UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

PUBLIC MEETING ON TEST PROCEDURE NOTICE OF PROPOSED RULEMAKING FOR LIGHT-EMITTING DIODE LAMPS

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P R O C E E D I N G S

MR. BROOKMAN: Good morning everyone and welcome. This is the U.S. Department of Energy's public meeting on the Test Procedure, Notice of Proposed Rulemaking, for Light-Emitting Diode Lamps.

Today is Thursday, May 3rd, here at the Department of Energy in Washington, D.C. My name is Doug Brookman from Public Solutions in Baltimore. So glad to see you this morning. We're going to start off this morning with welcoming remarks from Lucy deButts.

Welcoming Remarks

MS. DEBUTTS: Good morning, everyone. My name is Lucy deButts, and I represent DOE as a lighting team project manager. And today our primary focus is to present the LED test procedure NOPR, and open the dialogue between the industry and DOE in developing this rulemaking. We are looking forward to your input and your cooperation in developing this rule.

And at this point, I'd like to turn it back to Doug Brookman, our experienced facilitator, for some ground rules and going over the agenda.

MR. BROOKMAN: Thank you. And we'll do introductions first, though, as our tradition. Please

say your name and organizational affiliation. You can also get used to turning on these microphones, and getting them fairly close.

Introductions

MR. TUTTLE: Thank you. My name is Ralph Tuttle. I am with CREE in Durham, North Carolina.

MR. BROOKMAN: Thank you.

MR. CHIPALKATTI: Good morning. I am Chips Chipalkatti from Osram Sylvania in Danvers, Massachusetts.

MR. SZOMBATFALVY: Hi everyone. This is Dave Szombatfalvy from GE Lighting located in Cleveland, Ohio.

MR. GREEN: John Green with Cooper Lighting in Georgia.

MR. COOK: Keith Cook with Philips Lighting, here in D.C.

MR. BROOKMAN: I like that people are saying where they're from. I like that part. You're next.

MS. BURNS: Jennifer Burns, Philips Lighting, here in D.C.

MR. BOESENBERG: Alex Boesenberg, National Electrical Manufacturers Association, D.C.

MR. HAKKARAINEN: Pekka Hakkarainen with Lutron Electronics, Coopersburg, Pennsylvania, also

chairing the NEMA Lighting Systems Division this year.

MS. HORNER: Pam Horner with Osram Sylvania out of Danvers, Massachusetts.

MR. GELDER: Austin Gelder with ICF International out of Washington, D.C.

MR. CHRISTENSEN: Adam Christensen with Appliance Standards Awareness Project here in D.C.

MR. DUFFY: Mark Duffy with GE Lighting out of Cleveland, Ohio.

MS. THAKKAR: This is Mansi Thakkar with Navigant Consulting out of D.C.

MR. WALKER: Matthew Walker with Navigant, D.C.

MR. MARANTAN: Aris Marantan, Navigant, D.C.

MR. BROOKMAN: Okay. Thanks to all of you. Everybody get a chance – one person did not get a chance to introduce himself.

MR. BRODRICK: Jim Brodrick, DOE, Solid State Lighting.

MR. BROOKMAN: We were just talking about you, Jim. All of you received a packet of information as you came into the room, and hopefully handed a business card to Brenda Edwards.

Agenda Review

MR. BROOKMAN: Included in the packet was

the agenda, which I'm going to run through very quickly. Immediately following this agenda review and a brief overview from Lucy, there's an opportunity to make opening statements, to raise issues that are important to you at this stage in the rulemaking procedure.

Following that, we will dive straight into the content. You can see it listed there -- test procedure for input power, lumen output, and correlated color temperature, CCT.

We'll take a break mid-morning, round about 10:15 or so, following the break, test procedure for rated lifetime and then questions and closing remarks. At the end of the day, close to noonish perhaps today, there's yet another opportunity to make comments that are important to you. So there are a lot of opportunity, not only to comment on the detailed PowerPoint slides that you all have, but at the end of the day as well, so let's make sure you get said what you came here to say.

I'd ask for your consideration. Please, if you would, speak one at a time. Please, every time you speak, say your name for the record. There will be a complete transcript of this meeting posted on the DOE website. I'm going to be cueing individuals by

name as best I can. I also wish to encourage follow on comments. Sometimes the back and forth between individuals is very helpful to the Department as they try and interpret what you're saying.

If you can keep the focus here. Please turn your cell phones on silent. And limit sidebar conversations. You all have gotten used to using these microphones now. They work better than they used to in the past. And if you can be concise, share the air time, then that will be beneficial. That'll be good for all of us.

Questions or comments here at the outset before I turn it back to Lucy? I see none. Lucy.

Overview

MS. DEBUTTS: All right, so Doug already went over the agenda. Going to the webinar situation. So today's public meeting is being broadcast over the internet and those stakeholders that cannot attend in person can listen in and follow the slides as we go along. The webinar's participants, unfortunately, will not be able to talk to us due to the sound system limitations. The microphones are better but the system is not necessarily working all the time, unfortunately. However, they can use the chat or questions feature on the webinar software to patch in

their questions or remarks, and the webinar facilitator will be reviewing them with the help of the Navigant consultant, and if there are any questions that we want to address, we will definitely read them and address them in the room.

All those questions are going to be made part of the transcript today and will be published on the DOE website and be made part of the docket. We will try to address all of the questions that we receive today, time permitting, and so please don't be shy, and provide us with your input as much as possible.

We understand that the complicating technology of solid state lighting so we are looking for you to assist us in developing this rulemaking.

And last, but not least, just like I said, the transcript is going to be made available as soon as we get it back and we'll post it on the web. However the presentation and the Notice itself are already on the web on DOE website, and is readily available to everyone.

So, as I stated earlier, the purposes of this lighting meeting is to present the LED lamps test procedure and begin the conversation with the industry. Mansi Thakkar with Navigant Consulting will

help DOE in presenting part of the test procedure. We will discuss the rulemaking itself and the information collection for the next step of the rulemaking. And we're very interested in all of your remarks, not necessarily just those that will be addressed during the presentation. Obviously, there are other issues and please help us in discussing everything that you feel that should be addressed.

If you disagree with DOE's approach, we would really appreciate the alternative solutions that you may provide to us.

So as for the issue boxes, you will see issue boxes like these throughout the presentations. These boxes highlight specific issues that would like to be addressed. The item numbers in these boxes are not necessarily in numerical order throughout the presentation, however, we arranged them in a way that is useful for the presentation itself. So what I mean is you may see the item number 20 discussed before the item number 11, for example. It's not because we don't know how to count, it's just to help us to present.

As far as the deadline for comment period submission, we have it due on June 25, 2012. So we will appreciate all your written comments to be

submitted by that date. And at this time, I would like to invite opening remarks.

MR. BROOKMAN: Thank you. We wish to invite opening statements from anybody that wishes to do so. Would you like to introduce yourself? Please, hit the microphone, turn it on, say your name and organizational affiliation.

MS. JENSEN: I'm Kate Jensen with Steptoe and Johnson, representing Acuity Brands Lighting.

MR. BROOKMAN: Thank you. Okay. So let's start with opening remarks, brief summary statements about issues that matter to you. Yes, please, Ralph.

Opening Remarks

MR. TUTTLE: In order to follow the rules, I have to introduce myself again, apparently. I'm Ralph Tuttle. CREE just wants to thank the Department of Energy for the opportunity to work with you all on this rulemaking. We have a long history of working with the Department of Energy and also working with our associates in the lighting industry and I think we can pretty quickly come to agreement on how to proceed.

Other than that, I will hold any comments until we go through each of the issues individually. Jim Brodrick, it's good to see you again.

MR. BRODRICK: Thanks.

MR. BROOKMAN: Thank you. Alex. We expect it, and we like it. Go ahead.

MR. BOESENBERG: I'm Alex Boesenberg with the National Electrical Manufacturers Association. Many of my members are present today. Of course, we thank the Department and the meeting room facilitators here and everybody for this opportunity. As is often the case, our comments are still developing, so today we, whereas in some later stages of rulemaking, we might be able to rattle off a list to you, now it's more of an open idea session. But of course, we will finalize our comments and get those submitted.

The issue of lumen maintenance is one of concern to us, and we will discuss that when we get to that point in the discussion and slides today.

I have already briefly discussed with Lucy, and I will follow up with the Department, a concern we have for solid state lighting as it relates to actually yesterday's external power supplies [EPS] rulemaking. Lighting is historically its own animal, and basically want to keep it that way for several reasons. And I'll send you some more information on that and look forward to future discussions.

And lastly, as it states in the NOPR, this

ruling is for the DOE to help the FTC with their labeling program, and obviously we agree with that and think it’s a good idea, because we’re the ones who have to – my members are the ones who have to follow the labeling guidance and satisfy the FTC, and so that makes sense. We would caution the Department against, by force of habit, instituting a performance standards rulemaking for LED lamps immediately following this test procedures rule, because solid state is an emerging technology. It’s not ready to be regulated yet. We’ve said that many times in the past, and that’s still the sentiment. I think if you – well, no one wants to read the EPS NOPR if they don’t have to. It’s several hundred pages, but if you were to keyword search it, you’ll find they make mention of the fact that they had no actual solid state lighting power supply data to cite because they couldn’t find any products at the time they did their testing. I think that shows the Department has already tried, in effect, and ran up against the issue of there just aren’t that many products available and not a lot of mature product line, definitely, because products are changing every several months. And that illustrates, that’s one point that illustrates the issue, my statement that we’re not ready to regulate the

performance of those products just yet.

If the Department is concerned about poor performance and protecting consumers from opportunistic products, NEMA has undertaken a standard and has published a standard for minimum performance requirements, and if that issue is a concern of the Department, we're happy to share that standard with you and have a discussion about it and what our intent and goals of that standard are. Thank you.

MR. BROOKMAN: Thank you. Additional comments here at the outset? Nothing additional. Okay, so then let's turn to the content. Yes. Mansi.

MS. DEBUTTS: Not her yet. You're still going to hear me for a couple of seconds. All right, so at this point, I'd like to go over the rulemaking process and the scope of this rulemaking.

Rulemaking Process and Scope

MS. DEBUTTS: As far as the next steps for the LED lamps test procedure rulemaking go, we are at the NOPR stage, as we all know, and the NOPR published in the Federal Register on April 9, 2012. As I already stated, today's of course, the public meeting. As I stated, the comment period will end on June 25, 2012, after which DOE will review and consider all the comments that we receive. And currently, we plan to

publish the final rule for the test procedure by November of this year.

The scope of this rulemaking. So this rulemaking is applicable to LED lamps that fall within DOE's proposed definition of LED lamp. This definition will be found in 10CFR430.2, and it is based on the term integrated LED lamp as defined by the ANSI standard, RP-16-2010. The LED source is a lighting producing component within the LED lamp. LED lamp is intended to connect directly to the brain circuit through a corresponding ANSI circuit, and these integrated lamps comprise of LED source, which could be LED component or LED module. LED driver and ANSI standard base and other optical, thermal, mechanical or electrical components such as phosphor layers, insulation materials, fasteners to hold components within the lamp together, and electrical wiring.

