were aware of the furnace fan rulemaking

MR. BROOKMAN: Which would supply a rating.

MR. ROY: Right.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: Charlie Stephens. This sort of -- it's a good introduction to what I was going to have to say, because I don't -- where I live, we don't pay much attention to those annual numbers. The consumption number, and therefore the percentage of a consumption number doesn't mean anything much to us either. The variability of that number where I live is just too great. You know, we work all the way from 3000 degree days to over 9000. And it's just -- those numbers don't mean anything. And in fact, I'm having to look at this particular procedure as a way to rate a product, but I can't say that I've seen any usefulness or utility coming out of this rating that would help me understand what any given product would use in the way of energy. All it does is, in theory, allow us to compare one product against another on some sort of close to apples-to-apples basis. But I don't think it's going to deliver a metric that's going to be useful to me in terms of understanding the energy consumption of the product. And so I have no

expectation of that.

MR. BROOKMAN: Yes, Dave.

MR. WITTINGHAM: This is Dave Wittingham with Allied Air. First of all, I just would like to comment on your chart. The chart is showing characteristics that are typical of a PSC application, where you have a constant air volume, variable speed, more highly efficient system those curves would look significantly different, where the top lines would look flat and the watts would actually be going in the opposite direction that you show. And kind of the thought process behind that in this type of application, you may be penalizing the more efficient products. That's kind of point one.

Point two is you're taking nine points of data and then doing a curve fit, and it's a very cumbersome, labor intensive, and resource intensive process that would require a completely different setup from the typical AFUE testing that is done for gas products. We would advocate that, you know, E-sub-b is something that comes easily out of the AFUE testing, that we would highly encourage the Department to look at. Whatever the metric is decided, is to have something that is easily

accomplished within those test setups without forcing an additional test setup.

Yes, manufacturers do air flow testing, but we don't typically run two or three or four models to get the type of statistical data that would be required to develop a rating, and this would be a significant additional burden.

MR. BROOKMAN: Thank you. Terry.

MR. SMALL: Well, I think that we've all understood that the consumer of this type of information is Charlie, and Charlie is sitting here telling us that he's not seeing anything that is worth consuming, and Dave is saying that it is going to be a massive burden on the industry. Dave's with a big company, it would be catastrophic for a little company. So what are we doing here?

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: I didn't say nothing was useful, I just said that I have no expectation that an energy use number is useful. But I do find apples-to-apples comparisons useful, if I believe that they're truly that. I don't know that we can get there or not. We're working on it.

MR. BROOKMAN: You're talking about the consumer.

MR. STEPHENS: Well, the consumer -- the consumer almost never sees this stuff. The consumer is -- yeah, incentive programs, contractors who want to sell something or another, and explain to a consumer what it is they're selling relative to -- that costs more than this other one that costs less, you know, the consumer ultimately will see ratings of some kind, and that's useful, and we can teach them to understand what they mean, and we are. But ultimately, we're trying to understand, in our climate where I live, with this product, a reasonable estimate of how much electricity it's going to use in doing its job annually. I would like to know that number, but this is one of those cases that when you average everything, you get a number that applies to less than one percent of the installations, and it's just not useful. What I need is a rating tool that allows me to then adjust that and maybe a disclosure of some data from the testing that allows me to pick which points are relative to where I live, and come up with my own number. That would be useful.

MR. BROOKMAN: Greg.

MR. WAGNER: I was just going to say, Charlie, you just touched on one of the challenges

with doing what's being done here, and that is aggregating across the US all these different things to try to put together some kind of single metric that allows you to say this is the energy consumption of this product. And so it addresses the issue of nobody, as Charlie was just saying, in terms of being able to give them exact performance and mileage that they're going to expect.

But taking it away and putting it into CFM and these other things, takes it an even further step away from you being able to understand what it means in any installation application, and that is what typically is done is figuring out what is that heat load which goes into the number, heating degree, cooling degree days that you put into your calculations to generate the number of hours used. And removing -- separating the performance of the fan from the performance of the furnace is creating this two different metric system, but then even a consumer is going to have difficulty understanding how do I value the fan performance versus the furnace performance, because they are going to be two separate things, and not necessarily as one of my colleagues here mentioned, not necessarily along a rating line where this thing could be safely

operated. So it's taking it multiple levels away from getting back to what Charlie was wanting, to be able to specify the right product for your application in the field.

So it sounds like it's not serving a whole lot of functions versus if we can get something that is tied to performance and capacity of the unit, we can get something ultimately that enables people to supply it appropriately and put together an energy descriptor that allows you to measure it, rate it appropriately, and give the consumer something they can use.

MR. BROOKMAN: Craig.

MR. MESSMER: As I'm listening to everybody, this is Craig Messmer, I'm wondering about some advanced technologies that are starting to pop up out there where the air flow varies with temperature in the room, so there is no high, medium, or low speed. The unit continuously varies itself. What do we do there? Now you need a BIN analysis for the house application, or the average house, which doesn't exist, but it's nice. So that's a technology that is maybe up and coming, it's not even considered. It's not an ECM, it's not a -- well, the motor might be, but the control

scheme is different, it's not set by discrete speeds or CFM. So how do we handle that one? That's a question. I don't have an answer.

MR. BROOKMAN: Additional comments on this series of issues?

MR. JASINSKI: I have a couple of follow up questions. Dave, you mentioned that the curves for a higher efficiency unit would be very different and we agree. Unfortunately, I don't have a similar figure to put up here for everyone to see, but just to reiterate, Dave said that the air flow curves would look more straight, meaning that at higher external static pressures, a higher efficiency motor would be providing a constant volume of air, so it would be achieving a higher air flow at higher external static pressures, and as a result, because it was able to maintain the air flow at those higher external static pressures, the electrical consumption curve would go up because it would need more power to provide that constant volume of air.

So, in an attempt to account for that in this metric, that was one of the reasons why we normalized by air flow in the maximum control setting so that if you were normalizing say for this particular fan, the maximum's going to be about 1050

at the reference systems being proposed, whereas if you were doing this for a higher efficiency one, that curve would look flat and that air flow might be somewhere closer to 1300 or maybe even at 1400. So if you could comment maybe on -- I don't know if you've looked at it closely enough -- whether or not normalizing by air flow in the maximum control setting sort of avoids that issue of penalizing higher efficiency motors.

MR. WITTINGHAM: This is Dave from Allied Air. We have looked at it. There's more study that needs to be done around that to really understand if that holds true.

MR. JASINSKI: Okay. Yeah, if you could provide whatever you find, that would be very helpful.

And then another point was, Dave also brought up the issue of when you're taking the data and the burden or the changes to the setup that that would require as opposed to what they currently do now, whether you want to do it now or provide it in your written comment, if you could just explain where those burdens come in because I guess a way to look at this would be, there's the burden of actually taking the measurements, and then there's

the burden of what you do once you have those measurements. So -- you were speaking more to what you do once you have the numbers, which are calculations and creating these quadratic curves, so if you could explain how -- explain or provide an estimate of the magnitude of that burden maybe in terms of cost or time or systems or equipment that you would need to do that, that would be helpful.

MR. WITTINGHAM: Actually my comments were around the actual generation of the actual test points.

MR. JASINSKI: Okay.

MR. WITTINGHAM: You know, I am assuming -- and we've already done some work around here -- that you could take, once you have the data, you can put it into a calculation relatively simply. Yes, there is some up front work that needs to be done, and it's time consuming, but that's not -- and every time that you run it, the resource effort or the time and the cost that's involved with the setup and the running of the test, which in our estimation is almost a shift's worth of work for one model.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: I'll just add one thing about the fact that I do this already with a

different air handling product. I do it every day. It's called an HRV, and if you look in the HVI directory in Section 3, you'll see that those products have been tested in at least four different external static points, and they show the power consumption at those four points, and the air flow at those points, and all I have to do is decide what my target external static is or what I think he external static is going to be and I can figure out how much energy that thing's going to use for as many hours as it's running. Throw in the hours that I expect to run it, and I have an answer for how much energy I'm going to use to do ventilation. It's really not that hard. C439, you know, delivers those numbers, and all the manufacturers test to those things, and I find it very useful. Every day.

MR. BROOKMAN: Terry.

MR. SMALL: So Charlie, you already have it, basically.

MR. STEPHENS: The Canadians do, in C439, and those things are tested and it's in a directory that I can use. Yeah. But it's not for air handlers.

MR. SMALL: None of the equipment manufactured in Canada is typically manufactured

here, so --

MR. STEPHENS: A lot of it is manufactured here, and a lot of it is manufactured in Europe and other places. But I mean, the fact is, they're all testing to a test method that gives me the metrics that we're talking about here: air flow, energy consumption, external static, ducts.

MR. SMALL: So you want the multiple metrics and not the single value?

MR. STEPHENS: Well, if they come out of the test procedure, then I can figure out the energy consumption from my application. It may not be the rating. These things are rated differently. They're rated by apparent sensible effectiveness, or sensible recovery efficiency. But I have the tools I need to figure out how much electricity they're going to use and whether they're going to use more than they say. The range is like point three watts per CFM up to two watts per CFM, so it kind of matters.

MR. BROOKMAN: Any other comments on this? Yes, Craig.

MR. MESSMER: Is it appropriate to talk about tolerances in this slide, or are we going to talk about that later?

MR. JASINSKI: Later we're going to talk about sampling plan criteria, and that will probably be more applicable to that conversation. But I'll remember that you want to talk about it, so if it doesn't come up, then --

MR. MESSMER: Well, it will.

MR. JASINSKI: And if it relates more to measurements of air flow, then sure it's relevant, always.

MR. BROOKMAN: I was -- well, where did you think tolerance fits in this?

MR. MESSMER: The fan curves, the blue lines, the red line, solid lines -- all the lines up there. You have three points, but there is a scatter, of course, so how big is that scatter. Could be very significant in some cases. So we have to factor that in somewhere, especially if you're going to have a fan rating. And more to Charlie's point, I agree, if we just -- our catalogues give you CFM versus watts, and static pressure fan curve -- anybody can look at the fan curve and figure out what the energy consumption for that application is. I think most manufacturers already do that. So I'm not sure what a rating point is going to help, because you cannot compare two systems and two very

dissimilar hydronic air handlers versus gas furnaces, versus gas/electric, somebody's going to come up looking bad when in fact they may be the best solution for that house.

MR. BROOKMAN: Okay?

MR. JASINSKI: Yes, thank you. So sort of related to what Craig was saying is that you see in that figure that there's a wide range of operation, but not that entire range is not always necessarily relevant. So, for instance, in the maximum control setting, operating at zero external static pressure doesn't probably occur that often in the field. So in order to identify the parts of the points of operation that are relevant, DOE proposes to use a reference system. And the reference system represents national average ductwork characteristics, which allows for comparison of fan performance across different operating -- common operating conditions across different products. And the reference system takes the form of a curve that relates the external static pressure to air flow, represented by Q in this equation, and the physical characteristics of the system, K, in this situation. So the physical characteristics of the system -- so a system in a field application would be the actual

home and the ductwork itself. In the context of testing, K here would describe the test setup.

And for this test procedure, DOE is proposing to define the reference system by a specified external static pressure value and the air flow delivered by the fan at that ESP value in the maximum air flow control setting. So here is just sort of a manipulation of that previous equation, showing what I'm describing and how the reference system is proposed by DOE.

So, in order to determine what an appropriate reference system value would be, DOE decided that it would be more appropriate to try to base the specified value on field operation. And while DOE shares the concerns that ductwork and things beyond DOE's control might attribute to improper use, DOE is limited in what it can regulate under the statutory language, and wants to provide a rating metric that is indicative of -- representative of field use.

So DOE followed the following methodology for determining what an appropriate representative ESP value or reference system ESP value would be. DOE compiled over 1300 field measurements of external static pressure in maximum air flow control

settings. During this work DOE identified four different types of installation as it pertains to reference systems:

- heating only units, which are units that are not designed to be paired with an external evaporator coil and don't an internal evaporator coil.
- Second, units with an internal evaporator coil. An example of these units might be weatherized gas furnaces where the condensing -- excuse me, the evaporator coil is internal to the system for cooling.
- Thirdly, units designed to be paired with an evaporator coil. These are units, as it says, are designed to be paired with an evaporator coil, but these evaporator coils are typically separate components and they are paired with them in the field, they are not shipped with the evaporator coil factory installed.
- And lastly, manufactured home units which anyone who's familiar with the furnace rulemaking, requires special consideration because of the space constraints and other separate codes that manufactured home units

have to meet which impact the expected external static pressure of systems installed in manufactured homes.