So at this time, I would like to ask for your comments on both, proposed scope and the definition of LED lamp.

MR. BROOKMAN: Pekka.

MR. HAKKARAINEN: Pekka Hakkarainen. Just on the previous slide you said that the final rule will be published in November. When would be the

effective date? Immediately or at some future time?

MS. DEBUTTS: It's going to be – well, the effective date is going to be the publication date, and the compliance date is going to be some time away.

MR. HAKKARAINEN: Normally, I think we are used to having a three year period before effective date is set.

MS. DEBUTTS: With the compliance date you're talking about.

MR. HAKKARAINEN: Yes, with the compliance.

MS. DEBUTTS: Right.

MR. HAKKARAINEN: So it's three years?

MS. DEBUTTS: Mansi, can you help me on this one? I don't have the --

MS. THAKKAR: This is Mansi Thakkar. So the compliance date will actually be dependent on when FTC adopts this rule, so after DOE makes this rule final, FTC will have to adopt this rule and state that stakeholders have to use this test procedure to test LED lamps.

MR. BROOKMAN: And do you anticipate some timeframe? Is it typically going to be a couple of years? Would it be quicker? Do you know?

MS. THAKKAR: I don't know what FTC's timeline would be, but –

MR. HAKKARAINEN: So how is the effective date going to be determined, then. Is there a process for determining that?

MS. THAKKAR: Well, when FTC – when DOE comes out with the test procedure, FTC has to use it for the labeling requirements. They need to adopt that test procedure. So we, even though we don't know the timeframe right now, I guess it's not going to be immediate. So I can follow up and see, you know, cooperate with FTC and see what their plan is. Unfortunately, I cannot answer that question right now about the timeframe. But they're going to be some time between the issuance and the adoption.

MS. KOHL: Lucy, this is Betsy Kohl from GC. I just want to add, the FTC would have to do a rulemaking to adopt that, so there's going to be further process, so there'll be some time.

MR. BROOKMAN: Okay. Keith.

MR. COOK: Keith Cook with Philips. I'm a little concerned about the scope. I thought that the purpose of this rulemaking was in support of the FTC. The FTC labeling right now is dedicated to consumer, which is a much narrower marker than the RP-16 definition of integrated LED lamps. Does this mean that the scope is beyond what the FTC labeling

requirements.

MR. WALKER: Matthew Walker, Navigant. The idea is that this test procedure scope is established broadly to match what's in the ANSI RP-16, but then later, when FTC would adopt this test method, they would establish a – their own scope of applicability for their own labeling requirements. So rather than DOE anticipate what FTC would need for their scope, the idea is to let FTC make that determination when they adopt the test method.

MR. BROOKMAN: Matthew, do you anticipate that FTC is going to focus on consumer products, or do you know what they're thinking?

MR. WALKER: I mean I probably shouldn't speculate on what they would be able to do, but I would say that you could look at what FTC's current definition of general service LED lamp is to have an idea of where they stand at this point in time.

MR. BROOKMAN: So the question is on the scope and definition of LED lamps. Comments? Additional comments on that? Nothing additional. Okay.

MS. DEBUTTS: Well, without further ado, Mansi Thakkar with Navigant will start on the test procedure part.

Test Procedure for Determining Input Power, Lumen Output and CCT

MS. THAKKAR: Thanks, Lucy. Good morning, everyone. I'm Mansi Thakkar from Navigant, and I will be presenting the next two sections that discuss the test procedure for determining input power, lumen output and CCT, as well as the test procedure for determining the rated lifetime of LED lamps.

Starting with the test procedure for determining lumen output, input power and CCT, DOE proposes that LM-79 should be adopted, but has included some modifications or additional information to clarify the test conditions and setup. DOE reviewed available industry standards and spoke with several industry experts and determined that LM-79 was the method being used by industry. It is also the method referenced by Energy Star in the integral LED lamp specification for testing LED lamps for Energy Star qualification.

FTC light bulb labeling rule also recommends to use LM-79 for representations on the lighting facts label.

Finally, LM-79 is the standard required by DOE's lighting facts program for voluntary

participation in the program.

Based on this review, DOE determined that LM-79 was the best approach to determine input power, lumen output, and CCT.

LM-79 specifies the test setup, test conditions, measurement instruments, as well as the method of taking measurements for LED lamps. Of these specifications, the items listed on this slide have been adopted exactly as specified.

MR. BROOKMAN: Slow down a little bit.

MS. THAKKAR: Okay. Sorry. DOE now requests comment on the proposed incorporation of LM-79 to determine lumen output, input power, and CCT, and specifically these conditions that are being adopted exactly as specified.

MR. BROOKMAN: You can see issue box 2, and you can see the various elements that they'd like to receive comment on. Alex, is that you? Next? No? Pekka.

MR. HAKKARAINEN: Generally speaking, I think that the industry is in agreement with this.

MR. BROOKMAN: Okay. Thank you. Do we a have any more specific comments? Nothing additional. Okay.

MR. WALKER: This is Matthew Walker,

Navigant. We did have another comment from the webinar that refers back to the first issue. The question was, “what lamp types and bases are included within the definition of integral LED lamp, examples being PAR, R, medium, mogul, candelabra, pin bases?” I think our response is the definition in RP-16 would include all types of bases and I guess I’d refer back to the point that I made earlier that FTC would redefine the scope of their labeling rule at the time of adoption of this test method.

MR. BROOKMAN: Can you say who wrote us from the web? We wanted to identify who sends in the questions.

MR. WALKER: Michael McGaraghan.

MR. BROOKMAN: Great. Thank you. So we’re going to try, as Lucy said, to include comments and questions from those joining us via the internet. So you may proceed.

MS. THAKKAR: Any other comments on issue 2? So the first topic for discussion is air movement. As mentioned on the previous slide, the air movement requirement is being adopted without any modification from LM-79, which states that the air flow during testing LED lamp should be such that the normal convective air flow induced by the lamp is not

affected. While this requirement is proposed in the NOPR, DOE considered whether additional specifications should be provided to determine air movement. For example, IES LM-9-2009, which is the standard for determining the electrical and photometric characteristics for fluorescent lamps, provides a test to determine that the environment is draft-free. It requires a single ply tissue paper to be held in place of the lamp to observe, usually, that the environment is indeed draft-free.

DOE requests comment about whether the LM-79 specification is sufficient or whether more information should be provided to determine the air movement.

MR. BROOKMAN: Keith.

MR. COOK: This is case of let’s not over-specify. We don’t have to. This test, as silly as it sounds, has been an accepted industry practice forever, and it’s well understood. I’d say let’s just continue with it.

MR. BROOKMAN: Okay. Thank you. Do we have additional comments? Chip?

MR. CHIPALKATTI: This is Chip Chipalkatti. Yeah, the air flow, I agree with Keith on this, not over-specify because there might be cases where

there's active cooling fans, and that can affect the whole air flow situation.

MR. BROOKMAN: Okay.

MR. WALKER: Matthew Walker, Navigant. Just to be clear, your over-specify – don't over-specify, stay with LM-79 specifications? Don't add LM-9 specifications?

MR. COOK: Yeah, the issue is whether air movements should be specified in more detail, and I'm saying no.

MR. WALKER: Okay. Just clarifying.

MR. BROOKMAN: Okay. Thank you, Keith.

MS. THAKKAR: Okay. Thank you. Moving on to lamp orientation. DOE is not proposing LM-79 specification for lamp orientation. DOE understands that while the light emission process of an LED source is not affected by the orientation of the lamp, the thermal conditions for the LED sources could be affected by orientation, which in turn would affect the light output. Given this impact of orientation on thermal effects within the lamp, DOE's view is that it is important to test the lamps in specific orientations. However, LM-79 does not specify an orientation, and instead states that the lamp should be tested in the orientation recommended by the

manufacturer for the intended use of the lamp.

DOE is not proposing this requirement because on reviewing manufacturer catalogs, DOE has learned that the operating orientation is usually not specified by the manufacturer. Therefore, DOE is proposing that an equal number of lamps should be operated in the base up, base down, and horizontal orientations.

In issue 4, DOE requests comment on the proposed lamp orientation requirements.

MR. SZOMBATFALVY: This is David from GE. We believe that testing base up and base down would be enough with respect to understanding what the lamp's capabilities are, because in between you're going to get – you're not going to gain any value by testing the horizontal position. And in addition, you're going to have additional uncertainty in the measurement values between the goniometer and the sphere in the horizontal position.

MR. BROOKMAN: Okay. Thank you. Keith.

MR. COOK: Keith Cook. Yeah, I agree with that. I think we may be confusing technologies here. HID is absolutely dependent upon the orientation, but not so much with the solid state lighting. And so I think we're again over-specifying if we go to three

position testing.

MR. BROOKMAN: Thank you. Additional comments? Okay.

MS. THAKKAR: Okay. The next topic is the electrical settings requirement, and there are two issues to discuss here. The first issue is input characteristics. DOE proposes that the LED lamp should be operated at the rated voltage during testing, as specified in LM-79. Further, for lamps with multiple operating voltages, DOE proposes that the lamp should be tested at 120 volts, if it is rated for 120 volts, or at the highest rated voltage.

120 volts was selected because it is the most common operating voltage of available lamps, and especially if the lamps that are in FTC current labeling scope. For LED lamps, DOE proposes that the lamp should be operated at the maximum input power as specified in LM-79.

The second issue for discussion under electrical settings is lamps with multiple modes of operation. LM-79 specifies that if a lamp has multiple modes of operation, such as variable CCT, it should be tested at the different modes. In its research of manufacturer catalogs, DOE did not come across any lamps that functioned at multiple modes of

CCT, and requests more information about these products.

In issue 5, DOE requests comment on the voltage and dimming requirements as well as the availability of lamps that operate at multiple modes of operation.

MR. BROOKMAN: Chip.

MR. CHIPALKATTI: Chip Chipalkatti. I'm curious, when you say multiple modes, do you mean variable CCT as a mode, or do you mean every CCT that it's possible to go to?

MS. THAKKAR: I think the way LM-79 specifies it, it's a lamp that's intended to work at two or maybe more different CCTs.

MR. BROOKMAN: So multiple modes means different CCTs?

MS. THAKKAR: Yes.

MR. BROOKMAN: Keith.

MR. COOK: Keith Cook. Yeah, I think when LM-79 was written, the intent was just to leave flexibility there. We know that technically, it's very feasible to do this, the trouble is trying to identify a market need that creates the product. But all we're doing is leaving the flexibility for future development, and so that's, I think, the sole intent

behind it.

MS. THAKKAR: So I have a follow up question to that. For those lamps in the future, would you recommend that it's tested at each CCT that it can operate on?

MR. COOK: Again, it depends upon the intent. What you're trying to accomplish with the test. Typically, there is a difference in efficacy as you go to different CCTs, so if you chose the worst efficacy, if that's what you're looking for, you don't have to run the one test, you wouldn't have to run multiple.

MS. THAKKAR: Okay.

MR. BROOKMAN: Mark, do you want to comment here?

MR. DUFFY: Yeah, this is Mark Duffy of GE. There is a very distinct possibility that this would be a continuously variable CCT. So to say something like I want to test them all, would be an impossible thing.

MS. THAKKAR: Right.

MR. BROOKMAN: Chip, you want to add on?

MR. CHIPALKATTI: Yeah, that was exactly the reason for my question. Because it's foreseeable that there'll be lamps at variable CCTs, continuously

variable, variable CRIs, variable lumen outputs and so on. You couldn't possibly test every one of them.

MR. BROOKMAN: So what should DOE do here?

MR. CHIPALKATTI: I think I like the idea of looking for the most extreme of these conditions as the baseline, so the idea of the lowest efficacy might be –

MR. BROOKMAN: Should they specify it as the lowest efficacy, or should they say something else?

MR. COOK: This is probably something we need to take off line. There's a lot of different permutations. Testing at the worst possible efficacy for a setting that no one would ever use anyway, that's not fair. So we'll have to discuss it and come back.

MR. BROOKMAN: Okay. Thank you. We did gain some clarity there, I thought. That was good. Are there other issues here in the issue box that you wish to cue?

MS. THAKKAR: That was the main one, but if there are any other comments on the voltage or dimming requirements?

MR. BROOKMAN: I'm just scanning through here. I guess they all roll towards that same point. Okay. So then, with no objection, then, we'll move

on. Yes.

MS. THAKKAR: Okay. The next topic is lamp seasoning. This is also an area where DOE is not proposing LM-79 specification. LM-79 does not require the lamp to be seasoned prior to stabilizing the lamp and recording measurements. However, industry has observed a hump during the first 1000 hours of operation of LED source as shown in this graph on the right. If the lamp is not seasoned prior to measurements, then depending on the time required for lamp stabilization, it is possible that the lumen output determined through testing, may be higher than the actual lumen output of the lamp.

Therefore, DOE proposes that the lamp should be seasoned for 1000 hours prior to stabilization and lumen output measurement. DOE requests comment as well as any available data on seasoning the LED lamp for 1000 hours before measuring lumen output.

MR. BROOKMAN: Ralph.

MR. TUTTLE: Thank you. Ralph Tuttle with CREE. When we initially developed LM-79, we discussed this ad nauseum. The reality is that the graph that’s shown on the right is a CREE LED – I provided that information to Eric. Not all LEDs exhibit this increase in lumen output during the first 1000 hours

of operation. I was also the chairman of the TM-21 committee, and during the development of TM-21, we had the opportunity to look at the LED behavior of products from all the major LED manufacturers. While in fact, there were some that exhibited this characteristic, there were also a lot of LEDs that in the first few hundred hours, dropped significantly. As a result, I would strongly recommend that we not include seasoning in the testing of these products.

MR. BROOKMAN: In any form?

MR. TUTTLE: In any form, that is correct. Basically, you take the product out of the box and you put it into your goniometer and you perform the measurement.

MR. BROOKMAN: You do the test. Okay. Other comments or recommendations for the Department with respect to seasoning? Keith?

MR. COOK: I’ve been biting my tongue, but – a thousand hours may not be enough in some cases, that’s a problem, because if you look at the data that the Pacific Northwest National Laboratories has published on the L price testing, it actually was 3000 hours that it went up.

MR. BROOKMAN: Which then caused that lamp to be, quote, “seasoned”?

MR. COOK: It then leveled off. But it increased for 3000 hours, so, you know, where do you draw the line? Let's just draw it at point zero.

MR. BROOKMAN: Okay. So you agree with Ralph?

MR. COOK: Yes.

MR. BOESENBERG: This is Alex Boesenberg, NEMA. This is one of those points where I would submit that this is the hazard of a regulation that restricts innovation. LED designs, formulas, are changing every day and so next month's LED might never have a seasoning, or after that, one that burns in after several thousand hours. And remember that, you know, the way we usually figure 1000 hours is three hours a day, that's a year. Seasoning for a year before we can test it? Let's not do that.

MR. BROOKMAN: Okay. Yes, please. Adam.

MR. CHRISTENSEN: This is Adam with ASAP. Just more of a curiosity question than anything. Is there a technical hypothesis about why light increases in the beginning, or decreases in some cases?

MR. BROOKMAN: Ralph?

MR. TUTTLE: It really depends on a lot of factors in the construction of the LED, both the chip as well as the lamp itself. Typically, the behavior

that you can see in this graph is due to the fact that during the construction of the LED chip and the growth of the multi-quantum layers, not all of the dopant atoms that are incorporated in the crystal structure occupy an electrically active site. Rather than being in a substitutional site in the lattice, they might be in an interstitial site. As you start to operate the LED it heats up, and those atoms will then move in the crystal to a substitutional site, become electrically active, and you will get an increase in the lumen output of the chip itself.

Conversely, when you're talking about sudden reductions in light output, oftentimes that's due to the encapsulants that are used, and changes that occur in those encapsulants as they're first heated up.

So it really depends from one manufacturer to the next on how they construct both the component itself, as well as how they process the chip. Sorry, that's kind of a –

MR. BROOKMAN: That's cool. That's a brief primer.

MR. CHRISTENSEN: That was perfect. Thanks.

MR. BROOKMAN: Okay. Thank you. I like that. So final comments on seasoning? Okay. And NEMA will submit detailed comments on this point.

MR. BOESENBERG: We'll do our best on that one.

MR. BROOKMAN: Thank you. I'm sure you will. Okay.

MS. THAKKAR: Okay. Moving on to lamp stabilization. This is an area where DOE is adopting the specification in LM-79, but has added clarification on how lamp stabilization should be determined. So LM-79 specifies that the lamp should be stabilized until the variation of at least three readings of input power and lumen output over a period of 13 minutes, taken 15 minutes apart, is less than point five percent.

DOE proposes to adopt this specification and further includes the equation listed on this slide to clarify how the variation should be calculated. That is, the variation should be calculated as the difference between the maximum and the minimum values of lumen output or input power, divided by the respective minimum value.

In issue 7, DOE requests comment on the proposed clarification for calculating the variation to determine lamp stability.

MR. BROOKMAN: Keith.

MR. COOK: Generally speaking, I think this

is just good practice. We would agree with this approach.

MR. BROOKMAN: Yes, Mark.

MR. DUFFY: Yeah, Mark Duffy of GE Lighting. Just a small matter. The equation should be expressed as a percent.

MS. THAKKAR: Right. Okay.

MR. BROOKMAN: Thank you. That's useful. Additional comments on lamp stabilization? Okay.

MS. THAKKAR: The next topic is measuring the lumen output of the LED lamp. LM-79 specifies that a sphere-spectroradiometer, a sphere-photometer, or a goniophotometer should be used to measure the lumen output of the lamp.

DOE proposes to adopt this specification and requests comment on it. In particular, DOE is interested to receive comment as well as available data about how the lumen output from each of these measurements compare.

MR. BROOKMAN: Yes.

MR. SZOMBATFALVY: This is David from GE. From our experience we show that between the goniometer and the sphere measurement, we can get like a two percent difference. What's more important is when we look at the overall average from making

measurements at one site, at one location. There's an inherent bias, because when you look at round robin measurements for NVLAP and different labs, like the GE facility, we can see like a three percent difference. So it's important that we understand what those percentages are and incorporate that in this measurement method.

MR. BROOKMAN: Between the different systems?

MR. SZOMBATFALVY: Yes, I mean, within the lab you can expect, between a goniometer and a sphere approximately a two percent difference in measure results. Whereas, if you go outside between labs, let's say NVLAP and another location, you can expect approximately a three percent difference.

MR. BROOKMAN: Okay.

MR. COOK: Actually, NVLAP has published a variation of four percent.

MR. SZOMBATFALVY: Four percent?

MR. COOK: Yes.

MR. BROOKMAN: Yes, I'm sorry, Mark, go ahead.

MR. DUFFY: Just one further comment on that regard. Between labs could become very important if you're thinking about future rulemakings, because that

actually represents a bias and not a random variation. The lab that you choose to measure your samples in will only be one lab, it will not be all of the labs.

MR. BROOKMAN: Okay.

MR. DUFFY: Okay. So as you consider any rulemakings in the future, or deciding how you're going to place values on the lighting facts label, that needs to be taken into account if you're making measurements of small quantities of lamps.

MR. BROOKMAN: Got you. Do you have any additional?

MS. THAKKAR: I have a follow up question to the four percent across NVLAP labs. Is that when you compare the same two systems, the sphere-spectroradiometer across two different labs, or is –

MR. COOK: It's not specific to spectroradiometers or goniophotometers, it is a published NVLAP percentage statistic, based on round robin testing from a variety of labs. They all test the same piece of gear, you can get up to four percent difference, and they all did it right. They satisfied every requirement possible. It's simply, it's statistics. There will be up to a four percent variation –

MR. BROOKMAN: And they didn't specify these

different systems?

MR. COOK: Pardon?

MR. BROOKMAN: They did not specify these different systems?

MR. COOK: No, it’s independent of lumen measurement, it’s just a lab variation that NVLAP has empirically determined.

MR. BROOKMAN: Okay. I see some heads nodding around the room.

MS. THAKKAR: Thank you.

MR. BROOKMAN: Okay. Yes, Adam.

MR. CHRISTENSEN: This is Adam from ASAP. This is a little bit more of a mash-up between issue 4, back in the orientation issue and then this one. The gentleman from GE, sorry, I forget your – Dave. You mentioned before the orientation could be an issue when using different types of light measurement.

MR. SZOMBATFALVY: That’s correct. Specifically when you do a goniometer measurement, the mirror in the way makes that measurement – when it’s in the horizontal position you can get inaccurate measurements. It’s a difficult measurement.

MR. CHRISTENSEN: It’s just inherent in the tool that you use?

MR. SZOMBATFALVY: To the best of my

understanding, what my guy told me was it's inherent in the tool in the way the measurement is made.

PARTICIPANT: Right, it's in the test equipment. It's not in the device being measured.

MR. BROOKMAN: Thank you. Are we ready to move on? Yes.

MS. THAKKAR: Okay. Moving on to measurements for directional lamps. DOE proposes that the total lamp lumen output should be measured rather than the beam lumens, which are also known as the zonal lumens. This is because other directional lamp technologies, such as incandescent reflector lamps, or IRLs, report total lumens on FTC's lighting facts label. If directional LED lamps report anything other than total lumens, these lamps cannot be compared to other directional lamp technologies on the basis of FTC's label.

DOE requests comment on its proposal to measure total lumens for directional lamps.

MR. BOESENBERG: This is an ongoing discussion inside of industry. Lamp directionality and where you – what you measure where, is a very broad question. It's definitely being pursued in various standards bodies and testing bodies, but we don't have a good answer yet.

MR. COOK: Well, the other thing we need to understand too is what is the purpose of the test, or what are you trying to accomplish? I mean if you're looking for uniformity, that's one thing. If you're looking for total efficacy, that's something else. This is a very broad one. It all depends on what you're trying to measure.

MR. BROOKMAN: So we first heard from Alex, and then we heard from Keith. Now we're going to hear from Pam.

MS. HORNER: Yes, I'd like to point out another reason, less you think we don't have our act together. It is complex at another level, and that is that the Department of Energy has rulemakings on other technologies, where reflector lamps reside. And a determination, shall we say, on this can affect those other technology performance standards, believe me.