In going through this data, the third thing that DOE had to do was normalize the data for comparison, and in this case what I mean is that in certain reports some of the reports provided data that included the -- the ESP values included the evaporator coil pressure drop, some didn't. Also some included the filter pressure drop, and some didn't. So what DOE did was took the data and developed a value -- two values for each reported value, one that included the reported value for evaporator coils, and one that did not. And all of them included a pressure drop for the filter. So essentially what DOE did was took some of the studies which included estimations of evaporator coil pressure drop and filter pressure drop and determined a representative value for those pressure drops. And the reported value for an evaporator coil was point two inches water column, and the reported average pressure drop reported for an air filter was point two one (.21) inches water column.

So in this table, you can see the results of those studies where in single family homes, the

with coil external static pressure was around 0.73 inches water column, and without coil was 0.52. And in addition, for manufactured homes, it's much lower, at 0.37 for the with coil external static pressure, and 0.17 without. So the reason DOE determined two values was because not all -- one was because of the variation in the installation type, whether or not a unit has an internal evaporator coil, is designed to be paired with one.

And the fourth step, because not all units that are designed to be paired with an evaporator coil are actually paired with one in the field, DOE used EIA's RECS 2005 data to determine the percentage of furnaces or units that don't have an internal evaporator coil but are paired -- designed to be paired with one actually are in the field. And so the results of that are, 72.9 percent of non-weatherized gas and oil furnaces in single family households are paired with evaporator coils, and 50.2 percent of units designed to be paired with an evaporator coil are paired with an evaporator coil in manufactured home households.

So DOE then took these two values and did a weighted average to determine the reference system for units that are designed to be paired with an

internal evaporator coil. So you see here these are the same results, rounded to the nearest five-hundredths of an inch water column. So heating only units that are not designed to be paired with a coil, they assume the rounded value of the without coil for single family homes, which is point five inches water column. And remember, that this is in the maximum air flow control setting.

The units with an internal evaporator coil do not include the pressure drop in evaporator coil because that pressure drop is already accounted for in the results of the test based on the description on where the sensors are placed as I described earlier in the test setups. So that does not need to be accounted for in the reference system of external static pressure.

Units designed to be paired with an evaporator coil, as I explained, DOE did a weighted average using that RECS 2005 data to determine that a representative value for units designed to be paired with an evaporator coil would be 0.65 which uses the 72.9 percent weight for the with coil and then the remainder of without, and the result is 0.65 inches water column. And manufactured homes, 0.3.

MR. BROOKMAN: Craig.

MR. MESSMER: Craig Messmer. I feel obligated to point out that small duct systems operate at much higher static pressures than that. I'm sorry to say I don't have a field study, though, so is there any intention to do a field study on that?

MR. JASINSKI: Yes, we will collect any data that we can find, so if you can provide anecdotal --

MR. MESSMER: We can give you addresses.

MR. JASINSKI: -- data -- okay.

MR. MESSMER: Could you back up just one slide, though on that. I'm just a little confused why the coil -- with coil is a higher external static pressure, and without a coil it's less than. It doesn't make any sense to me.

MR. JASINSKI: So, in these cases, the with coil is -- the measurements were taken where the system was paired with an evaporator coil, and that evaporator coil pressure showed up in the field measurement. So essentially, I guess an example would be a furnace, if tested alone would probably be closer to the 0.5, but because it was paired with an evaporator coil, meaning the coil was present in

the furnace, which is a separate product and not indicative of how it ships from the factory, that is included.

MR. MESSMER: So is the coil part of the internal static pressure? Which column?

MR. JASINSKI: On the right. Internal static pressure -- this is external static pressure.

MR. MESSMER: Yeah.

MR. JASINSKI: I just want to make sure everyone else heard that.

MR. MESSMER: I'm just a little confused as to why when you have a coil as part of the product, you're external static pressure is going to be higher, which means better performing at the same CFM, right, better -- more capacity.

MR. JASINSKI: Maybe I'll go -- let me go back to that diagram, because it's easier I think, to understand what needs to be included in the external static pressure when you know where the pressure measurements are being taken. So, correct me if I'm wrong, but the question is why does the without coil -- why is the without coil external static pressure lower, and why is with higher.

MR. MESSMER: Yes.

MR. JASINSKI: So the external static

pressure, you can think of it as the pressure that the test system is applying to the product being tested. So for units that are designed to be paired with a coil, they don't ship with that coil installed, so the external static pressure, or the pressure that's applied by the test system has to be higher to account for how that -- to account for that coil that's not present in the test system but will be in the field.

MR. MESSMER: Yeah, I get that part, but I --

MR. JASINSKI: Oh, then maybe I'm misunderstanding your question, I'm sorry.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: Yeah, I think -- let me see if I can get this right. Take a heat pump indoor unit that's got an indoor coil, you would apply point five inches outside to that because the point two inches, which they figured out for a coil, is internal to that unit already.

MR. MESSMER: Right, it would be.

MR. STEPHENS: And so they only have to apply point five inches to that. My -- I may have the same questions for them that you do, but I think what he's explaining is when you've got a furnace

that doesn't ship with a coil, then you add the coil to the external static applied by the system, the testing system, so that you get the same level of total static pressure.

MR. BROOKMAN: Craig.

MR. MESSMER: You are correct. The table, the average table is accurate. I'm just trying to correlate it to the table of the data. It doesn't make any sense to me -- what the results of this --

MR. JASINSKI: I understand. The results here show the adjusted values, and so these adjusted values have the representative pressure drops that I mentioned previously. So, for instance, depending on how the data was reported, the point two for the evaporator coil was added in if the data reported in a specific report did not include that pressure drop in the measurement.

MR. MESSMER: I'm okay with your final charts which -- the next one -- that's the only important one to me, the other one didn't. So we'll move -- I'll maybe sidebar later.

MR. JASINSKI: Yeah, sure.

MR. BROOKMAN: Dave.

MR. WITTINGHAM: Yeah, I just had a question around, you know, you've got the 1300

samples. How were those measurements made and was there any analysis about how those measurements would correlate to a lab-type setup that we're talking about through the standard you referenced, or ASHRAE 37?

MR. JASINSKI: Yes, so the -- these numbers come from various reports that date from as recently as 2010, I believe, back to some earlier papers that were in the late 90s. So most of these data points come from field measurements. And they were measured in accordance with AMCA 210.

MR. BROOKMAN: Jim Vershaw's next in the queue. Jim, go ahead.

MR. VERSHAW: Hello, Jim Vershaw, Ingersoll Rand. A couple of points. Number one, if I was going to pick a static pressure, I'd take point five, that's part of my residential, non-weatherized furnaces -- most of those, not all of them, have a point five maximum static pressure on the nameplate that we get our state certification around. So the point five would be the more logical place to go.

The second point would be the definition of a heating only unit for a residential, non-weatherized furnace, I don't think I've ever seen a

heating only unit, but I can envision -- but I can create all my furnaces to be heating only in that they'd only have cooling by relay, and therefore I can test them all at lower external statics, and I would eliminate that -- I would eliminate cooling from the whole thing. But if you have to go to cooling, I would eliminate the heating only. Thanks.

MR. BROOKMAN: Okay. Thank you. Greg.

MR. WAGNER: Greg Wagner --

MR. BROOKMAN: Is your mic turned on?

MR. WAGNER: I apologize. Greg Wagner. Regarding the studies, you mentioned 1300 analyzed, how was this standardized for validating capacity versus requirement in the field? It would be important to know how those relate because again, the capacity and the function of the device is going to vary depending on what the actual installation requirements are. So oversizing product will lead to much, much higher statics in the field.

The second thing is, and you started to mention a test standard. AMCA 210 is not applicable to that kind of a testing, and I doubt anybody has a full air test chamber that is large enough, enough diameter -- we're talking about probably a ten-foot

diameter for most of these to build a -- to be in concert with AMCA 210. So what test standard were these measurements done by? I mentioned earlier I don't believe static pressure measurements. This is from 30 years of experience in dealing with air flow. Static pressure measurements are notoriously bad and they're difficult to get in a laboratory environment. They're even worse to get in the field. So just that question, I'd like to understand that. You know, were these with filters, without filters? What was that filter condition? How were these things done?

Further on, you know, we're talking about adding to the testing burden by adding a secondary test point versus what's already required under DOE for testing of furnaces today. So it's arbitrarily adding another static point that's based upon data which, again, I'd like to understand where those points come from.

Then, finally, or not finally, but additionally, we're sending messages to installers that it's okay to do bad practices, that high static conditions are acceptable, that we should want to keep perpetuating that. That's not a good message. We're also losing the signaling effect and that is,

when a homeowner would buy this thing, and they're finding they're not getting the performance they need, they need to find out why it is. Well, if you're saying that you should be running with these high statics and they see that they're performance is mediocre, they're going to say, okay, it's what it calls for because that's what the rating system calls for. Rather than saying, now I'm capable of getting 30 miles per gallon out of my car, but I'm only getting 25, what the heck's going on here. We need to push things so people understand that there are appropriate ways of doing this, and they can benefit from that.

And then finally, we need to use this also as a way to verify out in the field, I think, that people are getting the product they want. And I think that's what I hear a lot of folks saying. How do we make sure that we're doing the right things in the field? And that's where tying these to what should be done, versus not what is currently done in terms of bad practice.

MR. BROOKMAN: Charlie Stephens.

MR. WAGNER: Charlie, could you wait until we hear what the database was?

MR. BROOKMAN: You want -- yeah, let's let

him respond.

MR. JASINSKI: Yes, because otherwise, I'm going to forget all five of those points. So just to talk about -- you mentioned that people aren't using the AMCA 210 setup in their homes to get these measurements. What I should revise what I said and mean that in looking at how the measurements were taken, the -- this goes back to the whole external static pressure discussion that we had, is that we tried to make sure that when they referred to external static pressure in these studies that theoretically they were the same types of pressure measurements that were specified in AMCA 210, you know, placement of the sensors -- that that data would be -- I mean you can't -- obviously, you can't take an AMCA 210 test setup into the field. I mean it is field data.

The second thing is that, well, related to that, all of the studies that were used, that we could make public, are included in the docket in PDF form, so I would encourage everyone that takes issue with the results or the methodology of gathering this information, to look at those studies and point out why some studies might be appropriate and some may not, or some of the limitations of how we can

use that data based on things, factors that Greg mentioned, such as this study doesn't mention whether or not the filters had just been changed or had it, or whether or not it's included. This was the methodology DOE used based on the data that it could find. If you have other data, better data, we would really appreciate that you submit that also.

MR. WAGNER: Greg again. AMCA 210 requires that you have good, fully developed flow to be able to get a pressure measurement. Or you have a large air test chamber that allows that flow to stabilize and create a reasonable expectation of good static pressure measurement. That's not possible in any of these field installations. So I guess my question is it's not to AMCA 210. I've read enough of them to know it's not to that. What standard are these to, because that is -- that's not apparent from any of these? And then how did they correct for temperature, barometric pressure, et cetera, to a standard condition? And then, finally, you have all the field effect things which are how are you comparing capacity to what the need of the dwelling is? Filter and other things. So it's not just the basic static pressure, but it's also those other attended variables as well. I don't know that

I'll have time to get through all however many, 1300 of those applications before the comp period's due in July 30th, but I think that onus should be upon the folks that are putting together this analysis to substantiate that those measurements comply with some known standard, not just arbitrary measurements that were made by different folks.

MR. JASINSKI: Alex is a little bit more familiar with some of these studies than I am, so maybe he can provide a little bit more insight as to some of the standards that may have been used.

MR. BROOKMAN: Let me make a process note. In a little bit we're going to break for lunch, kind of regardless of how far we advance at the moment. So, Alex, go ahead. Alex Lekov.

MR. LEKOV: Alex Lekov, LBNL. As mentioned, this is based on studies formerly published on Page 60 and 61 of this presentation. So some of the, or most of the studies are actually presented in public forums and conferences, and discussed. Detailed spread sheets are associated with almost every single one of them. Some of them have a lot of details in the reports themselves. And when the data was compiled, DOE's team actually did their best to create conditions to compare above

variables.

So, in terms of your statement, as part of formal comment, we could provide this assessment, why these studies are relevant. But this is actually a body of knowledge that has been collected by a lot of parties over the last probably 12 years.

MR. WAGNER: You're the expert to be able to tell me what standard they were done to? I mean, that's what I'm trying to find out. It's not clear from the papers.