MR. BROOKMAN: Okay.

MS. HORNER: So we need to have an internal discussion on this.

MR. BROOKMAN: Okay. And you'll do that and get comments back in time.

MR. BOESENBERG: I said we'd do our best.

MR. BROOKMAN: Are there additional comments on this point and divergence. I should note for the

record, when Mansi raised this issue, there was a lot of chuckling going on in the room. So that's what that's all about. Okay. So we're going to proceed.

MS. THAKKAR: Okay.

MR. BROOKMAN: Apparently we have a question from the web. Yes. Matthew.

MR. WALKER: Okay, so we have a few questions from the web. Start with one –

MR. BROOKMAN: From?

MR. WALKER: From Joel Jacobson. "This would increase the time to measure initial lumens of every LED lamp. It is not worth it." This is at 8:37 am, so it's in reference to the seasoning discussion.

Then we have one from Cameron Miller, two points. "From NVLAP PT and NIST Map Testing, the differences between all laboratories is within standard deviation of plus or minus three percent. The second point is how tight are you going to define a sphere? Is a hemisphere acceptable?"

That might be a good thing for the room to discuss as to whether a hemisphere could be an acceptable requirement for the LM-79 testing.

MR. BROOKMAN: What is a hemisphere?

MR. WALKER: Usually, the sphere testing for light output is a complete round ball, and then a

hemisphere would be half of that, and I imagine it might be a cheaper device. Less expensive device.

MR. BROOKMAN: … clarify what that was, okay. Could we get comment on that?

MR. COOK: Maybe Ralph can answer this, but I don’t remember that being accepted in LM-79.

MR. BROOKMAN: Ralph?

MR. TUTTLE: Yeah, this is Ralph Tuttle. It is not an acceptable practice. There’s too much error incorporated in trying to do any measurements with hemispheres. If the – it really depends on the light pattern coming out of the product that’s being tested, so we do not recommend that the hemisphere be used for that.

MR. BROOKMAN: Prior to Ralph, we heard from Keith. Thank you. Thanks to both of you. Do you have a follow on?

MS. THAKKAR: No.

MR. BROOKMAN: No follow on on that. Yes.

MR. WALKER: I still have a couple more. Again, another Cameron Miller. “NVLAP has not published the plus or minus four percent total encompassing data yet.” Context for that might be a little bit lost since we’ve moved on a little bit.

MR. BROOKMAN: Alex?

MR. BOESENBERG: I saw four published somewhere. I'll find it.

MR. WALKER: Okay. And we have Tim Rasinski at NVLAP. "We can allow DOE to review our proficiency testing data here at NIST, but cannot supply copy of the reports. The reports are only intended for lab use and have not been reviewed for release to the general public."

So then, earlier, Cameron Miller made the comment, "I feel the hump is probably insignificant in the rating process" – again referring back to seasoning. "I do feel that the 1000 hours should be included because this would eliminate bad products that TM-21 prediction might falsely predict good performance." Okay.

So there's an idea that TM-12 data could be used to project, I guess project – I'll just read as it says. "TM-21 should be used to project the data, but using the 1000 hours of seasoning would validate the application of TM-21." So that was a Cameron Miller comment. Sorry I didn't state that to begin with.

Another Cameron Miller. "LM-79 2008 is being updated and the new version will be available, probably in the fall."

Cameron Miller, “the hemisphere will be accepted in the new version of LM-79.”

Alex Truong. “LM-79 requires a type C goniophotometer, so horizontal lamp positioning does not apply.”

And that brings us to the end of the current webinar comments.

MR. BROOKMAN: Okay. That’s good. And Ralph, you want to comment on – not that last thing.

MR. TUTTLE: This is Ralph, I’m sorry. The update to LM-79 is still in the development stages, and has not been screened or approved by IES. So while Cameron notes that that is one of the topics of discussion, it has not been ratified at this point, as is the use of a type A goniometer, which is also being discussed.

MR. BROOKMAN: Okay. Thank you. And of course, the Department’s wanting to make these meetings accessible via the internet, so thanks to those that are joining us via the internet. That works well for a lot of folks. Additional comments on this segment before we move on? Okay.

MS. THAKKAR: Moving on to the sampling plan. DOE proposes that at least 21 lamps should be tested to determine the input power, lumen output and

CCT. The lamps should be selected first with a minimum of three lamps are picked per month for seven months of production out of a 12 month period. These months are not required to be consecutive over the 12 month period. If production occurs less than seven months of the year, three or more lamps should be selected evenly for each month of production. If more than 21 lamps are tested, the sample size should be a multiple of three so that an equal number of lamps are tested in each orientation.

DOE requests comment on the proposed sample size requirements for testing these lamps.

MR. BROOKMAN: Sampling. Always an issue.

MR. BOESENBERG: Alex Boesenberg, NEMA. We are working on the response to this. Obviously, 21 is traditional in the lighting rulemakings. However, in the case of solid state there is somewhat of a precedent Energy Star. They test ten. So there’s some discussion we have to have, and then there’s some consideration the Department needs to make about, you know, if somebody got there before you, and we’ve already been doing our testing to that, is it reasonable to continue that. But there’s a lot of ins and outs, and we will provide more written comment.

MR. BROOKMAN: Okay. Thank you. Dave.

Mark.

MR. DUFFY: That's all right. Mark Duffy of GE. The fourth bullet on your slide about equal number of lamps in each orientation, if you take our suggestion of not using horizontal, then you probably don't need to worry about that particular aspect.

MR. BROOKMAN: Okay. Yes, Adam.

MR. CHRISTENSEN: This is Adam from ASAP. So just besides traditional sampling in industry, is there other justification for why 21 that DOE is investigating?

MS. THAKKAR: It was based on what's traditionally used for other lighting sources, but it was also based on picking a number that was a multiple of three that wasn't too small – because of the orientation requirements, yes.

MR. CHRISTENSEN: Traditionally we've had to do this for fluorescent lamps for a long time now.

MR. BROOKMAN: Okay. Alex.

MR. BOESENBERG: Alex Boesenberg, NEMA. Just another comment. We – it might be worth for ASAP to look at our comments to the HID lamps rulemaking. For instance, 21 was thrown out there too because, again, it's traditional. But when you're talking about a 2500 watt lamp, it's awfully expensive to run

21 of them for a year. Or two or three years, ten years until failure. So that's an issue that opened up the 21 isn't perfect discussion. And then also, specific to solid state, as I made mention in my opening remarks, it is an emerging technology. We are trying to get – consumers are clamoring for it. We're trying to get it to market quickly, and the larger the samples, the longer the test times, the more it is we tell people we have a product, we just can't sell it to them. So it's a consideration.

MR. BROOKMAN: Thank you. Keith.

MR. COOK: I guess one question I've got is what are you going to do with these 21 samples? Are you just going to run a CCT test, or CRI, or are you going to do a lumen maintenance test also?

MS. THAKKAR: So I can answer that. We are just going to test it for input power, lumen output, and CCT, which are the metrics in FTC's lighting facts label.

MR. COOK: Okay.

MR. BROOKMAN: Are you finished, Keith? Pekka.

MR. HAKKARAINEN: Yes, one other thing that comes to mind in this is that the seven months of production, it'll be very important to carefully draft

the language here in this rule, because my understanding is that to comply with the FTC labeling requirements, provisional labeling can be used with new lamps to introduce them to the market before the seven months worth of production. Depending on how this rule is written, that could mess up the current system and therefore new lamps would not be able to get to the market at the right time. So it's very important how this is written.

MR. BROOKMAN: Thank you. Ralph.

MR. TUTTLE: This is Ralph Tuttle. And Pekka, that is exactly what I was going to comment on, is the fact that – you know, if I'm Ralph's light bulb company, making some products, I want to get them on to the market as quickly as possible, and conform to FTC requirements. I want to measure my samples and be able to put that label on the product immediately, rather than waiting for any period of time to do so. So I agree with you completely, Pekka.

MR. BROOKMAN: Please, yes, Mark.

MR. DUFFY: Just to add to the agreement. I would like to suggest that DOE consider, for the initial labeling, that they just take 21 samples, and then if future rules, the next second year comes along, then you take this kind of thing into account,

but initially you should be able to label on the basis of your first production.

MR. BROOKMAN: Okay. Keith.

MR. COOK: Keith Cook. Yeah, to pick up on what Mark's saying. This is where I was originally headed. Is the ironic thing about this whole testing throughout a year is the fact that we haven't had a design stay in production more than a year. Period. This technology is changing so fast. The LED efficiency is going up so quickly, that we redesign every fricking product, every year. And so by the time we run this testing, it doesn't mean anything any more, because we're on to the next product.

MR. BROOKMAN: Interesting. Okay. Thank you. Yes, Chip.

MR. CHIPALKATTI: Chip Chipalkatti, Osram. I have the same concern. As constant change in the technology and new products coming in, so some of these long term tests are meaningless by the time the product is ready to be launched.

MR. BROOKMAN: What should be done about this? Alex.

MR. BOESENBERG: Well, I don't know if I have an answer to that question of what should be done, but this is an illustration of the emerging

nature of these products, and regulations tend to be for mature products. These are not mature, that's why we're having difficulties nailing this down. And so the suggestion of just taking an initial sample may be the best we can do until the technology quiets down.

MR. BROOKMAN: Okay. We have additional comment or question from the internet?

MR. WALKER: Yes, we have an additional comment from Julia Farber, appears to refer back to the goniophotometer discussion. "The issue with the measurement of horizontally oriented lamps is based on shadowing, because of the lamp's poor mechanism. Lamps are usually supported from above or below, and the support structure can interfere with the light measurement."

MR. BROOKMAN: Okay. Thank you. So, let's move on.

MS. THAKKAR: Okay. The final topic of discussion in this section are the rounding requirements. DOE proposes that the values over all 21 samples should be averaged and only the average value should be rounded. For input power, the average value should be rounded to the nearest tenth digit, for example, 12.5 watts. For lumen output and CCT, the average value should be rounded to the nearest

tens unit, such as 820 lumens, or 2750 Kelvin.

For the estimated annual energy cost, which is also a metric required for FTC's lighting facts label, DOE proposes that it should be calculated as the product of the average input power, the electricity cost rate, and the estimated average annual use. This value should be rounded to the nearest cent, such as $7.23.

DOE requests comment on the proposed calculation and rounding requirements.

MR. BROOKMAN: Pam.

MS. HORNER: This is Pam Horner who just had the microphone put in front of her. If my colleagues would help me remember, I believe the current FTC rounding rule is five lumens.

PARTICIPANT: Correct.

MS. HORNER: Which we don't like, by the way.

MR. BROOKMAN: I see –

MS. HORNER: And dare I say this is at least better. And at least cents makes sense, not to round to tenths of cents, so that's a good thing. But I would say this falls into the category of, we had better think about this before we say anything further as a collection of manufacturer comments. But you

bring up some good questions, thank you.

MR. BROOKMAN: Mark, you want to comment here?

MR. DUFFY: Yeah, I may make a comment. I will be involved in the NEMA – ultimately, in the NEMA comment. But something that is apparently – that I would like to see DOE consider in their rounding recommendations here is what the resolution of the measurement is. Because in many cases, the resolution of the measurement far exceeds the rounding specification, especially in the FTC case.

MR. BROOKMAN: Okay. Yes, Adam.

MR. CHRISTENSEN: I think I would also be curious to see about the resolution of the test measurement and have rounding based more on that than – or have DOE consider that in their determination.

MR. BROOKMAN: Thank you. Yes, John.

MR. GREEN: Yes, John Green with Cooper. I agree with the issues with rounding. I have to look at estimated average use per day, that that’s a guess to begin with, so rounding to, you know, a penny out of $10.00 doesn’t seem to fit the model very well.

MR. BROOKMAN: Okay. Additional comments? We’re going to hear back from NEMA on this one, I guess. Additional comments at this point? Nothing

additional – oh, yes, Ralph.

MR. TUTTLE: Ralph Tuttle. I guess one question that I have as I'm going over this is that when it comes to Energy Star and EPA requirements, labs performing these measurements have to be approved laboratories. And at this point in time, unless I missed it, I don't see anything in this document regarding certification of the labs. So I'm just wondering what the requirement will, in fact, be.

MR. WALKER: This is Matthew Walker, Navigant. You're right. The LED NOPR as written so far does not include a laboratory accreditation requirement, and I guess this is an opportunity for you and others to suggest that you would like to have that or not like to have that, and what specific requirements you think would be the most useful for LEDs.

MR. BROOKMAN: Ralph, please.

MR. TUTTLE: Thank you. Ralph Tuttle again. I strongly urge the DOE to consider a requirement of certification of laboratories that are performing these tests.

MR. BROOKMAN: Okay. Thank you. Does NEMA have a posture on this? On the question of certification of testing laboratories?

MR. BOESENBERG: We'll have to discuss it and reply back.

MR. BROOKMAN: Okay. Thanks, Alex. Anything else? Matthew?

MR. WALKER: Yes, one other thing on the measurement resolutions and values that we were talking about earlier. I mean, to the extent possible that NEMA is able to provide their own suggestions and feedback based on their own experience with those measurements, I think that would be very valuable.

MR. BROOKMAN: Okay. We've been tremendously efficient, and we've gone through 25 slides in a record amount of time.

MR. BOESENBERG: Alex Boesenberg, to reply to that – Yeah, let me slow you down a little bit here. As we have stated, we are working on industry guidance on the issue of measurements rounding and reporting. And I look forward to delivering that as soon as possible to the entire world, the Department included.

MR. BROOKMAN: Okay. Thanks for that. The reason I'm asking the question is whether – it's now ten after ten, whether we should take a break before we proceed, or whether we should just press on. I don't know – how long do you think the next element,

test procedure for rated lifetime – I see about 20-odd slides, so maybe we should take a break. Just a quick break.

It's now ten minutes after ten. We'll resume at 10:25, and many thanks for very, very constructive, high quality comment here. We'll see you back here at 10:25.

Wear your visitor's badge in the building. There are rest rooms on both ends of the hall. There's a coffee shop down on the ground floor in that direction. Don't leave the building. We'll see you back here at 10:25.

(Whereupon, at 10:10 a.m., the meeting was recessed for a 16 minute period.)

MR. BROOKMAN: Let's resume. Please take your seats. As I noted, we made really good progress before the break this morning, and now we're going to proceed and hear about test procedures for rated lifetime. And back to Mansi.

Test Procedure for Determining the Rated Lifetime of LED Lamps

MS. THAKKAR: Thanks, Doug. So moving on to the next section, we will now talk about the proposed test procedure for determining the rated lifetime of LED lamps. The FTC lighting facts label also has a

metric called “life” on the label which reports the expected rated lifetime of the lamp in number of years based on an estimated three hours per day of usage.

MR. WALKER: Mansi, I’m going to stop you for a second. This is Matthew Walker, Navigant. A couple of comments from the earlier section that came in during the break.

MR. BROOKMAN: Yeah, let’s do those now before we proceed. Please, yes.

MR. WALKER: So the first one is from Ronald Daubach. “There’s a difference between laboratory accreditation and certification of data. I think that you want to consider laboratory accreditation, and not a certification program.”

MR. BROOKMAN: I see, so I’m going to – I’m going to receive comment also from the room. Ralph I see you commenting, yes?

MR. TUTTLE: (off mic)

MR. BROOKMAN: That’s correct. And Chip?

MR. CHIPALKATTI: I agree with that.

MR. BROOKMAN: Okay. We have I think – I see several – many of the manufacturers thumbs up, heads nodding, so thanks for that comment. Yes.

MR. WALKER: So the next one is from Michael McGaraghan. “How does the energy cost calculation

come into this rounding issue? Energy cost is not one of the metrics being proposed in this procedure, is it?"

MR. BROOKMAN: Alex?

MR. BOESENBERG: Alex Boesenberg, NEMA. No, the energy cost is published by the Department and they just actually published the latest 11.84 cents, I think, this past week.

MR. BROOKMAN: Okay.

MR. WALKER: Okay. So this one again from Ronald Daubach. "Accreditation procedure by which authoritative third party gives formal recognition that a body or person is competent to carry out specific tasks. Certification is a procedure by which a third party gives written assurance (certificate of conformity) that a product, process, or service conforms to specified requirements."

MR. BROOKMAN: So that's just amplification. We've already covered that one.

MR. WALKER: Yes.

MR. BROOKMAN: Okay. That's all? Then we're moving on. Back to Mansi.

MS. THAKKAR: Okay. Because a standardized test method does not currently exist to determine the rated lifetime of LED lamps, DOE reviewed four

approaches to determine rated lifetime, and analyzed advantages and disadvantages of each approach.

The first approach that was analyzed, which is in column one on this slide, requires that the lumen output of the LED lamp is measured until it reaches 70 percent of initial lumen output, or L70.

The second approach, as required by Energy Star for qualifying lamps for the Energy Star label, and requires that LED lamps be tested for 6000 hours. The lumen maintenance at 6000 hours should meet a minimum value to make a rated lifetime claim of 25,000 hours. Qualification for more than 25,000 hours requires more than 6000 hours of testing, and corresponding lumen maintenance requirements at those hours.

The third approach that was considered, which is column three on this slide, requires that testing of the LED lamp for a minimum of 6000 hours and projecting the time required to reach L70 lumen maintenance based on our projection model.

Finally, the fourth approach, which is also the approach proposed in this NOPR, requires that the LED source, rather than the LED lamp, be tested for a minimum of 6000 hours, according to IES LM-80, and the lumen maintenance be projected to L70 using the method

outlined in IES TM-21. However, the maximum rated lifetime projection should not exceed 25,000 hours.

We will now discuss the advantages and disadvantages of the four approaches.

MR. BROOKMAN: Before you do, let’s hear from Mark.

MR. DUFFY: Yeah, I just want – before we go too much further down this road, I’d like to get some clarification. Earlier you defined an LED source, and I’m trying to understand whether we’re talking about the package level, where LM-80 data may exist, or whether you’re talking about arrays of packages where the LM-80 data would only be that of the individual packet?

MS. THAKKAR: So the intent is that it applies to those components that LM-80 applies to, and LM-80 says that it’s for a modular package, or an array.

MR. DUFFY: Thank you for that clarification.

MR. BROOKMAN: Okay. Keith.

MR. COOK: I guess I’ve got to voice concern. The topic here is approaches considered to determine rated lifetime. And yet your lifetime is being predicated solely upon LM-79 data. That is very

misleading because there's a lot of other factors that go into these devices, such as the drivers and the mechanical aspects that are not being comprehended with this testing. And so you're telling everybody that the device is good for X number of hours, based solely upon the LEDs themselves. And I think that that's very, very, very misleading and may result in a lot of disappointment by some of the people out in the field.

MR. BROOKMAN: What would suggest the Department do?

MR. COOK: The problem is right now this technology is so new that we haven't been able to develop a good standard. And I understand that that's a bad situation, but it's reality, and there are groups, for instance, there's one that's headed by Fred Welsh, that is trying to get their arms around that very subject, and they're trying to come up with ways to test, to establish reliability levels. But we're not there yet.

MR. BROOKMAN: Okay. Alex?

MR. BOESENBERG: Alex Boesenberg, NEMA. As an analogy or a reference to the difficulty, Ralph and others could comment on how long it took to write LM-79 and LM-80. The – came up with an idea and then it

didn’t work aspect of solid state standards, and I can speak from that – from the experience of the NEMA solid state lighting standards that I facilitated with many of the people in this room. When we said, okay, let’s do this method X, Y and Z. By the time we had finished discussing the wording of that paragraph a few months later, it was no longer valid, because the solid state system we had taken as the baseline, didn’t exist any more. And so the challenge for anything right now for rated lifetime is that the assumptions and physical circuitry parameters and things that go into it, have a habit of not sticking around long enough for us to finish publishing the document.

And if you figure on 1000 hours a year as typical consumer maintenance, we’re talking about people putting 25 years on packaging already, and for now, the industry has left that up to individual manufacturer discretion.

MR. BROOKMAN: Yeah. Ralph.

MR. TUTTLE: I would agree with Alex. Today there is no known methodology in the industry to accurately determine the lifetime of a solid state lighting product, whether it’s a luminaire or a replacement bulb type of product.

One thing that perhaps DOE may want to consider is that instead of defining the lifetime of the product on the package, define instead lumen maintenance of the source itself. And that is a measure that there are standards or methodologies in the industry that are very common today. But lifetime is not something that we can accurately predict today.

MS. THAKKAR: I have a clarifying question for that. So given that this is for FTC's label, would that lumen maintenance value then just be reported against the life metric, or would you suggest something else for life on the label?

MR. BROOKMAN: Back to Ralph.

MR. TUTTLE: Yeah, Ralph Tuttle again. I would recommend that on the label that there be no claims of life at this point in time, because the reality is that there is no way that we can predict that. Case in point, a lot of the studies that were done up at PNNL within the CALiPER program showed very, very rapid lumen depreciation and actually non-functionality of some products in very short periods of time, even though some of the best LEDs in the world were being used in those products.

So, you know, there are groups, as was previously referred to, that are working on this –

trying to tackle this subject, but as of today, we have no answer.

MR. BROOKMAN: Alex.

MR. BOESENBERG: Alex Boesenberg. And of course we understand we're talking about something that feeds into some other agency's program. We have our own ongoing discussions with the FTC about this and other subjects, so I sympathize. I understand that the DOE has a certain lack of control over the final product, as it were. But we will comment as best we can.

MR. BROOKMAN: Okay. Thank you. Okay.

MS. THAKKAR: Okay. Moving on. We would like to discuss the advantages and disadvantages of the four methods that we considered. The first advantage of approach one is that the LED lamp, rather than the LED source is being tested. Additionally, this method is not a projection of rated lifetime, so the reported value of lifetime is what you actually observe during testing.

However, this approach does have some disadvantages. The biggest one being that the time required to test the LED lamp until it reaches L70 can be extremely long. The lumen of the lamp takes 25,000 hours to reach 70 percent of initial light output, the

time required for testing would be almost three years. Another disadvantage of this long testing time is that because LED lamps and LEDs in general, are a rapidly evolving technology, the product may be obsolete by the time testing is completed.