MR. LEKOV: It's -- this is the way those measurements are done in the field. People measure the temperature differences appropriately. They -- most of the studies actually talk about the corrections, appropriately done. They list whether the system is with coil or not, with filter or not. So there are a lot of details. Studies come also with the raw data. We contacted most of the authors, discussed details when something was not specific. It's as all this could be and it basically those are all studies done the last 12 years.

MR. WAGNER: Understood. But I'm saying they're not necessarily done to any standard, if you will. Which standard?

MR. BROOKMAN: Charlie Stephen. Alex, and Greg, and now Charlie.

MR. STEPHENS: There are several people in here, you'll see there's usually about four different groups of people associated with this, and over the years many of them have actually developed the standards themselves. I have created the standards that are being used, and they're all using them. They may not be your standard, but this is field -- this is field measurement, and you get into the house and you do the best you can in most of these cases. The filter, I can tell you in our studies, the filter is not there because a true float plate meter is in that slot that's being used to measure the air flow. And so there's a lot of other -- there's a standard that's used, there's a protocol that's used that is consistent from study to study to study.

I won't represent to you that it's comparable to AMCA 210. There might have to be some adjustments made between the field protocols, but I will tell you that we will be delivering some new data that will allow you to also answer some of your other questions about the load of the house and the capacity of the system delivering it, and how

oversized it is, and if there is any correlation of that, we will be reporting in our data.

But we go to great lengths -- I fund an enormous amount of data collection out there, and I welcome to have anybody else spend the money that we spend and go out and get your own data if you don't like ours. But in the absence of better data, all of which is fully explained in the studies, exactly how it was done, exactly what corrections are made -- all of that's in the studies. If you want to challenge them, read them, and then come talk to me.

MR. WAGNER: Greg again. I have read it, a number of the studies, particularly the ones put out by Lawrence Berkeley, and they refer to Pigs (ph) and others, and I've looked at his studies as well. My point is only if there is a standard for measuring this, what is that? Is it published? Is it recognized by ANSI?

MR. STEPHENS: It's a protocol that's used in the field because, you know, this isn't a laboratory. You know, people's homes are not a laboratory, so that you can't use a standard, you use a protocol. There's a difference there. The protocol's a little looser, but the precision of the instruments is fairly consistent, that's specified.

Where the measurement are taken, the limitations of where the measurements are taken, they're all specified in the protocol.

MR. WAGNER: Well, accounting for static pressures in a not fully developed flow is very difficult, and I guess --

MR. STEPHENS: It is, and that's why there's some limitations on where you can take those measurements, and in some cases we don't actually get to take those measurements because we can't do that.

MR. BROOKMAN: Okay. Harvey.

MR. SACHS: Harvey Sachs, ACEEE. Greg, your concerns are very important. I'm a consumer of this information, not a generator of it. The underlying questions, I think, that you're trying to raise are whether the field protocols, which are certainly not consensus standards, are giving us biased data.

There's certainly distribution, but what we don't have real good control of for the obvious reasons, is whether there are systematic biases in the measurement protocol that's used. There are some systematic biases, but -- of which the most important may be that the reports I've reviewed have

been predominantly for attic-based equipment and distribution systems, tends to be newer houses and tends to be places where the distribution is attics. I suspect Charlie's got control with some -- with crawl spaces, at least, but we have much less for the stock of houses with basement based.

Nonetheless, the patterns appear to me to be very consistent. One if of substantially higher external static. Even in carefully controlled new houses in California -- a set of 100 that were done within the last few years -- substantially higher external static than -- twice as high or more -- than is reflected in the rate conditions under 210/240.

And the second thing is quite surprising that people have not been able to establish a strong correlation between unit capacity and external static of the duct system. These are the patterns that have been observed and that pattern of non-relationship between capacity and system ESP would seem to be one that would persist even if there were biases in the reported value. They were actually offset from some true ESP if we were able to measure that with well developed flows. So I hope that helps.

MR. BROOKMAN: That has given us something to thing about over lunch. I'm going to suggest we pause for lunch right now, even though we haven't completed the Fan Efficiency Rating.

It's now 12:55 and takes just about an hour to get -- if you don't leave campus, which I don't anybody leave campus because you won't get back and you'd have to go through security again. I would say that we've really done a deep dive on a few of these subjects today, and I know that's useful to the Department. We also need to make sure we get through all this material during the span of the rest of the day when we return from lunch.

So you must wear your badge in the building. And there's a big cafeteria, if you go down to the ground floor and go about 100 yards in that direction, a big cafeteria. You go up two flights of stairs, or two escalators, and we can all go en masse, if you'd like, but we will resume at 1:55, right here in this room.

Let me thank you, we've had a very constructive dialogue, we'll continue that when we resume from lunch.

(Whereupon, at 12:55 p.m., the meeting in the above captioned matter was adjourned for lunch

recess, to reconvene at 1:55 p.m.)

AFTERNOON SESSION

2:01 p.m.

MR. BROOKMAN: Let's start back up. So we covered a lot of ground this morning, and occasionally we dove deep into the little detour. We need to stay focused in the afternoon to make sure we get through all this content effectively. So I'm going to turn it back to Sam, and he's going to pick up where he left off.

MR. JASINSKI: Thanks. Unless anyone wants to comment further on the proposed reference systems, I'll move on.

MR. WITTINGHAM: This is Dave from Allied. Just one comment that the proposed control settings, there are a products that have stated limitations that are below those settings, and operating them at this range could lead to an unsafe or an unreliable condition. Thank you.

MR. BROOKMAN: Thank you. So the Department would love to see that data, it really would. Aniruddh.

MR. ROY: Aniruddh Roy, AHRI. I just want to summarize some of the points that have been brought up with respect to this reference system. We feel that with this proposal, DOE is condoning

field installation or practices that could be contrary to what are specified in manufacturers' instruction manuals, as well as maybe even ignoring the poor ductwork that could be in some of the field data. That was investigated in the course of determining these values, so we feel that as far as reference systems are concerned, it should be limited to a performance comparison between products, and not field values.

MR. BROOKMAN: Thank you. Additional comments? Yes, Harvey.

MR. SACHS: Harvey Sachs, ACEEE. We've been going through this question of the appropriate external statics a couple of decades now. It's not an easy one, but I'm struck by the fact that the vast majority of air conditioner sales now, and for the foreseeable future, will be for retrofits and replacements. They're not for new construction. I've had ductwork modifications done to get my turning things, and things like that. I've tried to run the numbers just to get a CCA quality installation done as a way to differentiate premium products. The costs of doing things outside the new construction market, in replacements and remodeling, are almost prohibitive for almost everyone. It is

imperative that any ratings we use give information that has potential utility in the real world. And the design expectations and the rating points that point two and point three inches static, exist only in the clouds.

The studies that have been done of new construction, to code under Title 24, don't produce those values. We have not insisted as part of our consensus agreements that we go back and rerate air conditioners at realistic external statics, because it would require rerating all of those products.

This air handler proceeding is the one chance we have to give the contractors information that can be used in design for field conditions that predominate. Not in our minds, but in the field, and it would be a terrible pity to throw that away.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: And I would just add to that that I don't think DOE really has a choice here. If I go back to the middle bullet on the eighth slide here where we talk about the test procedure, making a reasonable representation of energy use or efficiency in an average use condition, that's not an average use condition in the laboratory, that's in people's homes in this

case. So I think we have to take this range of real life circumstances into account to the extent we can. And I -- and based on our data, I don't think what I'm seeing here is terribly unreasonable. It's a reasonable range, based on what we've seen, even though the variance can be somewhat large, especially on the high side. This is reasonable in our estimation.

MR. BROOKMAN: Okay. Sam, I don't think you've yet presented slide 34.

MR. JASINSKI: No.

MR. BROOKMAN: So, proceed.

MR. JASINSKI: Slide 34 is using the same data that was presented earlier as an example for air flow and electrical consumption, this is using that same data, here represented are the three proposed rated air flow control settings. You'll notice that the medium high gray curve is gone, and just to clean up the slide a little bit, I also eliminated the electrical consumption. But the point of this slide is to give a graphic representation of a reference system curve, using the proposed reference system criteria for this particular model, would help in showing where the operating points are, or the relevant points of the

operating air flow curves are for this particular model. So, where you can see that for this particular model is of the installation type of design to be paired with an evaporator coil, so it's been assigned a reference system external static pressure of 0.65 inches water column. At that external static pressure, at the maximum air flow control setting, it delivers 1050 cubic feet per minute of air, and the equation that's shown there is used to develop the rest of the curve which, where it intersects the other air flow control settings designates an operating point. So this effectively shows where this particular model, what the expected performance at the operating system using the physical characteristics that are represented by the reference system.

So this might be a little redundant, I think we spent a little bit of time already on the request for comment on the proposed reference system. We can move along.

MR. BROOKMAN: Yes, any final comments on the reference system. Greg.

MR. WAGNER: Yeah, there is one comment. You used originally PSC motors for the standard baseline, and there you're showing the air flow

curves typical of PSC motors. The thing with the external static pressure being higher, that will reward the PSC motor application, however it will be detrimental to the ECM motor type of thing. So, from using this kind of scheme, a PSC motor driven furnace fan will have less watts used under this scheme than it would under using an ARI rating point, shall we say. And vice verse will happen with the ECM motor. So it's going to skew the data, one in favor, one against.

MR. BROOKMAN: Okay. Harvey, knowing that we're trying to move on.

MR. SACHS: Harvey Sachs. So the translation of Greg's comment is that DOE is building a system that will discourage innovation that would save energy, and would penalize products that could be sold more profitably as premium products that do save energy. This does not seem consistent with the goals of the legislation.

MR. JASINSKI: One particular request for comment that we have regarding the reference system, DOE is aware that, as everyone has heard, that field external static pressures can be higher than recommended by manufacturers. DOE is also aware that for the Canadian standard related to air

handler performance, CSAC 23, which was established in February 2011, I believe, that they use multiple reference -- that that standard uses multiple reference systems, one to represent manufacturer recommended installation, and another to represent common, field installation. And the reference system used for manufacturer recommended installation is 0.3 inches water column, but I will point out that there's a distinction. This is for the heating setting, which is typically a median air flow control setting, whereas the NOPR for DOE is proposing to use the maximum air flow control setting, which is a higher air flow control setting and typically designated for cooling.

But the request for comment here is that DOE would like to know if interested parties feel that using a similar multiple reference system approach would give a better indication of overall performance. But I will preface that with, DOE cannot set an energy conservation standard using multiple metrics, so if we did use a multiple approach, in the end it would have to result in a single integrated metric.

MR. BROOKMAN: Greg.

MR. WAGNER: Greg Wagner. I participated

in those CSA meetings in rule development process. The reason for two levels of that is the same one we're having discussion about right now, that we just previously had here, and that is that the point six recommendation is not a good recommendation for consumers and others installing equipment in the field. And since there wasn't consensus reached, it was thought better to have two levels to be able to help consumers and others distinguish between good practice and bad practice. And what we want to do is encourage the good practice to get energy savings, and not to be codifying bad practice, which is what the direction of higher statics are leading us.

MR. BROOKMAN: I'm not sure who would answer the question, but is the industry in general still behind either the results or the configuration of the Canadian standard? Aniruddh.

MR. ROY: Aniruddh Roy, AHRI. In the past the industry has submitted comments against the adoption of the CEA 23 2011 standard because it is significantly burdensome to the industry.

MR. BROOKMAN: That's a partial answer to my question, thank you. Harvey.

MR. SACHS: Harvey Sachs, ACEEE. And this

is really a question directed to Eric, I suspect. We have -- I have some confusion in my understanding of the single metric, and I refer particularly to HSPF, the heating season performance for heat pumps. And it's my understanding that the Department does require publication of the HSPF value for each of five or six climate zones. And the reason I'm bringing that up is that I could well imagine an analogous process that would be hard to challenge, if, within this single metric we still, for example, using your FER wound up with zonal FERs depending on the relative anticipated weight of cooling and heating. So I'm just not understanding what single metric means to you.

MR. STAS: Eric Stas, DOE. And I apologize because I can't quite recall how HSPF got into our regulatory system, whether it rose from a statutory standard, do you recall?

MR. SACHS: I believe that it came in with the initial batch of seasonal standards from -- Frank may remember it better than I do -- but it came in with the water heaters, air conditioners, heat pumps and furnaces, all in that same first batch.

MR. STAS: I mean the general point comes

from the definition of energy conservation standard 6291.6.a, where it says "a performance standard." That's where the genesis of this is, and we've had this in many of our rulemakings, so I think you're aware of that history. But we would appreciate your comments on why you think this case is a different case. In that if you were to analogize to these HSPF, that would be a good --

MR. SACHS: Thank you, Eric. The only reason I bring it up is just that it might make sense.

MR. STAS: We're always looking for good solutions that work well within the confines of the statute.

MR. BROOKMAN: Yeah, thank you. Craig.

MR. MESSMER: Craig Messmer. I guess I probably don't need to say it, but I will anyway. Our reference system should be 1.2 inches. We're pretty happy with that. So I recommend that you continue it.

MR. BROOKMAN: Thank you.

MR. JASINSKI: So the reference system is also useful in helping to determine exactly where the procedure should specify the determination be made. As we've heard, it's difficult to pinpoint

specific external static pressures, so instead of requiring manufacturers to try to target those specific operating points, DOE is proposing that determinations be made at three -- three separate determinations be made per rated air flow control setting. One at 0.1 inches water column, the second at an ESP that's equal to the applicable reference system divided by two, and an ESP between the applicable reference system ESP and 0.1 inches water column above the reference system ESP. And the reason the language is broad here is because there are multiple reference system ESPs that are proposed, so hopefully these instructions allow for a universal approach to each of those different scenarios.

The result is that three determinations are made in each of three of the rated air flow control settings, which results in a total of nine determinations required to generate the proposed metric FER for any given residential furnace fan.

Coming back again to our example of an actual model. I brought back the electric consumption curves, and this is just a general overview of all the measured data that is required to calculate FER for a particular model. You'll see

that three rated air flow control settings which are the top curves, the black curve which is the truncated reference system curve with the operating points labeled with the black dots to show at which -- to identify at which points we want to take -- or at which points we want to use the electrical consumption. And then, following down from those black dots you'll see a provided black circles which represent the electrical consumption measurements that will be used in the calculation of FER.

So now that we have all the measured data, the question becomes how do we calculate FER and use the power measurements that were identified to calculated estimated annual electric energy consumption. And DOE is proposing to do that, as I mentioned earlier, by proposing -- estimating national average operating hours for each of the rated air flow control settings, constant circulation, heating, and cooling.

So DOE used the following equation to establish or to estimate national average heating and cooling fan operating hours. And I'll just walk through this equation. So the hours are equal to fan on time ratio -- and I apologize, this looks like it's two separate variables, but in fact, that

is not a minus sign, it should be a hyphen, so that's one single ratio -- so, the fan on time ratio times the average annual energy use, which is adjusted by a weather factor to account for weather variations over a period of time, divided by the input energy or input capacity in the cases of heating and cooling.

To estimate the national average operating hours for constant circulation, DOE used two reports that provided survey results of homes in Wisconsin and Minnesota related to their habits and use of constant circulation. DOE used this data with a few adjustments to account for factors that -- for certain factors that the Wisconsin and Minnesota data results are higher than what would be typical of the national average hours for a number of reasons. First of all, well the first two reasons are closely related. Because Wisconsin and Minnesota residents have a high awareness of indoor air quality issues, the building codes in those states are more stringent when it comes to infiltration, so those homes typically have lower air infiltration than the average home in the United States, so for those combined reasons, the survey results -- people in Minnesota and Wisconsin will --

DOE expects will use constant circulation a lot more, so DOE wanted to account for that.

And then the last point there is that Wisconsin and Minnesota homes are located in a northern climate region, which is not indicative of the climate of other climate regions, and so that's another factor that contributes to the fact that homes in Wisconsin and Minnesota may use constant circulation more than in say, the hot dry region in the south.

MR. BROOKMAN: Let's just pause just for a moment.

MR. JASINSKI: Sure.

MR. BROOKMAN: Jim Vershaw, you have your hand raised. Is your question related to these -- the earlier slide?

MR. VERSHAW: Yes, the earlier slide.

MR. BROOKMAN: Please. Go ahead.

MR. VERSHAW: As far as using three points to characterize the curve, I firmly believe that we ought to be … get an accurate fit … might be able to be more particular point … five points for the curve which …

MR. BROOKMAN: Jim, I don't know what you can do, but you're kind of breaking up, we're

hearing two out of every three words. We're getting the gist of it, but if you can do --

MR. VERSHAW: Well, I'm hearing myself back on the phone. That better?

PARTICIPANT: Talk some more, it sounds better.

MR. BROOKMAN: Yes, it sounds better, just keep going, and loudly.

MR. VERSHAW: I want to go back --

MR. BROOKMAN: That's better, yes, go ahead.

MR. VERSHAW: I think we ought to use five points to describe the curve, you shouldn't use three points. That's the first point. Second point, was -- okay, I forgot.

MR. BROOKMAN: Okay, you can return to that and we're going to continue with the presentation point and then we can back up as necessary. So, Sam, back to you.

MR. JASINSKI: Thanks. Were there any questions or comments related to this slide?

MR. STANONIK: Frank Stanonik, AHRI. On your equation, okay now the text says test by national average heating and cooling fan operating hours. And the equation talks about an input

capacity. Which input is that? By heating input or by cooling?

MR. JASINSKI: For furnaces, it would be your input heating capacity -- I'm sorry, for the heating hours it would be the furnace input heat capacity.

MR. STANONIK: I guess I asked my question badly. So the question -- my question really is, so this hours you would calculate separately heating hours and --

MR. JASINSKI: No, I'm sorry. So these calculations, these values are based on national averages, so these aren't values that you would calculate specific to each model. We did these calculations based on national average data and have proposed a specific value for hours that would be used across all products.

MR. STANONIK: Okay. So then you use the heating input?

MR. JASINSKI: Yes, the national average, I believe it was from RECS 2005, the average heating input capacity.

MR. STANONIK: Okay. And then the second question is, the second bullet talks about, okay, you used the results from information in Wisconsin

and Minnesota to estimate national average. So first of all, I'm assuming that meant you made some adjustments to adjust for the fact that you're getting data from, let's say, a northern climate --

MR. JASINSKI: Yes.

MR. STANONIK: -- to somehow reflect an average, a national average, and part of that is using national average energy use?

MR. JASINSKI: No, the specific adjustments that were made were, for instance, well, the resulting average -- weighted average based on survey responses for say, the Minnesota or Wisconsin, I mean, specifically DOE expects that those results are 50 percent higher than what would be typical for other homes in the northern region, and 90 percent higher than what would be typical in the south hot, dry region.

MR. STANONIK: Okay. And if you'll indulge me one last question on this slide, and this is a serious question because I'm not familiar with those Wisconsin, Minnesota studies, but so in these homes where people were using the fan for constant circulation, was there any let's say entry in the data that might identify when those homes were perhaps opening windows in the temperate times?

MR. JASINSKI: I can't say with 100 percent certainty, but I don't believe so. And just as a note, one of the backup slides, which I know there were some issues with the printouts, but if you access the presentation on line, there's a backup slide, number 64, provides the details of how DOE translated the survey results into estimations of hours and used these adjustment factors.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: Charlie Stephens. Listen, Harvey made a point earlier that if you go back far enough that we think, based on our own limited data -- which we're trying to get more of right now, we should have more data on this very shortly, which we'll provide to the Department -- there's a high correlation between circulation, or constant circulation and high end air filtration, electronic air filtration systems. That in the past it's -- most people are circulating to filter the air. And I've learned that anecdotally by lots of conversations with contractors who recommend this, and program it, and their clients. So that's -- I think that's potentially true.

I don't know about the Wisconsin and Minnesota data, but in recent times, the code has --

the national energy codes have clamped down on air tightness and ventilation may now be playing a larger role in the future, in other words, and there are a significant number of systems in our part of the world compared to what there used to be, where these systems are being timed to run for the purposes of ventilation and there is a fresh air inlet on the system. That's a recent phenomenon, but it may be a forward looking phenomenon. We may see more of that.

So I think what I didn't find in the proposal here is a very good rationale -- I know we don't have much data, but there's not a very good rationale for your adjustment. And I really would be a lot happier if we could find some more data and get a better rationale for how we can estimate how accurate this figure you're using is. If you are willing to tell us what we need to know in order to get that data, there's some chance that I can get a lot more data, at least in our part of the world, if somebody tells me. I have the budget to do it. I just need to know -- I don't want to bring you data that isn't what you needed. But we really, I think, need a lot more data before we can nail this number down. I'm not very happy with kind of what I see

here as arm-waving.

MR. BROOKMAN: Okay. Jim Vershaw is on the line. Jim, go ahead.

MR. VERSHAW: Yes, Jim Vershaw here again. … Go back to the … data where we wanted to do five. The other point was that we feel that there should be latitude on where the data is taken. In other words, don't make it exactly one, or exactly point three five, have a little bit of … when you say five points … we want to get well spread out data points, five should be just fine …

MR. BROOKMAN: Thank you. Jim, you're still breaking up, I don't know whether you've got some other alternative that you could use, or whether your cell phone needs to be charged or what's going on there, but you can think on that. Did you hear most of that?

MR. JASINSKI: Yes, I thought so.

MR. BROOKMAN: Yes, I think we got most of it.

MR. MESSMER: You're clear on what he's saying. He's saying --

MR. JASINSKI: Instead of targeting point one, have some tolerance so you don't have to hit that exactly --

MR. MESSMER: Right, because it takes a while to get to any given test point.

MR. BROOKMAN: Okay. That's what I heard as well. Dave, you want to --

MR. WITTINGHAM: Yes, just to kind of reiterate what Jim was saying. There's many systems when you go to the low end of the low end in regard to static, or high end, systems can become unstable, particularly when you're trying to measure air flow. And the air measurement device, and the piece of equipment that you're trying to measure, the stability of those can be real critical.

MR. BROOKMAN: Okay. Good.

MR. JASINSKI: Thank you. So moving on, DOE proposes a value of zero for hydronic air handler off mode operating hours, because DOE expects that hydronic air handlers are not typically equipped with a seasonal off switch, or the consumers will not turn off power to the hydronic air handler. There's a definition provided for seasonal off switch which essentially states that "a seasonal off switch is a switch that cuts power to the product and results in a distinguishable difference between standby mode and off mode electrical energy consumption.

So the idea here is that DOE does not believe that hydronic air handlers typically have such a switch, and in effect there is no distinguishable difference between off mode and standby mode electrical energy consumption.

And lastly, DOE estimates or proposes to estimate that the average annual standby mode fan operating hours is equal to the remainder of annual hours not assigned the other modes discussed: heating, cooling, constant circulation, or off mode.

So all that translates to this table, and here are the results of those efforts. As you can see, in the heating mode, the estimate is 830 hours, constant circulation mode is 400 hours, cooling mode is 640 hours, off mode zero as I mentioned, and then the equation there for standby mode is essentially the total annual -- total hours in a year minus the hours that are estimated for the other modes of operation.

Now you'll notice that there are two sets of values, the single stage heating values that I just mentioned, but DOE is proposing to estimate the heating mode hours differently for multistage -- for units that have multistage heating. The difference being that the 830 hours that was estimated for the

single stage heating is divided by the heating capacity ratio, and the heating capacity ratio is the ratio of the output heat capacity in the low heat setting to the output heat capacity ratio in the high heating setting.

And on the next slide, I'll go into a little bit more detail about that, the methodology and the impacts of that. But does everybody have the summary of the estimate hours?

So to go into detail about the multistage hours. DOE proposes to account for the differences in operation between single stage heating and multistage heating, or modulating heating units in its estimated annual heating fan operating hours. DOE finds that low heat setting -- in multistage units the low heat setting is typically -- typically accounts for 90 percent of heating operation time. And as a result, it requires more heating operation hours when compared to a single stage unit to provide the same total delivered heating in a given installation.

So, as a result, DOE proposes to use the following equation to determine average annual heating operation hours for multistage and modulating furnace fans, which is to take the 830

that is estimated for single stage and divide it by that heat capacity ratio. So just for reference, an example of a heat capacity ratio would be a model where the low heat output -- low output heat is roughly 70 percent of the high output heat capacity, and that would result in heating hour estimate of around 1185 hours.

So essentially, this is how DOE is accounting for the fact that multistage hearing units have a longer operating, fan operating time in the heating mode.

So there's lots of requests for comments regarding these -- the operating hours, with some specific comments, but the first on is generally whether those operating values are reasonable estimations of national average operating hours. And I'll go back to the table so we can refer to them.

MR. BROOKMAN: Aniruddh.

MR. ROY: With respect to the studies that occurred in Wisconsin and Minnesota, I think these two states have the indoor air quality issues -- or, yes, indoor air quality issues, and so in the national average I feel it would be better if DOE also consider other states to give a better

representation of those hours, not just Wisconsin and Minnesota. So those are our comments.