(Laughter.)

MR. BROOKMAN: Ralph would like to comment at this point. Ralph.

MR. TUTTLE: This is Ralph Tuttle again, and I have to respectfully disagree with that comment and the chuckles that went around here. I mean, even today, we are providing to the lighting community, LEDs that we designed and put into production five years ago, and they're still being used today. They're still being – in fact, that older product I'm referring to was just within the last year that some of our newer products finally surpassed it in the volume of product that we were shipping. So while everybody is absolutely right, that we're all working on improving the lumen maintenance of the product, the efficacy of the product, just the overall robustness of it, still today, there are a lot of LEDs that were designed quite some time ago that are still being designed into products.

MR. BROOKMAN: Okay. Thanks for the

clarification.

MS. THAKKAR: Actually, I have a clarification question. When you say LEDs, do you mean the LED package, or do you mean the LED lamp itself.

MR. TUTTLE: I'm talking about both.

MS. THAKKAR: Both.

MR. TUTTLE: In some cases, but I am specifically referring to the LED package itself.

MS. THAKKAR: Okay. Thank you.

MR. BROOKMAN: Yes, Chip.

MR. CHIPALKATTI: I think the point just made highlights the additional fact of divergence between the actual chip and the light source, and the rapid change in the final product. And so it's – the question of value, what product is being written about here in this rule? And I think it's the system. And so the fundamental fact is that even though some LEDs may be still being used, there's a lot more manufacturers of LEDs coming with new stuff, and so there's a constant change in that field anyway.

MR. BROOKMAN: This is a point Alex made yesterday about – thinking about this as a system. Many of you weren't – some of you – many of you were here yesterday. Okay. So additional clarifications

before we move on? The Department's going to try and have to figure out, try and do something about this, right? Unless they choose not to, so let's hear advantages and disadvantages.

MS. THAKKAR: Okay. Moving on to approach two. The advantage of this approach is also that it tests the LED lamp rather than the LED source. Additionally, the lamp is tested for a minimum of 6000 hours only, and therefore this approach is not as time consuming as approach one. A disadvantage of approach two is that it does not take into account LED failure mechanisms, other than lumen depreciation. And while Energy Star does require a rapid cycle stress test for testing failure, this method is not a proven source to determine failure for LED lamps.

The advantages of approach three are very similar to those of approach two. Approach three also tests the lamp rather than the source, and requires testing for a minimum of 6000 hours only, and is therefore not as burdensome as approach one. However, a key disadvantage of this approach is that a standard method has not yet been developed to project LM-79 lumen maintenance data to determine the lifetime of the lamp. Additionally, it may not be feasible to develop a method of projection in a timely manner for

reporting life on the lighting facts label by FTC.

Finally, the advantages of the proposed method, which is approach four, is that it uses industry accepted standards, LM-80 and TM-21, to project the lumen maintenance of the LED source. DOE also proposes that the maximum rated lifetime that is reported, should not exceed 25,000 hours. This is important to insure that exceedingly large projections of lifetime are not made exclusively on LED source lumen maintenance data. It is also currently unknown what the lifetime of some of the other components within the lamp, such as the LED driver, might be. 25,000 hours provides a conservative estimate of the lamp’s overall lifetime. Finally, the proposed approach would be less burdensome than testing the LED lamp for 6000 hours because LM-80 data for the LED source is often available from LED source manufacturers.

The proposed approach does have some disadvantages, though. The primary one being that it projects LED source data, rather than LED lamp data. Secondly, the proposed approach does not account for other LED lamp failure mechanisms, such as LED driver degradation and failure, the effect of the interactions between LED sources and between LED

sources and other components. However, these failure mechanisms cannot be accounted for currently because standardized test methods to determine the impact of these components have not yet been developed. As new standards to determine the life of an LED driver and other components are developed, this proposed test procedure could be revised.

Therefore, DOE proposes approach four, because it uses a standardized test and projection method, and has minimal test burden. DOE now requests comment on the four approaches presented as well as the relative cost and benefits of each approach.

MR. BROOKMAN: Alex.

MR. BOESENBERG: Alex Boesenberg for NEMA. As you may expect, we are still working on the industry comment for this. Approaches number two and number four are receiving the most discussion, but actually favoring one over the other isn't necessarily – we're not flipping a coin or anything, but it's more of a – as you note, there are advantages and disadvantages to each. So we'll have more on that.

I do want to comment specifically on 25,000 hours, because the sentiment I have received and am receiving still, is that we disagree with a cap which is ultimately an arbitrary number. We sympathize – I

sympathize with the Department that 25 years sounds like plenty long already, and yes there are many outside factors, but it is not typical of test procedures to put reporting, or cap requirements. That is something that you arrive at based on your testing. And ultimately, the marking of the package, as we've noted several times today, is something between the manufacturer and the FTC. So for those reasons, fundamentally, I would submit that the Department remove that cap and number one, we're still working on test procedures that will actually allow you to arrive at a more scientifically based number, but even so, it's something for my manufacturers to discuss with the FTC as far as what they put on there.

And also, it's an internal decision. Some companies do not want to put an outrageously large number for lifetime, because they just – they want to be conservative. And others consider it a marketing decision, and if we think we've got LM-80 and we can say 40 years, let's do it. There's lots of individual decisions that some are market-driven, so they're internal company decisions that's part of the free trade, and free open market between different companies and their positions, and what they claim and how they compete based on performance and other

factors. So, lifetime is highly discussed.

MR. BROOKMAN: I have a follow on question for Alex. Since you said – you said you were considering two and four, is it likely that if NEMA arrives at something it will be kind of bounded in that framework, or is it possible that NEMA will come back with something that DOE has not yet anticipated?

MR. BOESENBERG: I'm not sure because it's still early. And, of course our initial comments at the start of this section, you can take as fairly negative on the whole topic. So it's just as likely our response will be, leave it off the table for now.

MR. BROOKMAN: Okay. Pam.

MS. HORNER: I'm going to risk – this is Pam Horner. I'm going to risk philosophical couple of sentences here. And I'm not meant to be flip. If you take the point of view of the consumer, which to Keith's earlier point is probably what should be considered, since this is in concert with the FTC, one would have to assume that the consumer, try to be one for a moment, talks about or thinks about what is the meaning of life – I'm not kidding. That's what this is about. So with the ordinary light bulb world, there is an expectation of the consumer, and I see you nodding here, that life does not mean lumen

maintenance, it means it’s the end of the bulb as I know it. It doesn’t work any more.

What we’re faced with is the reality that the meaning of life, for the consumer, has no test procedure that is agreed upon by the experts, which points to premature, on this point, but it also opens the possibility, and whether we incorporate it into our comments or not, Alex, I think we should also be very innovative and say that perhaps this is an education opportunity.

One of the – Alex mentioned that we were looking at approaches two and four, we were commenting on them, and one could argue that one of the reasons for that is both talk about lumen maintenance, which is the reality of how we have characterized the meaning of life for those who produce this product. And in that world, this may sound silly, but is there an educational approach that we could take that starts to say this is the way this operates, guys, and what it means on the box when we say so many hours, it means something different than you’re used to.

So it doesn’t preclude the possibility of us embarking upon something to educate the consumer, rather than to try to drive home something that isn’t ready. I hope I’m making sense. Thank you.

MR. BROOKMAN: Yes, that was helpful. Thank you. Alex.

MR. BOESENBERG: This is Alex Boesenberg. Thank you, Pam. It's worth me stating for the record and reminding everybody, especially someone who comes and reads the transcript and isn't familiar with solid state lighting, which is a lot of people, that LEDs don't just burn out and stop working. They just get dimmer. That's where lumen maintenance and L70 come from. L70 is when it's at 70 percent of what it once was. And the point is the consumer definition of lifetime that Pam spoke about is, it doesn't work any more at all. But industry and transportation safety, individuals, municipalities, everyone is grappling with the fact that LEDs just get dimmer, and it's a huge deal for roadway lighting because municipalities have a mandatory obligation to put a certain number of lumens on a road surface. They need to know when they have to replace that LED because HID, it just stops working. But the LEDs will last a long time past what I guess – I might get in trouble – but call it their useful life, in terms of producing enough lumens to meet the safety standard. That's something industry is actively working on.

Unfortunately, Jim Brodrick left already.

He could tell us about the Municipal Solid State Street Lighting Consortium that he is helping run where they are addressing that very issue. And they are working with the Next Generation Lighting Industry Alliance that Keith Cook is the chair of, which is industry's think tank for the MSSLC, and is helping them grapple with that issue. Ultimately, there are – there's no path forward on what to do to somehow identify an LED as hit a point where you might want to consider "replacement" I'll call it, because it still works. So do we make it turn off? Do we make a light blink? Who knows? There's all kinds of different ways to solve it. And it's a problem that has never been an issue because other stuff just burns out.

MR. BROOKMAN: John, comment?

MR. GREEN: Yes, to support that, where LEDs are used in commercial or maybe even industrial applications as well, they usually have light levels that are specified by IES that – so minimum light levels to perform tasks, and those levels just don't exist in the normal consumer market for residential applications. So it just supports the fact that people expect the lifetime to mean it's not going to work any more, it's not going to fall below a certain level in my house.

MR. BROOKMAN: Okay. Thank you. Comment from the web?

MR. WALKER: Yeah, we do have one from the webinar participants. Cameron Miller, on the 25,000 hour cap, his comment is, “the cap can be increased as long as industry provides specific statistics to prove their stated numbers.”

MR. BROOKMAN: Okay. So do we have additional comment on these four approaches? We’ve heard from NEMA about what they plan to do, and any other comments? Mark.

MR. DUFFY: This is Mark Duffy of GE. I agree with all of these comments, they’ve been terrific.

MR. BROOKMAN: Even the philosophical ones.

MR. DUFFY: Even the philosophical ones, the meaning of life, you know, --

MR. BROOKMAN: We might need to go to the bar rather than lunch.

MR. DUFFY: Yeah, exactly. Recommendations for lamp replacement and so forth is something that DOE should be prepared for as a response that may incorporate multiple methods, because in some cases LM-80 data may be available, in some cases LM-80 data may not be available, and if you’re in a situation

where you've specified your preference for approach four, you may be in a situation where all of a sudden there's products out there for whom LM-80 data isn't available and you need to have some way of establishing what you're going to put on – or FTC needs to establish what' going to be put on their box.

MR. BROOKMAN: Yeah. Lucy, can you describe, or can someone describe the nature of the consultation with FTC at this point? Have you begun that? Not yet.

MS. DEBUTTS: No, we haven't, not yet. But we actually, just like Alex stated, you know, we read the documentation from the group that Jim Brodrick is working with, and we are going to be taking this into consideration, and we understand the issue is very complex. So although a lot of your remarks probably preempted the next slide we're going to have.

MR. BROOKMAN: Okay. I'll just make the comment NEMA has been so involved in standard-setting activities for a long, long, time. You're very sophisticated at this stuff. If you're going to come forward with something that's a lot different from what they're looking at, you've got to get – you've got to do early consultations, so they're looking at some pathway that's going to drive this train.