MR. BROOKMAN: Okay. Thank you. Greg.

MR. WAGNER: I was going to say, looking at the circulation mode at 21 percent of the hours represented on the single stage heating, I'm a manufacturer, I'm going to target that for making sure that I have the lowest watt consumption in all the modes, so make sure I design something for that. It's a big number out of that percentage of the total run time.

The other thing is that the cooling mode is included in here, and as we covered earlier, that's covered under the SEER calculation, so it's already a regulated part of it. I think, going back to what we originally talked about definition, the heating mode should be the only one that is part of some regulatory action to evaluate what furnace fan performances, as per the mandate originally laid out.

MR. BROOKMAN: Okay. Thanks. Craig.

MR. MESSMER: Craig Messmer. We're seeing a lot of the newer homes, very, very tight homes starting to have a lot more circulation hours than that. In fact, they may never shut off. So I don't

know if you factored that into this equation.

MR. BROOKMAN: This is nation-wide?

MR. MESSMER: Right, I don't know, maybe there needs to be something that's stated for these new tight homes. The FER's going to be grossly different.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: I'm getting ready to launch a study into that out in our area, but -- and that is true except that in our area they tend to be timed to meet ASHRAE 62.2 which is really what's referenced in the code, and that tends to have them running timed at about eight hours a day, typically out where we are, in that mode. So whether or not that overlaps the heating and cooling function is another issue which we have to investigate. But I hope to have some good data on that -- that's a separate study we're about to launch. And I'll provide the data.

What I wanted to ask was, well there are two things. One is, how consistent are these with the kinds of values that we see in the test procedure for heating -- for furnaces, heat pumps and air conditioning in terms of weight averaging? You know, the ratings for -- I mean, I would hope

they would be somewhat consistent since some of these products are used in that very same mode sometimes in the very same climate zones. So I'm just pointing that out that they should be consistent. If they aren't, if they're radically different, then maybe we ought to think about why, making sure we know why.

The other thing is, how these things are used makes a difference to me. We'll get into the energy use here shortly, but I'm not very happy with energy use and using these numbers as an energy use metric. I think if they were used to weight average a fan efficiency, watts per CFM, CFM per watt or whatever, I'm happier with that, because I think you won't be nearly as far off the mark with your average number at the end.

The variation that we're going to see in annual energy use is much larger than you're going to see in the variation of the efficiency of the fan, I think, even using these weight average numbers to come up with a single national number. If it was a single national watts per CFM, you're not going to be too far off, I think. But you're going to be way off in Butte, Montana and Waco, Texas, if you try to put the same air handler in

those two places. The number that you come up with is going to be really, really, really way wrong in both of those places. And I don't think it's constructive to lead people to believe that it's useful. Whereas, you won't be nearly as far off if you're publishing a single weighted average fan efficiency number, based on these same weightings. Just my two cents on that.

MR. BROOKMAN: Okay. Thank you.

MR. JASINSKI: So specific questions about some of those -- some of them mentioned. DOE is also requesting comment on whether hydronic air handlers are designed to provide multistage or modulated heat. This is just an instance where hydronic air handlers are relatively newly commercialized product and as we've discussed, there are a lot of variations, so DOE is requesting comment on whether those specific variations are commercially available or -- you can provide that in written comment if you can identify hydronic air handler models that provide multistage or modular heating.

MR. BROOKMAN: Yes, okay, Charlie's got some data. Okay.

MR. JASINSKI: Another question is whether

or not the methodology presented for determining multistage heating hours is appropriate.

MR. BROOKMAN: Craig.

MR. MESSMER: Well, we have multistage hydronic air handlers, but we have no data on this. We didn't know we needed to have any, so I'm not sure how we're going to be able to reply to that other than saying that we have multistage air handlers.

MR. JASINSKI: Sure.

MR. BROOKMAN: Charlie, go ahead.

MR. STEPHENS: Yeah, I'll just -- multistage is -- you're kind of maybe using the term a little off. It's not necessarily multistage, but it is variable capacity. If you have a variable speed air handler, and we use the ones by the major manufacturers for this, with a hydronic coil, or you can order one from Area Brands that makes the Life Breath line -- they have a variable speed version of this thing. You can use an outdoor reset control on this thing to manage the pump for the hot water, or to manage the temperature of the hot water, and you can vary the heat being delivered to the house, and you can vary the air flow to match the temperature. And we've done a lot of projects like that in homes

that actually use them in that way, so it's -- it's not exactly multistage because there's no burner, but you do manage the hot water in similar ways, either with the pump or the temperature of the water, and you can manage your air flow to hit, for instance, a delivered air set point temperature, which is frequently what's done. So you should take that into account, I think.

MR. JASINSKI: Thank you. That's very helpful.

MR. BROOKMAN: Craig.

MR. MESSMER: Charlie brings up a good point. What are we talking about multistage? Are we talking about the heat generation portion of the system, in this case the boiler with setback controls? Or are we talking about just multiple fan speeds as being the stage?

MR. JASINSKI: So similar to -- well, essentially the air flow control settings, and that goes back to tying -- DOE's assumption that air flow control settings are typically designated for specific functions. So in product literature, DOE finds that different air flow control settings are designated for heat, and in the instances of a multistage units, one air flow control setting will

be designated for high heat output, and a lower one would be designated for a low heat output. So in the context of this proposed procedure, it would be the air flow control setting that's designated for low heat.

MR. MESSMER: Okay. Some systems, like heat pumps, for example, the capacity of the system changes not just with the air flow, but with the outdoor unit. Same thing with a boiler. Same thing with some other types of systems. So the percentage of low stage is going to be different than if you had just a simple air flow change, whereas maybe the water temperature stays the same in the hydronic coil. I'm not sure how to handle that, but it's something we need to consider.

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Harvey Sachs, ACEEE. Sam, I think your use of the term is somewhat idiosyncratic in terms even of my limited understanding. I'm pretty sure we saw four speed PSC motors long before we had any significant penetration of modulating heating devices. And in fact, my understanding, which is not terribly good, but reasonable field experience, is that this was to match to static pressure to get the air flow you desired. That was

done very roughly. So that multistage to me, as an industry term, is about the energy source supplying to the coil, and it's not about the fan settings. So I think you may well have confused several of us.

MR. JASINSKI: Okay. Well, just that as -- - to repeat. Essentially, you know, Greg has brought this up multiple times in that the difficult task here is to essentially separate thermal performance from air flow performance. And within the confines of the statutory limitations that we're working under, our goal here is to rate air flow performance. So in this context, DOE has made assumptions about how air flow control settings play into design decisions, and have come up with, based on what we found in -- from discussions, comments, and product literature, that in designing a fan to be used in these systems, so designing a fan to be used in a multistage system, for instance, that there is a relationship between the air flow control setting and a specific heating stage. So DOE here is not confusing the two, they're simply asking and assuming, and asking about that assumption, that they are related, that in fact, when a manufacturer produces a multistage heating unit that has multiple heat outputs from the burner, that those outputs are

designated for a specific air flow control setting of the circulation fan. There's a mapping going on, essentially, not that they're the same entity.

MR. SACHS: (off mic) Application specific. That's about … in my experience.

MR. BROOKMAN: Charlie Stephens.

MR. STEPHENS: I think it might just be a matter of terminology here. I mean we == when we look at an air handler, specifically, ignoring the heat source, we look at multispeed versus variable speed, typically, to sort of separate out the ones that you either have to wire for different tap speeds, or some of the dumber ECM products that actually look more like a multispeed PSC motor than a true variable speed motor.

But I think the real difference in an air handler is you've got a lot more choices with speeds, typically, you've got a lot of dip switches that you can play with on a variable speed motor, versus a PSC or multitap motor. But, that being said, they respond differently, and they're controlled differently. So the question is, in our mind, it's a matter of control. Are you controlling to a single speed, or does the motor adapt to the conditions that it sees and the controls -- and this

gets complicated. This is where I think people earlier have pointed out, you know, that when you've got an air handler that adapts to what it sees in terms of external static or temperature, or its being controlled on another variable like outdoor air temperature or something like that, return water temperature, whatever you want to use, you get a more complicated paradigm, if you will.

But I think, again, for the test procedure and giving this thing a rating, it just has to be rated at a certain air flow point and external static pressure point, regardless of what control settings were used to put it there. I think if you can just figure out how to rate the thing at those points using as few variables as possible, we'll understand in the field how that plays out when we control it.

MR. BROOKMAN: Okay. Jim Vershaw also has a comment or a question. Go ahead, Jim.

MR. VERSHAW: Can you hear me this time?

MR. BROOKMAN: Yes, sounds better.

MR. VERSHAW: Well, I've only dialed in three times so I'm little bit late on the comment, but if you go back to -- I'm with the gentleman who's questioning, who's using the number of hours

in this whole calculation, and what's the value that brings, because it's an arbitrary number that's supposed to be kind of representative of some place in the country, but it depends upon so many things. Why not just -- the performance of the appliance based on what the end condition? That gives you the thing without throwing in hours that confuses what's really going on depending on where you are and how you're using the problem.

MR. BROOKMAN: Okay.

MR. JASINSKI: So here --

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Harvey Sachs, ACEEE. If I could be so bold as to translate Charlie Stephens and Jim Vershaw, I think you would find a lot of support for expressing this metric in watts per CFM instead of trying to do it in kilowatt hours per year. It may require a little bit of a stretch. It may require a lot of support. But I haven't heard anyone defending the efforts to remove ourselves further from the data with a lot of assumptions and extrapolations to get this as annual energy descriptor instead of a steady state descriptor.

MR. JASINSKI: Maybe this will become more clear when we provide examples, but the proposed

metric is actually in the units of watts per CFM. The estimate average annual energy consumption is normalized by the operating hours as well as the air flow in maximum air flow control setting, so the resulting metric will be in terms of watts per CFM. And I think that will become -- I'm going to provide an overview of the variations of the FER calculation, and then immediately after that show some examples of how FER will be calculated for specific models. So maybe that will clear up some confusion.

MR. BROOKMAN: Going in that direction.

MR. JASINSKI: Like I said, there are some variations of the FER equation. At the top I've provided general form, so FER here. As we stated previously, it's just the estimated average energy consumption which essentially is the sum of operating hour -- the estimated operating hours times power consumption in all the rated modes, depending on the product, normalized -- again, divided by the sum of the operating hours for the rated modes, times the maximum air flow control setting, and all that is multiplied by 1000 to put the final resulting metric in the units of watts per 1000 CFM, which I think a lot of manufacturer are

familiar with. I think that's how fan performance is characterized for the CAC rulemaking.

So the first variation that I've provided is for non-hydronic furnace fans. Again, for non-hydronic furnace fans, standby and off mode operation are being excluded, because those -- consumption in those modes is being covered in ongoing rulemaking activities for products that fall into those categories. Here you can see the specific variables that follow the general form under those constraints.

Next is heating and cooling hydronic furnace fan, to designate them from heating only hydronic furnace fans. And here I've highlighted in red that standby mode and off mode are included here and it's important to note not only is annual energy consumption in those modes included in the numerator, but a key difference is that the estimated operating hours is included in the normalization factor in the denominator here also. And later on in the rating metric examples and comparisons, the impact of that will come to light.

Following that is the heating only hydronic furnace fans variation. Excuse me, before I go on, you'll notice that this is actually IFER

which stands for integrated fan efficiency rating, and the reason is because standby and off mode here are integrated, pursuant to EPCA when possible, any measurement of standby and off mode should be integrated in the overall metrics. So that's the reason there is a variation for integrated fan efficiency rating.

So, then the last variation, heating only hydronic furnace fans. Again, DOE expects that there are some hydronic furnace fan products out there that are not intended to be paired with a cooling system, which may or may not be accurate. But in that particular variation you'll notice that there are no terms for accounting for cooling operation. So these are the different variations of the FER equation.

MR. BROOKMAN: Yeah. So questions on the equations? We're about to describe some rating examples. So maybe that will be illuminating.

MR. SACHS: In the third equation --

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Harvey Sachs. -- we have a term CH times E-sub-max. I assume that's E-sub cooling instead?

MR. JASINSKI: No, it's intentionally max

because, as proposed earlier, DOE is proposing to rate in the maximum air flow control setting, which expects is designated typically for cooling operations.

MR. SACHS: Thank you. So this refers back to the earlier ambiguity. Thank you.

MR. JASINSKI: Sure.

MR. BROOKMAN: Charlie.

MR. STEPHENS: Charlie Stephens. Just a quick -- how are we differentiating between heating and cooling hydronic and heating only?

MR. JASINSKI: So DOE found that there are certain hydronic air handlers that are not designed to be paired with an external evaporator coil, therefore the thinking is that the fan is not designed to provide cooling, which would -- I'm sorry, go ahead.

MR. STEPHENS: Well, actually, we're using those with cooling, and in fact you can do that, do cooling when you use a chilled water -- you use chilled water from a heat pump to do that. You don't use an external coil, you would only use --

MR. JASINSKI: Right.

MR. STEPHENS: So we use a fan speed that did cooling.

MR. JASINSKI: I guess the important question is then, is there a need for a distinction? I guess what we're trying to do is prevent using the IFER for hydronic furnace fans that provide heating and cooling for something that might not be designed to do that.

MR. STEPHENS: The difference -- this is Charlie again -- the difference comes in when you either have an external refrigerant coil on the system or you don't. But the fan speed, the fan speed may be the same. You may be doing cooling in the maximum -- what you call the maximum E-max, but the external static that it's working against may be different, depending on whether you're doing it with a DX coil or you're doing it with chilled water. I don't know how you're going to make that distinction, but we're doing both of those things actually, so --

MR. JASINSKI: Thank you.

MR. STEPHENS: It depends on whether you have a boiler or a heat pump, or a water heater or a heat pump doing the heat.

PARTICIPANT: Sorry, to address Charlie's situation, you could just have one formula and if there's no cooling, CH goes to zero, and the formula

looks like the bottom one, right?

MR. STEPHENS: Yeah, well, I don't know how the inter -- I haven't thought about how the interplay goes between the external static. You have an extra coil in once case and you don't have an extra coil in the other. So the values that -- yeah, the E values are, you know, it's a matter of whether it's E-heat, which is one coil, or an add-on coil I think is the differences in the E you're using.

MR. JASINSKI: Just to provide an analogy I guess that might clarify so that we can -- so that when you provide written comments you understand what DOE is trying to understand here is that, analogous to maybe a furnace manufacturer who is designing a furnace that is not intended to be paired with a cooling coil, they might design that fan differently than they do for one that is designed to have a cooling coil. So that's what we're trying to do here. Does there need to be a distinction for a hydronic air handlers or any products that may not be -- the fan design is not intended to provide cooling. It would fall into one of these bins, but the question is we don't want to use the wrong equation for, say, a hydronic air

handler, if it exists, that is not intended to provide cooling.

MR. BROOKMAN: Charlie.

MR. STEPHENS: One quick -- I don't know of any that are not designed to do cooling. All the ones that we use like -- and I don't like to mention names -- but like Tranes 4TEE (ph) air handlers, Carrier's FE-4s, those. We use those. They're designed to do cooling or whatever, and the Life Breath product is designed to do cooling as well, so all the ones we use will or will not do cooling, depending on what you want.

MR. JASINSKI: Okay. Thank you.

MR. BROOKMAN: Craig.

MR. MESSMER: Craig Messmer. It really depends on what the goal is of this rating metric. If the goal is to get the field to determine what the energy use is on an annual basis, then having separate equations sort of makes sense, because you don't have cooling in one, okay. But if the goal is to be able to rate across the board, how do you compare a non-hydronic furnace fan FER with a heating only hydronic furnace fan IFER? How do you know which one's more efficient?

I would propose that you have just one

equation and that's it. And just plug in some standard values for cooling or whatever if it doesn't have it. That allows you to compare different products across different product types. We've already kind of agreed, sort of, that none of this is going to give anybody any indication of what their energy use is going to be during the year, so I think we can take that goal off the table. So that's what I would recommend.

MR. BROOKMAN: Greg.

MR. WAGNER: Yeah, I'll just dovetail that. We talked a lot about that, and some of this calculation and manipulation, you get the hours and all the other stuff. We're just doing a lot of work to accomplish something that it sounds like a lot of folks don't want to get, and it's not necessarily going to be helpful to their consumer, because ultimately, they need to know what is the cost of energy per whatever that function of that device is. And we're losing sight of that by doing a lot of this extraneous calculation, manipulation of data.

MR. JASINSKI: Okay. I'll move on.

Rating Examples and Comparison

Next I want to provide some rating examples to hopefully get everyone a little bit more

familiar with the fan efficiency rating and how it compares across different types of products.

So this is something you've seen before. Again, using the same non-weatherized gas, non-condensing furnace fan with a four speed PSC motor, we'll use the proposed annual operating hours, and this table essentially walks through the calculation of estimated annual energy use. So you can see that in the power column, those are the measurements that are taken at the operating points which are identified by the reference system, multiplied by the estimated annual operating hours. You can see the annual consumption by function in the last column. And then in the bottom, the total.

I've provided a reiteration of the FER equation here, and then below that you can see the actual values for each of those different factors. So at the top, the annual -- the estimated annual energy consumption, normalized by air flow in the maximum air flow control setting, which in this case is 1050 CFM, and that is multiplied by the total annual rated operating hours, which in this case does not include standby or off mode, so it's essentially just the sum of the annual operating hours, multiplied by 1000, which results in a fan

efficiency rating for this particular model of 376 watts per 1000 CFM.

So next -- I don't have a depiction of the -- or a graphic of the measured data, but this is for a heating and cooling hydronic air handler furnace fan that uses an ECM motor. So again, the first column shows the power which was identified using the same methodology as before, multiplied by the annual operating hours. And I've highlighted in red here that the standby operating hours and power consumption are considered for this particular product, the hydronic air handler, which you can see impacts the total annual operating hours, as well as the annual energy consumption.

So again, same representation in words of what's going into the integrated FER calculation here. And then below, the numbers that correspond to those things. Of note here, you'll notice that the annual rated operating hours amounts to the total annual rated operating hours, whereas in the previous example that number was much lower because it excluded standby operating hours, and again, multiplied by 1000 to result in an integrated FER rating of 45 watts per 1000 CFM.

To bring these two together and to provide

a little bit more context, essentially what this graph shows is both of those ratings -- it shows the contribution in each mode to the total of that rating. And so the one all the way to the left is the non-weatherized gas, non-condensing furnace fan that uses a four speed PSC that we've seen throughout the presentation. All the way to the right is the example that I just presented of the hydronic air handler heating and cooling that uses the ECM. And then to bridge the gap, to show -- because the difference between the hydronic air handler is one that it includes standby, but also that it also uses a different motor type, I provided a non-weatherized gas, non-condensing example that uses an ECM to show the comparison between PSC and ECM performance. And below, in case you missed any of that, I've provided information regarding how the acronyms match up to the specific types.

MR. BROOKMAN: Dave.

MR. WITTINGHAM: This is Dave with Allied. I think if you go back to the prior two slides, it really illustrates the problem of having two different measurement and metrics. That if you're looking truly at fan performance, when you include the standby power, it really skews the number so

from a comparison standpoint, it is going to cause confusion, and even adds to the value of the, in a negative way, of the metric itself. Because if you look at the power that it's using when it's moving air, in the first scenario, it's kind of in between the values. This number is below any of the values that when it's truly moving air. Thank you.

MR. BROOKMAN: Frank Stanonik.

MR. STANONIK: I think Dave hit a key point. If this is supposed to be a fan efficiency measurement, and the key idea is how much energy I'm using to move air, that's the function of this product, then injecting the standby laws really doesn't fit that descriptor. And in this particular case, it just being allocated here, where in the other cases it got allocated somewhere else. I mean standby loss for this equipment is somewhere, but it seems so arbitrary to stick it here and drag that number down in this one instance.

MR. BROOKMAN: Charlie.

MR. STEPHENS: Charlie. I would agree. I'm a little bit ambivalent about how you do it, but I think you need to make things consistent. You either need to bring the standby power in from the other air handlers besides hydronic, and I think

most manufacturers already have that number as long as the test methods are consistent from what they have to do to get that from like a Carrier FE-4, whatever, 4TEE, whatever, then you should bring it in here. Or, you should separately list it out, or take it out of that one. Because I really do think, again, all those hours and everything, your hourly allocations are going to change depending on where you are, and that -- even the standby number is the residual of whatever's not active mode, essentially, and that varies.

So I agree with the other commenters that that really should not be in one type of air handler and not in the others, or maybe it should be separate for the hydronic, because as you say, it's not covered anywhere else, but it needs to be apples and apples.

MR. BROOKMAN: Okay. Harvey.

MR. SACHS: I would look forward to comments from industry, including the motor manufacturers. What we've seen with a number of other technologies is the standby power is the result of other design considerations, when standby power was not considered something that was an important design variable. And if it is somehow

made visible in ways that matter to the customer of the advanced motor, we may see that the 75 or 80 kilowatt hours a year go down a great deal. It may well be, as we've seen with power supplies, analogous to power supplies in some respects for computers, that we can get the functions we want and save money with some redesign that only gives us three watts.

So I'm certainly sympathetic to the view that incorporating that standby into the annual energy consumption. It's something that's hard to do and decreases the value and can only be justified if that's the only construction of the statute that can be allowed. Otherwise, separately reporting that would certainly be a whole lot better as a signal for innovation and approaching our energy efficiency goals as a nation.

MR. BROOKMAN: Okay. Thank you. Final comments on 49 and the preceding slides that build up to that?

MR. JASINSKI: Doug, I have one specific question. One thing that's not represented here is that some of the impacts that we're pointing out as being less than desirable to some, between the hydronic air handler rating here and the non-

weatherized gas, from including standby, might also be characteristic of a comparison between a single stage and multistage unit, because if we go back here, the calculation for the annual heating hours, that 830 would actually be divided by that heat capacity ratio. So that 830 would increase, like I said before, something typical might be around 1185, and the result would be that the total for say, a multistage -- this is a single stage I believe -- the total for a multistage might be a little bit larger than that. And again, it would cause a discrepancy in the comparison.

So one question is whether or not normalizing by the total annual operating hours, or the same number of hours regardless of how you come to that total, would be beneficial as opposed to calculating them for each specific model? Essentially eliminating differences in the denominator. Something to think about.

MR. BROOKMAN: I think include in your comments. Greg, go ahead.

MR. WAGNER: Certainly that 8300 hours or 8760 number of hours versus 1800 hours skews that data hugely, and since you're only running it at 11 watts in the standby mode, it does a huge disservice

to have two numbers that are ostensibly supposed to be comparable, not being in the same ballpark. So something has to be adjusted, the hours, standby mode, something to take away that factor.

MR. BROOKMAN: Charlie.

MR. WAGNER: I would say the last thing is in circulation mode, the same thing holds, since it is a significant amount in this particular case, you'd want to drive the circulating watts down considerably to, you know, you may not do anything about the other modes, but you drive those watts down and you'd have much better FER, yet it's not necessarily a better product. That's not a good factor.

MR. BROOKMAN: Charlie.

MR. STEPHENS: Yeah, I just would add to what Harvey said, I agree with what he said about separating it out so it's not trivialized. But the other thing is standby is particularly egregious everywhere because it provides no service to anybody. It's just power consumption for nothing. And we should really be willing to invest a couple of bucks to actually fix that. And I don't think we will, I mean, if you bury 75 kilowatt hours in 700, it's not going to be a big number, but if you

separated it out and say, look, this could be 25 instead of 75, and you multiply that times millions. I mean that gets to be a power plant or two. So we really need to be able to focus on that.

MR. BROOKMAN: Okay. Are we shifting gears?

MR. JASINSKI: Yes, I'm going to --

MR. BROOKMAN: I'd like to invite everyone to stand up and just stretch for a moment while we're shifting gears here. And you can stay standing. Now we're going to hear from Detlef Westphalen. Actually Deet-lev (ph) Westphalen.

Certification, Compliance and Enforcement Overview

MR. WESTPHALEN: Detlef Westphalen, yes, with Navigant. Sam and I had a fight about how many of the slides that he'd allow me to present, and it wasn't many. There might be a reason that he wanted me to present these couple here, but anyway.

Certification, compliance and enforcement. There's really only one slide here with some request for feedback. I realize what's not mentioned here is that -- and it's listed in the NOPR -- that there are also some changes associated with what's required -- proposed to be required in a certification report for these products. And I'm

not going to dwell on that unless somebody wants to get into that.

But this slide is about sampling plan for residential furnace fans. DOE proposes to create a new section for sampling plan specifications for manufacturers to determine the certified ratings, and DOE proposes to adopt the same statistical sampling procedures that are applicable to residential furnaces. Those are in sections 18 and they also refer to section 11 of 10CFR429.