MS. DEBUTTS: We will take care – take a look at all the comments and we'll consider the alternatives. That's why I asked earlier, if you have a proposal please do so because we want to make sure that what we're doing is useful for everyone.

MR. BROOKMAN: Yeah. Pekka.

] MR. HAKKARAINEN: So this is Pekka Hakkarainen. I'm now speaking as a representative of a company that does not make these products, but nevertheless is involved in this lighting business, and what is troubling to me listening to this conversation, is that I don't think that we are possibly going to have a proposal by the 25th of June to offer that could be adopted. This is an area that I am concluding in my mind, that we are simply not ready to do so. Is there some way that we can take the reality of the situation into account and with regard to the life rating, do it differently than traditional rulemakings where we have a comment period and then we sort of go into a waiting period, as industry, and then the final rule comes out. Is there some mechanism where we could do it differently?

MR. BROOKMAN: Interesting idea. Alex.

MR. BOESENBERG: Alex Boesenberg. I would offer, in support of that, remember that ultimately

we're talking about consumer satisfaction and market policing. There are mechanisms for reporting complaints for products, et cetera. And the FTC has their own enforcement procedures too. Specific to this supporting the FTC's labeling, lifetime claims could be left up to them specifically at this time.

MR. BROOKMAN: Thank you. Chip.

MR. CHIPALKATTI: Chip Chipalkatti, Osram Sylvania. You just wanted to make a general comment about all of this, not specific to the methodologies, is the fact that it's insistence of the FTC labeling requirement and the key word is labeling. And a lot of the challenges of putting a lot of information on very small packages is a critical concern. It's expensive, but it's often not legible because it's so hard to find the information on the package. So one must take into account the impact on the actual physical packaging. As we think about educating consumers and so on, and what needs to go on the label.

MR. BROOKMAN: Okay. Final comments on this. Betsy?

MS. KOHL: This is really good to go back to the question from Lutron – this is Betsy from GC – if we receive additional information that we want to have

another round of comment or be posted up, or have a supplemental document of some kind, there are ways, opportunities, for additional input.

MR. HAKKARAINEN: And I'm just now speaking for myself, but I have a suspicion that others in the room might agree that we would welcome that kind of an approach.

MR. BROOKMAN: Thank you, Pekka. Appreciate you raising it. Thank you, Betsy. Okay. So let's proceed then.

MS. THAKKAR: Okay. These are the test procedures that are proposed in the NOPR, which is approach four that we just discussed. DOE is proposing a definition for rated lifetime, as the time when the lumen output of the LED source falls below 70 percent of initial light output. It is possible that this definition may change if the proposed test procedure to determine rated lifetime changes.

DOE requests comment on the proposed definition of rated lifetime.

MR. BROOKMAN: Keith.

MR. COOK: Absolutely not.

MR. BROOKMAN: Maybe you've got to be more specific than that. Come on.

MS. DEBUTTS: You don't want to comment, or

you don’t agree with this.

MR. COOK: I don’t agree, that’s not the definition. Pure and simple. There’s a lot more in that lamp than just the LEDs.

MR. BROOKMAN: Do you want to – Alex, do you want to comment here?

MR. BOESENBERG: Alex Boesenberg. I didn’t have anything specific to comment, but I think to build on Keith’s point, that this is one of those issues where you’re talking about a component of a larger product, and rated lifetime is really specific to the product. It doesn’t matter if the LED will last 100 years, I’m pretty sure the rest of the system won’t. So it’s – I think the word is irrelevant. It is irrelevant to this subject, the overall, you know, the goal of this rule.

MR. BROOKMAN: Other comments here? Adam?

MR. CHRISTENSEN: I’m not sure that I’d go as far as saying irrelevant, but it’s a tricky problem to solve for sure. I think it’s still early in our process, and we’re a consensus building group for those of you that don’t know ASAP, we have consumer groups as well as utilities and environmental groups on our board. So we’re still grappling with some of this, but to the extent that kind of a systems

approach could be taken and more included in the analysis of a measure of lifetime, besides just lumen maintenance, I think it would probably be helpful.

MR. BROOKMAN: Good. Thank you.

MR. CHRISTENSEN: But I can't say anything more specific at this time because I don't have –

MS. THAKKAR: Thank you.

MR. BROOKMAN: But you're working on it.

MR. CHRISTENSEN: We're working on it.

MR. BROOKMAN: Yeah. Okay. That's good. Additional comments on lamp rated lifetime? Please go ahead. Yes.

MS. FARBER: So just to clarify then, your comment about –

MR. BROOKMAN: Please say your name again.

MS. FARBER: I'm sorry, Julia Farber with UL. Just to clarify. What you mean by the other additional components in the lighting structure. What's their annual lifetime? Is there any easier way to measure how long those products will last? Just a thought, maybe you'd want to build the lifetime around how long those would last.

MR. BOESENBERG: This is Alex Boesenberg. Industry and other scientific groups are definitely looking at that. Mean time between failures and all

those other factors. It is proving to not be that simple.

MS. FARBER: Oh, I'm sure.

MR. BOESENBERG: Of course, and certainly UL, we have used your test methodologies as basis for some of our systems approaches. The fact that UL recognizes a luminaire as a system integral with the ballast driver light source and everything else, you've been very useful to us, thank you.

MS. FARBER: You're quite welcome.

MR. BOESENBERG: But – so the – yeah, that was one of the first things brought up years ago at some of the earliest CALiPER and DOE's SSL meetings, as everyone grappled with, well, what if the transistor fails? So yes, it's part of what's being discussed but turned out to be a lot harder than that.

MR. BROOKMAN: Thanks. Now let's proceed.

MS. THAKKAR: Moving on to the steps to determine the rated lifetime, as was just defined. The first step is to project the rated lifetime is to determine the in-situ temperature of the LED source when it operates within the lamp. This temperature can be determined by performing an in-situ temperature measurement test, or ISTMT. The in-situ temperature is required to know the temperature at which lumen

maintenance data should be used for projecting rated lifetime.

Once the case temperature is known, the second step is to obtain lumen maintenance data at this temperature. This can be done in one of three ways. The lumen maintenance data is either available at the case temperature directly from the LED source manufacturer. The second option is if the case temperature falls between two other temperatures at which lumen maintenance data is available, then the lumen maintenance data at the case temperature can be interpolated in TM-21. Finally, if the lumen maintenance data is not available from the source manufacturer and cannot be interpolated, it must be obtained by testing the LED source and measuring the lumen maintenance at the in-situ temperature.

The last step in determining the rated lifetime is projecting the lumen maintenance data that is obtained in step two. The method described in TM-21 should be used to project lifetime, but the maximum allowable value of the rated lifetime should not exceed 25,000 hours.

We will now go into the details for each of these steps.

MR. BROOKMAN: Yes, excuse me, before you –

Ralph.

MR. TUTTLE: Thank you. Ralph Tuttle, with CREE. I would like to make a recommendation. I think that as an industry we concur that any attempt to define rated lifetime, regardless of the methodology, is useless at this point. And while I appreciate the amount of work that's gone into developing these step by step methods, the reality is, once we go through them, I think as an industry we're going to say, you know, that doesn't work. So perhaps we might want to bypass some of this at this point in time.

MR. BROOKMAN: I'm looking at Alex. Ralph just made a representation on behalf of the industry. Alex.

MR. BOESENBERG: I was debating whether or not to make the same statement. I also appreciate, I know it took a lot of time to put all this together, and I can't speak for those on the phone. There may be someone who would like to review it. I do not have any industry consensus, I haven't even received hardly any comments on these portions because we're not prepared to comment on it. So, we have no comment, by and large. I can't speak for everyone, but if she goes over it pretty quick --

MR. BROOKMAN: As you look at these slides

and the details in these slides, NEMA would, of course, be commenting perhaps specifically or generally on what's in here as you review this material. But maybe we should just put the question to those who are on line, whether they have any specific comments about this. I guess what you're suggesting is that we not review all these slides, correct?

MR. BOESENBERG: Proposing to the group to consider that, and probably jump to slide 46 and talk about sample size again.

MR. BROOKMAN: So I make this query to those joining us on line, if you'd like this additional review, then we can go through this, I presume. Mark.

MR. DUFFY: Yeah, I respectfully would like to hear, regardless of the potential irrelevance, I'd like to hear what the DOE is thinking about when they put this proposal together, even if we are concerned about the whole proposal.

MR. BROOKMAN: Are you suggesting – I'm not sure I understand what that means. That means you want to go through these slides, or –

MR. DUFFY: Yeah, that's basically what I'm saying, is please give the DOE an opportunity to tell us what they were thinking so that when we develop our

comments which we need to make to this very proposal, we know exactly what was in your minds. I think it will help us as an industry to know that.

MS. DEBUTTS: It's only six slides, you know, and the people on the webinar would like to go over them as well. So if you all don't mind –

MR. BROOKMAN: Well, let's do it.

MR. CHRISTENSEN: I would like to as well.

MR. BROOKMAN: Adam would as well. So let's do it and Mansi's doing a very efficient job with this. So proceed.

MS. THAKKAR: Okay. So the first step as DOE has proposed the test procedure currently, is to determine the in-situ temperature of the LED source. DOE proposes that the UL standard 1993-2009 should be used for setting up the test box, test conditions, testing equipment, and instrumentation. Additionally, a thermocouple should be attached to the LED source at the temperature measurement point that is identified by the LED source manufacturer by making a temporary hole to insert the thermocouple as stated in Appendix D in the Energy Star specification.

DOE requests comment on adopting the relevant sections of UL standard 1993 and performing the ISTMT, as well as the practicality of attaching

the thermocouple temporarily to determine the in-situ temperature.

MR. BROOKMAN: Does it make sense for us to go through all of them and receive comments at the end, or should we do it section by section? I'm unclear myself.

MR. DUFFY: I'd like to go section by section, because I have a question.

MR. BROOKMAN: Okay. Mark, please.

MR. DUFFY: I'll turn my microphone on. This is Mark Duffy of GE. I have a question about UL 1993, and I guess we have UL in the room. The question is, is the purpose of that set up to mimic normal operating conditions, or is it to mimic some sort of a stressed operating condition within this box, within this enclosed box?

MR. BROOKMAN: Can you answer this one, Mansi.

MS. THAKKAR: So my understanding is that it mimics normal conditions in terms of the ambient temperature and humidity requirements for a lamp that's designated to be operated in normal conditions, but it also provides specific stress tests for a lamp that might be used say, in a wet location, or a humid location. And for those conditions, it provides

specific details on how to test a lamp in an environment that's simulates the humid conditions or the wet conditions.

MR. DUFFY: So I guess my question is, if you put it in a box to measure this temperature, are you going to elevate the temperature artificially above normal operating conditions?

MS. THAKKAR: I believe the test box is open from the bottom end, and the UL standard actually provides how to control the temperature for each component, and what to do in case the temperature is getting above what it should be. So they ask you to edit out and make sure the temperature returns back to normal.