And this third bullet, I'm just going to read it. DOE believes product variability and measurement repeatability associated with the electrical energy consumption measurements proposed for rating residential furnace fans are similar to those associated with electrical energy consumption measurements required for residential furnaces. As I said, I'm just going to read that and then request comment.

MR. BROOKMAN: Yes, Aniruddh.

MR. ROY: So the interpretation as far as, you know, what EPCA's guidance has been for DOE is to open up the scope to various products. But when it comes down to certification requirements, it's narrowed down to furnaces, residential furnaces.

That's something we fail to understand because in the case of confidence limits, you have different confidence limits for residential central air conditioners and heat pumps, and what is specified I think under residential furnaces is about 97.5 percent. So these products are subject to different confidence limits as far as DOE certification is concerned. So we think it's kind of unfair to just extend the 97.5 to all the products, because currently the manufacturers are rating central air conditioners, I believe, to 90 percent. So that should be taken into consideration.

Another factor we hear with AMCA 210 is that Section 4.1.2 specifies a random uncertainty of -- or measured random uncertainty of 95 percent. So I think DOE should take that into consideration also before coming up with a confidence limit of 97.5 percent. In fact, my question originally before you stated that slide was, has DOE evaluated the feasibility of the 97.5 confidence limit thus far on the proposed FER metric?

MR. WESTPHALEN: Well, I would say at this point, Sam mentioned that there was some testing conducted, and obviously the scope of the testing that's going to be conducted for such a rulemaking

is much more limited than all of the testing that a lot of the manufacturers do in their own labs. DOE would certainly welcome data that would provide some indication of what the confidence levels perhaps should be if the proposed levels aren't appropriate.

MR. BROOKMAN: Dave.

MR. WITTINGHAM: Yeah, this is Dave from Allied. While the measurement of the electrical power should be fairly stable and accurate, although there are some special requirements for variable speed motors -- you have to have true RMS type devices which some manufacturers may or may not have. When you introduce the measurement of air flow into this equation, the variability of air flow measurement is considerably higher. The measurement uncertainty, the tolerances of motors, fans, the manufacturing process, there is a fairly high degree of variability in the air flow of measurement.

Greg, I mean, your area of expertise is to build air moving devices, and Greg can allude to the difficulty of consistent and accurate air measurements. And I think that is something that DOE needs to consider in this, moving forward, that the measurement uncertainty tolerance of components within this. We need to have a reasonable tolerance

in this and absolutely the rating and enforcement confidence limits need to be the same. We have an issue, a unitary small (ph), where we have a different rating confidence limit and an enforcement confidence limit. I think that's something that we should absolutely try to prevent here.

MR. BROOKMAN: Greg.

MR. WAGNER: As any of you that have conducted air flow measurements know, it's difficult to get accurate, precise measurements. And even under laboratory conditions, as Aniruddh alluded, AMCA will define what some of those uncertainty confidence levels are. It's much greater than what it is for what they do currently with the furnace testing where it is the temperature and a meter device to establish what that capacity is. That's a fairly robust measurement system. When you go to measure air flow, it's not as consistent, as Dave just outlined. That's another reason, a good reason, for keeping with the standard that's already used and accepted in terms of measuring output and capacity of products, which DOE recognizes in terms of the AFUE, and adding on something of an electrical consumption with that, because you already have an understanding of what that tolerance

and uncertainty window is for measurement of capacity.

MR. BROOKMAN: Okay. Harvey.

MR. SACHS: Thank you, Detlef. My brain is getting old and I don't remember the statistical sampling procedures for residential furnaces. But it brings me back to my initial, not my initial, but one question earlier to Eric and Mohammed, and this section is called certification, compliance and enforcement. What is going to be certified? This IFER or FER determined measurement -- no, calculation -- or the underlying measurements that support it? What is the manufacturer going to be held responsible for?

And I ask this in part because it directly relates back to the question whether we'd rather have five air flow measurements occur at different static pressures, or rather have multiples -- multiple measurements at three? So there's just an awful lot of ground to be covered, I think, before any of us has an understanding of what is being asked.

MR. WESTPHALEN: I think part of what you're referring to, Harvey, is the proposed requirements for certification reports. And I kind

of brought this up here with me, a cheat sheet, so I didn't have to memorize it.

MR. SACHS: I don't have it.

MR. WESTPHALEN: And I'll read it. So for -- and it's different for furnace fans used in hydronic air handlers, but for furnace fan used in HVAC products other than hydronic air handlers, the represented value of the fan efficiency rating, the FER, the maximum air flow capacity at the reference system external static pressure, in cubic feet per minute, whether the product has multistage or modulating heating, and if so, the maximum and minimum output heat capacities in British thermal units per hour. And whether the HVAC product is designated for use in manufactured homes.

MR. SACHS: But these are all data you require to be revealed. Not all of these are certified.

MR. WESTPHALEN: These are all items that are proposed to be required as part of the certification report.

MR. SACHS: Okay. So in terms of my question, the FER would be a required disclosure subject to compliance, but none of the underlying data would need to be disclosed to the Department,

although many of us would hope that they would be in the engineering literature from the manufacturer.

MR. WESTPHALEN: That's correct. Usually DOE reserves the right to inspect test report data which would have --

MR. SACHS: Yeah. Thank you.

MR. BROOKMAN: Terry.

MR. SMALL: I have one comment -- this is Terry Small -- that you might want to consider, is the idea that maybe the manufacturer be allowed to obviously have the choice of testing each model. Other possibility might be to use an AEDM, perhaps, to rate models. Just a thought, if you've considered that, or would consider that as part of your rulemaking.

MR. WESTPHALEN: I'm not aware that there has been discussion as part of the discussion specifically on this test procedure development regarding allowing AEDMs. But I would imagine that's something that DOE could consider. And certainly if your written comments could elaborate a little bit more, that might be helpful.

MR. KHAN: This is Mohammed, DOE. Detlef just kind of took the words out of my mouth. And I'm sure that you will submit comments, and I hope

that you could elaborate on that option, explaining what potential benefits there would be, right, versus the burden that's involved. What kind of measurements are there going to be to try to validate such a program, how reliable it's going to be, so forth and so on. Those are the kinds of things that DOE would need to be able to consider in making that kind of determination.

MR. BROOKMAN: Charlie.

MR. STEPHENS: Charlie Stephens. I just would add that we have done quite a bit of laboratory testing of heat pump systems, which obviously involve the air handlers, and it involved testing the air flows, and we were quite pleased that we were able to validate pretty much all the manufacturers' fan curves, as well as their ratings in the lab. So we -- whatever the manufacturers are doing to measure the air flow and develop their fan curves seem to be what we found if we went to measure the same things, almost across the board. So I don't -- we're not very discouraged with what the manufacturers produce in their own literature. So we know it's possible, and when we actually go to measure it, we get the same numbers, oddly enough, which is encouraging to us.

So I think this is actually already happening in some places. And as hard as it is to measure, we must be measuring pretty much identically to the manufacturers. We had four different manufacturers' equipments in the lab, and several different capacities, and we didn't really find anything off the mark when we were doing our own work. So somebody's doing fairly consistent work out there, and I don't have any reason to suspect that we couldn't continue that.

MR. BROOKMAN: Dave.

MR. WITTINGHAM: Just a comment on that, and I think the manufacturers do make every effort to publish accurate air flow data. But when you look at something that's held to a 97.5 percent tolerance limit, it's a completely different row. And that's what this is advocating.

MR. MESSMER: And Charlie, it's Craig. I can echo that, that's the challenge. What is that confidence limit? And we test per AMCA standards as described there. We have oftentimes testing in comparison to the manufacturers, and occasionally there are differences in the amounts that are given, and we test, you know, hundreds if not thousands of units annually, and I would just say that I would

have a very strong problem with meeting anything close to 97 percent.

MR. BROOKMAN: Let me inquire on this point, because I think Aniruddh referenced a number, but maybe it's late in the day -- I thought that's all I heard. Would the two of you suggest what the confidence level should be?

MR. WITTINGHAM: Well, I think -- this is Dave with Allied -- I think at the high side, it's probably a 90 percent confidence limit. I mean that's what we have in place for the air conditioning side. But actually, I think there's some work that would need to be done to validate repeatability of this over a section of products before I could give a full answer to that.

MR. BROOKMAN: Frank?

MR. STANONIK: If you could go back to the slide that actually has the FER calculation -- I don't want to use it as an illustration, but that one, yes. I mean, one of the byproducts of the very -- the current significant discussion going on about certification and enforcement is that at least our members have certainly become quite a bit more appreciative of the significance of the confidence limits. And I think because of that, to answer a

question like this, as Dave mentioned, we probably would want to do -- try and do a much more rigorous, I call it, air analysis, to come up with let's call it a documented number, as opposed to the historical practice, which was kind of, yeah, that kind of looks good. I'll just tell you, I'm not aware of any data that supported any confidence limits for any of the equipment that we deal with today. They were just numbers that seemed to fit.

But in this case, if you're looking at, you know, you've got, as an example, you've got the Emax of the cooling hours, you've got the -- you have at least three electrical measurements, and then you have the air flow measurement.

PARTICIPANT: I don't mean to interrupt, but there's actually nine measurement points that are being proposed, and then there's a curve fit based --

MR. STANONIK: Okay. So you have nine electrical -- okay, nine electrical --

PARTICIPANT: Nine measurements.

MR. STANONIK: Nine measurements and in terms of what's done today, okay, so it makes some reference to -- well, today we measure electrical consumption on a furnace at the same confidence

limits. Well, yeah, but again, that's kind of -- because that's the cards we were dealt. But especially for something like this, we can't answer your question right now because we're probably going to have to look and say, try and do to the best of our skills here and maybe we hire some outside skills, a true air analysis and say, okay, if I had to do this like in this manner and really account for all the possible measurement errors, what does the confidence come out at? And I have no idea. Well, I'll take that back. I'm pretty sure it's not going to be 97.5 percent confidence limit.

MR. BROOKMAN: Can you do it fairly quickly, Frank?

MR. STANONIK: Not me, but if we need to, we can probably find somebody that can.

MR. BROOKMAN: Do you have --

MR. STANONIK: Well, I'm sorry, Doug. The key is going to be identifying what we would agree are reasonable errors on those measurements.

MR. BROOKMAN: That's what I was thinking. And I was wondering if you have the kind of specification here in math form that now allows you to check against these formulas and the like.

MR. STANONIK: I'm going to defer to

Aniruddh here, because he's been talking to the manufacturers about this one more than I have.

MR. ROY: Aniruddh Roy, AHRI. I'm not sure if we'll be able to come up with a proposal by the comment deadline, but I would encourage DOE that, in the final rule, to at least perform a study rather than just refer to part 429.18 because that pertains to furnaces, and use that as a justification for the confidence limits for electrical measurements, because it's significantly different, as you've heard from everyone over here at the table, it's significantly different from the AFUE calculation.

MR. WESTPHALEN: Sure.

MR. BROOKMAN: Charlie, and then to -- go ahead.

MR. STEPHENS: Harvey first.

MR. BROOKMAN: Yeah, Harvey first.

MR. SACHS: Harvey Sachs, ACEEE. I just want to caution us that we're using the terms confidence interval and even error analysis somewhat loosely. There is a significant danger that we start talking about confidence bands that are two-sided, and we are adamantly opposed to punishing a manufacturer for putting out a product that performs

better than it's certified to do. So it does matter in terms of the confidence intervals, whether we're doing a one-sided or a two-sided error analysis.

MR. BROOKMAN: Okay. Charlie.

MR. STEPHENS: Yeah, Charlie Stephens. In our work in the HVAC world, we strive for a 90 percent confidence interval, and we're generally quite happy with that unless we can identify a potential source of systematic bias. In which case we may try to go for 95 percent. We never look for more than 95, but 90 we find in our work for predicting equipment performance, is adequate because by the time you pile on application-specific factors, those things are washed out. So we'll see. I'm optimistic that we can get to 90 percent, but I wouldn't be pushing very hard for anything more than that.

MR. BROOKMAN: Okay. Thank you. Jim Vershaw is on the line. Jim, you're next.

MR. VERSHAW: To Charlie who mentioned, though, that manufacturers were doing a good job was exactly why we use ASHRAE 37, not 51. In terms of confidence level, 97.5 is going to be … if the motor were --

MR. BROOKMAN: Jim, we're really losing

you now, try something different here.

MR. VERSHAW: Is this better?

MR. BROOKMAN: No -- keep talking, let's try it.

MR. VERSHAW: Okay. If you do -- 97.5 isn't going to work, 90 might, but I haven't got data to prove it, but I know 97.5 is going to take at least three samples of everything to make the numbers come in line.

The other big issue that we have with DOE certification versus enforcement is that the certification rules are different many times than the enforcement rules, and in many cases the tests that you use to get your certification would actually fail the enforcement. So a lot of work has to be done there in order to get that pulled together. Thank you.

MR. BROOKMAN: Thank you. We got all of that, that came through clear. Thank you. Okay. So additional comments on these points? Did you have anything else you wanted to cover, Detlef, on this series of issues?

MR. WESTPHALEN: No, I think it was just the one slide plus the request for comment, and we move on to closing remarks, which I assume --

MR. BROOKMAN: Yes. The Department of Energy, as is typical, has made a Xerox copy of the business cards of attendees, and also I'm going to hand out this evaluation form. Please take a few moments to fill it out.

And as Detlef mentioned, now is an opportunity for anybody that wishes to do so to make closing remarks, raise issues that you don't think have been adequately covered during the span of the day. Terry first.

Closing Remarks

MR. SMALL: Terry Small with Mortex. I'd just to just make two comments in general, and one of them being just the cost for particularly the small manufacturer to be able to perform all the necessary testing on what would be a, maybe, a small volume of actual units being sold in a given year.

So Greg has just kindly reminded me that a true AMCA certified unit, you can have them build a wind tunnel for you -- it's about eight, ten feet in diameter and 40 feet long or something, looks like a rocket ship. I'm wondering that if we do an error analysis, and we look at the sensitivity, or maybe accumulate tolerances and all that, if there's any possibility we could possibly look at maybe a

different way to get the CFM value. Maybe more in the line with a temperature rise calculation, you know, like could be used in the field, would be used in the field, which might be substantially quicker and thus less expensive. Maybe require less capital equipment. It would be probably much more achievable for a smaller manufacturer.

And I guess that I'm just thinking back to all the field data that was on external static pressure that was collected. I'm assuming that how was the CFM information developed on all of the field data? Was that just with a hot wire anemometer or a for velocity, or how was all the -- or how was the CFM, on a temperature rise basis?

MR. BROOKMAN: Charlie.

MR. STEPHENS: No, just -- we use what's called a twofold plate that actually slides into the filter slot in the unit, and it's proven to be pretty accurate. It's been verified against laboratory measurements to be very close.

MR. SMALL: For CFM measurement?

MR. STEPHENS: Right, for CFM measurement.

MR. SMALL: And of course I'm embarrassed to say I'm not really aware of that particular device, but for instance, could a small manufacturer

use that device in our lab without having to buy $140 or $200,000 AMCA-certified wind tunnel to get the measurement? I guess my closing comments are that I think if you're making tens of thousands of each model a year, you can amortize the cost to do all this testing, you know, as Jim Vershaw was saying, it looks like to him at 97.5 percent confidence level, you'll have to do probably at least three tests per model. For a manufacturer that's making a few hundred of a particular model a year, that will be absolutely prohibitive. So we might as well just -- we'll have to drop the model, drop the models or whatever, do something different. Thank you.

MR. BROOKMAN: Harvey Sachs.

MR. SACHS: Terry, my other role was a small manufacturer, although not this industry. I think if you check in with AHRI and Craig Messmer sitting next to you, the advocates, I think, have a pretty good record trying to find ways that small manufacturers can compete fairly, and niche products can compete fairly. And we're all ears. We didn't come to the table to try to put you out of business.

MR. SMALL: Terry Small again. Well, you know, I'm thinking that what came to my mind was,

you know, we all have a furnace stand and then using a temperature rise methodology to get CFM value at low speed and a CFM value at high speed. Certainly you calculate into a CFM value that could be used in the formula. And I don't have a feel for the repeatability or the accuracy. But certainly something like that, running two or three tests would be not that much of a problem in coming up with something that looked like it was, you know, when you lay out the -- or you do the formulas, tied with a reasonable confidence interval, maybe 90 percent, I think could be maybe very feasible for the smaller guys. But I'm just not sure about -- the way the NOPR is written exactly, whether it's going to be feasible for the smaller manufacturers.

MR. SACHS: Harvey Sachs again. There are various waiver procedures, and I certainly don't talk ever for DOE, but there are ways of doing the combination. I hadn't thought about temperature rise, but when you brought this up what occurred to me was put a long duct in front of the unit and a flow hood. So a flow hood and an electrical measurement and, you know, you might make me happy. I don't know if you'd make DOE happy.

MR. SMALL: This is Terry again. I'm

thinking that if, you know, we're talking about the test procedure here. We're getting ready to put the test procedure in concrete. I'm wondering if it could be demonstrated by a small manufacturer that we could get good results with something that's not a $200,000 AMCA wind tunnel. Would there be -- and we could show DOE maybe that we could even validate our model and we could use that to perhaps, on an AEDM, to simulate. I just wonder if DOE would consider that as another option or possibility.

MR. KHAN: This is Mohammed Khan, DOE. And I actually planned to say what I'm about to say at the very end anyway, but. Those kinds of ideas, alternatives to what has been presented and proposed here today, is something that we want to hear about. So in your comments summarizing many of the comments that you've already made here today, in addition to that, maybe you could include any kind of alternative approaches that you think would be very viable, make more sense, less burdensome, more cost-effective, then we certainly want to know about it. So it's something that we will, in fact, consider. So please submit that.

MR. BROOKMAN: Eric Stas.

MR. STAS: I have one follow up question

for you. You talk about buying a wind tunnel. What if you go to the third party testing and use somebody else's wind tunnel and you all share it kind of thing? How much do the costs drop in that situation?

MR. SMALL: Well, Eric, we did some very preliminary -- you know, we haven't really had a lot of time to get ourselves organized for this, or at least my company hasn't. And so we -- just to give you an idea, we started out, we just listed all the various models and all the possible capacities of heating device in the model. And we've got four or 500 models, and this is at the first pass. And we were thinking also, it might take a day if we did it ourselves, but it would take a shift if ITS, if a third party did it too. And so you're looking at a lot of testing.

Now, we make an electric furnace that has a bunch of different capacities of strip heaters, you know, five kw, eight kw, ten kw, 50 kw -- and quite frankly, I don't believe that the FER value is going to be any different, depending on how many heating elements -- I'm talking about electrical heating elements -- that you're inserting into the furnace. So maybe instead of 400, we might be

looking at 100, but you're still looking at a tremendous amount, whether you paid -- if you paid an outside third party, you'll have estimated about $2000 I believe here, so that would certainly be a couple of hundred thousand dollars. It's going to be expensive, one way or another.

The problem is, if we were selling several hundred thousand units a year, then you're looking at, you know, a fairly small amount per unit. But if you're selling 5000 units a year, or 2000, and you have all these different models -- by the way, we build our products strictly to order. So we wait for the customer to order it. We have a lot of options. Some of the kw's on an electric furnaces we probably never built. But it's there in the catalog if they wanted, you know, a seven kw, we could make that. So you're going to force us to have tested the 7 kw even though we may never sell it. Because I doubt if you would want us to take the order first and then test it later.

So I think for the smaller -- I think for smaller manufacturers, this could be problematical, and I don't necessarily think, you know, it's not going to add anything to the consumer, really. In fact, It may take somebody like us off the market,

you know, who will do the odd combination of heating devices and all that. So I just think that ought to be taken into consideration. We'll make some comments on it.

MR. BROOKMAN: Thank you. Aniruddh.

MR. ROY: Aniruddh Roy, AHRI. I just want to supplement what Terry said in terms of the manufacturer testing burden. With regards to furnaces first, and then I'll expand it to other products. For the longest time, furnaces, you know, the federal descriptor was the AFUE metric. The AFUE metric is still there, but now, manufacturers are also subject to standby and off mode requirements, and you have the FER rating, which is specified at different static pressure measurements outside of ASHRAE 103 and federal test procedure. And of course you have the air flow measurements also which are required in order to establish the FER metric.

In addition to that, manufacturers have to conform with what's going on in Canada for the furnace fan rating which is a totally different metric, so that's going to add an additional burden.

We encourage DOE to try and harmonize and create a metric which essentially can be used all

over North America, not just in the US. And also consider the confidence limits. Because now if manufacturers are required to conform with the 97.5, there are other products that have confidence limits that are different, and so that could also pose an additional test burden overall on manufacturers. So those are our closing remarks.

MR. BROOKMAN: Thank you. Additional closing remarks? Yes, Frank.

MR. STANONIK: Frank Stanonik, AHRI. It's more a question then, just because I lost track of it. Obviously we're going to be interested in sharing the slides with members who weren't here, a copy of slides that does have the equations on it will be available where?

MR. KHAN: Mohammed Khan, DOE. Frank, perhaps you may have come in -- I think you came in a little bit late, and you may have missed my comment about that problem. First, I apologize that the printing came out the way it did. But on the DOE web page the presentation is there, so you can -- it is available, yes.

MR. STANONIK: Very good.

MR. BROOKMAN: Yes, Craig.

MR. MESSMER: Craig Messmer. First, I'd

like to thank the Department for having this meeting. I thought it was pretty good from my perspective. I thought I was heard. I'm just going to leave it with this. I hope this is not the last time we have a chance to have an input into this test procedure, that July 30th isn't the last time we get asked what do we think. Thank you, and see you again.

MR. BROOKMAN: Thanks. Harvey Sachs.

MR. SACHS: I'd like to thank everybody, but particularly Jim Vershaw who put up with this awful system for a whole day.

MR. BROOKMAN: Dave, then Greg.

MR. WITTINGHAM: Again, I would like to thank the Department and everyone for their participation. I think the number -- most of the topics have already been touched upon. The burden is obviously a sensitive issue with the manufacturers as well as the tolerance enforcement criteria. But I think I would strongly recommend that whatever the Department look at, as we look at a possible modification that allows integration of this test procedure with existing AFUE or a modification of that test, that when a unit is being tested, you can pick up another point or two, if E-

sub-b is not sufficient, to pick up another point or two within that test process, without forcing another whole test setup to gather the data. I'd appreciate it.

MR. BROOKMAN: Thank you. Greg.

MR. WAGNER: I too would like to echo the thanks. It's been an enjoyable day. I also thank the Department of Energy for ensuring job opportunities for fan guys like myself in the future. And Mrs. Wagner thanks you for that as well.

Seriously, this is a good process. I would ask that you take a look at some of the proposals that have been put forth to try and reduce the amount of burden of testing that goes with adding a new metric. I think what the goal is to get some measure of what that furnace fan performance is, can be accomplished well within what's being done today, in a manner that is useful and consistent, to be able to distinguish between good products, poor products, and to drive energy efficiency going forward.

And from there, output, after you figure out what the test method is, then you can start putting some idea around what the confidence levels

would be, as someone indicated earlier, without really knowing what these test process is, there is a lot of uncertainty about the measurements, not just the process itself.

With that, I echo what Craig said. I hope this is not the last opportunity to make the comment in addition to our written comments, because I think there is a huge opportunity here to put forth a good test standard that would be a limited amount of burden, but a great deal of useful information for all involved.

MR. BROOKMAN: Thank you. Final comments? So then, for my part, I will just thank you. I thought we had a very, very constructive day, and I'll turn it back to Mohammed for closing remarks.

Closing Remarks from DOE

MR. KHAN: Mohammed Khan, DOE. I'm just going to say thank you. We heard a lot of comments and opinions which I think the Department certainly appreciates. And I'm also going to reiterate the fact that, again, your comments are important. We need to have them. And when you submit those comments, please be sure to include in detail, additional alternatives that we heard, we touched on today. And I can assure you that we will consider

them in full. So with that --

MR. BROOKMAN: We should thank those that joined us via the web.

MR. KHAN: Absolutely.

MR. BROOKMAN: And hope this worked for you and the Department's always looking for ways to improve access to these proceedings, so let them know about that as well.

MR. KHAN: Thank you.

MR. BROOKMAN: Safe travels to everyone.

Applauds(Whereupon, at 3:53 p.m., the meeting in the above captioned matter was adjourned.)

REPORTER'S CERTIFICATE

This is to certify that the attached proceedings before:

U.S. DEPARTMENT OF ENERGY

In the Matter of:

NOTICE OF ROPOSED RULEMAKING PUBLIC MEETING ON RESIDENTIAL FURNACE FANS TEST PROCEDURE

Were held as herein appears and that this is the original transcript thereof for the file of the Department, Commission, Board, Administrative Law Judge or the Agency.

Further, I am neither counsel for or related to any party to the above proceedings.

Wendy Greene

Official Reporter

Dated: June 20, 2012