MR. DUFFY: Okay. So, I guess I'll get right to the point here, if the UL test is intended to determine whether or not a temperature maximum has been exceeded, it might be a stress type of a test that's looking for whether, under these conditions, extreme conditions, have they exceeded – has the safety temperature been exceeded. That would not be the right kind of test to get at normal operating conditions for determining lumen maintenance. That's my concern.

MR. BROOKMAN: Okay. Julia, do you want to

comment?

MS. FARBER: I am unfortunately not a technical expert in this particular area, but we did have our technical expert supposedly calling in, so if I may ask if somebody who's manning the laptop could see if someone from UL has responded to any of these thoughts.

MR. BROOKMAN: Sure, Matthew's over there. We'll see if anybody has responded.

MS. FARBER: In the meantime, we could definitely take these considerations and I could follow up with those for people who are interested in that specific answer.

MR. BROOKMAN: Okay. Matthew, do you have something from the web?

MR. WALKER: Yes, we did have one comment from the web, I'm not sure of the affiliation. But it comes from Carl Bloomfield.

MS. FARBER: Bloomfield.

MR. WALKER: Bloomfield. Okay. Well, the comment is, "as the use of UL 1993 is being specified, please note that the standard allows an optional test box for specific wattage products," and then in a second statement from Carl Bloomfield, "the temperature test is usually to represent real life

application."

MR. BROOKMAN: Okay. Thank you. So let's proceed then.

MS. THAKKAR: Are there any other comments.

MR. WALKER: We did just receive one more. This one is from Joel Jacobson. "Agree, the UL box is a worst case scenario."

MR. BROOKMAN: Okay. Yes, Ralph, please. Let us know.

MR. TUTTLE: I'm sorry. Yeah, that's pretty conflicting, you know, worst case would, to me, indicate the worst possible operating conditions that the manufacturer of the product recommends that product be used under. Whereas normal is – yeah, undefined at this point in time, to me.

MR. BROOKMAN: They might specify a temperature range and you'd be at the worst end of that range. Okay. So let's proceed.

MS. THAKKAR: Okay. We will now discuss the method for obtaining lumen maintenance data if it must be determined by testing the LED source. DOE proposes to adopt LM-80 for the test conditions, set up, instrumentation, and measurement of lumen output of LED sources. For the test conditions, DOE proposes that the requirements specified in LM-80 should be

adopted with some modification, Instead of testing LED source at three case temperatures as specified in LM-80, DOE proposes that testing should be performed only at the case temperature identified during the ISTMT. Additionally, the drive current passing through the LED source during testing should be equal to or greater than the drive current passing through the source when it is operated within the lamp.

The second topic under test conditions is air temperature and air – sorry, go ahead.

MR. DUFFY: I may be your most frequent interrupter through these, but I want to deal with each one as I think of them. This gets back to the clarification that I asked for before. If LM-80 data is not available, and now you have a complete lamp unit, is it incumbent upon the testing procedure to tear that unit apart and test these sources according to LM-80 at a temperature that represents this institute temperature. Is that what you're thinking?

MS. THAKKAR: Yeah, that was the intent. But I had a clarification to your clarification.

MR. DUFFY: Okay.

MS. THAKKAR: Would you have to tear apart the lamp to get the source, or would the source be available?

MR. DUFFY: Usually you have to destroy the product to get this piece out of the product for testing in that manner.

MS. THAKKAR: I see.

MR. BROOKMAN: Yeah, go ahead, Ralph.

MR. TUTTLE: Another situation, and one of the reasons LM-80 is written the way it is is that it’s not feasible that source manufacturers test LEDs at every conceivable temperature that it may be used under. LEDs in replacement bulb products can run at temperatures anywhere from 55 to 140 degrees Centigrade and everywhere in between. One of the reasons that we specify today, three, and ultimately probably two – and the LM-80 is currently going through a revision – the reason that we specify at least two temperatures is to allow us to determine the relative lumen maintenance at a temperature in between the upper and lower. So the way this is written would make it extremely difficult to comply to the requirement.

MR. BROOKMAN: Okay. And can you offer how it might be revised so that you might comply?

MR. TUTTLE: If in fact, DOE is intent on using LM-80 and TM-21 as a methodology for determining lumen maintenance of the light source, I would

recommend that they simply follow all the methodologies as defined in those documents, rather than try and add something different to them.

MR. BROOKMAN: Okay. Thank you. Other comments at this juncture? Okay.

MS. THAKKAR: So, the second topic under test conditions is the air temperature and air movement requirements. DOE proposes that the air temperature around the LED source should be maintained between the case temperature and five degrees Celsius below the case temperature as specified in LM-80. That is, if the case temperature is 70 degrees Celsius, the air temperature should be between 65 and 70 degrees Celsius.

For air movement, DOE proposes to adopt the specification in LM-80 as well, which states that care should be taken to minimize any drafts around the LED source, but some air movement is necessary to avoid thermal stratification.

DOE requests comment – we already went through the first part about testing at just the in-situ, so in the second part, DOE requests comment about whether the measurement location point for measuring air temperature around the LED source should be specified, and whether the allowed air flow should

also be further specified.

MR. BROOKMAN: Comments on those two elements? Location and proximity, I guess. Ralph.

MR. TUTTLE: Well, I guess for lack of anybody else, I'll comment on it. We've noted that there's somewhat of a – some vagueness in the way the LM-80 was originally written relative to minimizing the air flow, and in fact that's one of the topics that's been discussed in quite a bit of detail within the working group that's rewriting LM-80 at this point in time. We anticipate the new document will be completed before the end of this year, and in the new document, it will define exactly how to monitor the air flow through the system.

MR. BROOKMAN: Okay. Thank you. Other comments as reflected in issue box 13? Okay.

MS. THAKKAR: I just have a clarification there. Would it also include more detail on how to or where to measure the air temperature?

MR. TUTTLE: It defines – it gives recommendations on best practices.

MS. THAKKAR: Okay. Thank you.

MR. BROOKMAN: Thanks, Ralph. Okay.

MS. THAKKAR: Further operating orientation during testing. DOE proposes to adopt LM-80 which

states that the LED source should be oriented as specified by the source manufacturer, and spaced out to allow air flow around each unit. While DOE proposed three specific orientations for testing the LED lamp, it is not doing so for testing the LED source because the case temperature is being controlled during testing. Therefore, the impact of orientation on the thermal effects of the LED source should be minimal when testing the LED source, thus minimizing the effect of orientation on lumen output.

DOE requests comment on the proposed approach of using manufacturer guidance for the operating orientation. No comments.

MR. BROOKMAN: Comments? No comments on this one?

MS. THAKKAR: Moving on to the external –

MR. BROOKMAN: Here’s Ralph, good.

MR. TUTTLE: Yeah, let me comment on this. During LM-80 testing, our experience is that orientation of the component itself in no way affects lumen depreciation of that component.

MR. BROOKMAN: Okay.

MS. THAKKAR: Thank you. So moving on to the external driver. DOE proposes that the external driver used for testing should be as specified in LM-

80 as well, which requires that the driver should be compliant with manufacturer's guidance. DOE request comment on whether this requirement is sufficient or needs further clarification.

MR. BROOKMAN: Ralph, I'm looking at you.

MR. TUTTLE: I'm sorry, I think we're really talking about two different things here. LEDs during LM-80 testing are driven typically at constant current with laboratory power supplies, which, relative to an external driver that is used in a bulb product, we're talking two different things here. The requirements as far as variation in output power are extremely tight when it comes to LM-80 testing. And my experience with drivers used in bulb products is that they can't come close to maintaining the accuracy that a laboratory power supply does.

MS. THAKKAR: Okay. Okay.

MR. BROOKMAN: Yes, Keith.

MR. COOK: Keith Cook. This is, I think, a little bit confusing because the scope said it was integrated lamp, which meant that the driver was included in the device. Now you're talking about an external power supply. Which is it?

MS. THAKKAR: To clarify that point, so it is an integrated lamp, but this is for when only the

source within the lamp is being tested. So it might not be tested with the integrated driver and you need another power supply to run the source.

MR. SZOMBATFALVY: This is David from GE.

MR. BROOKMAN: Yes, Dave, go ahead.

MR. SZOMBATFALVY: Yes, this is the point that Mark had brought up about maybe having a dual path, that if we don't have LM-80 data, that we may look at another one of those scenarios that you proposed, like scenario two or something like that.

MR. BROOKMAN: Ralph, you wish to – Chip. Chip, please.

MR. CHIPALKATTI: Chip Chipalkatti. Again this comes back to the question of is it the component or the lamp that you are looking at, and maybe there's this emerging conversation that there might be two dual parts for this, if the LM-80 data is not there.

MR. BROOKMAN: I see.

MR. CHIPALKATTI: But you're effectively trying to certify or qualify a product, and yet you are reaching inside to only one element of that overall product to test it.

MR. BROOKMAN: Isn't the product typically an integral lamp?

MR. CHIPALKATTI: Yes.

MR. BROOKMAN: Typically, right.

MR. CHIPALKATTI: And it goes back to what Mark was saying earlier. You're going to have to tear this product apart to actually test this component.

MR. BROOKMAN: Go ahead, Mark.

MR. DUFFY: Yeah, of course, I agree. But the – it's just an overall comment –

MR. CHIPALKATTI: (comment off mic)

MR. DUFFY: Yeah, I think it is. Just an overall observation. This is an awful lot of effort to get at an FTC label number. So at some point we need to step back and ask ourselves, what should we advise the FTC in regard to their label and have that conversation at some point.

MR. BROOKMAN: I wish FTC were in the room here.

MR. DUFFY: It would be helpful.

MS. DEBUTTS: We'll definitely take your comments and we'll see what we can do in cooperation with the agency.

MR. BROOKMAN: Thank you. Okay. So, this is very helpful. I think this is very, very helpful what we're doing here. So keep going.

MS. THAKKAR: Okay. For measuring the lumen

output of the LED source, LM-80 specifies that a spectroradiometer should be used. Instead, DOE is proposing that any of the three methods specified in LM-79 for the LED lamp should be used to measure the lumen output of the LED source as well. These three methods are the sphere-spectroradiometer, sphere-photometer, and goniophotometer.

DOE requests comment on whether any of these three methods can be used to measure lumen output or only the spectroradiometer should be used.

MR. BROOKMAN: Alex.

MR. BOESENBERG: I have grammatical comment. Just to clarify sentence two there. Is it the same thing to say that DOE is proposing that either the first, the second, or the third test device might be used or may be used?

MS. THAKKAR: Yeah –

MR. BOESENBERG: Because some could read that to say you have to do it all three. I'm pretty sure that's not your intent, but I want to clarify that.

MS. THAKKAR: That is right, the intent is that any one of the three methods could be used.

MR. BROOKMAN: Thanks for that clarification. This is like legislative language

here.

MR. WALKER: This is Matthew Walker from Navigant. Could anyone speak to why LM-80 specifies one of the measurement instruments as compared to LM-79 where all three are included?

MR. BROOKMAN: Ralph, please.

MR. TUTTLE: Yeah. In fact I was looking at this. LM-80 requires not only testing of lumen output of the LEDs, but also chromaticity, and in fact forward voltage and all of the – many of the photometric and electrical characteristics of the product under test. For example, you can’t use goniophotometer to measure color. You need a Gonio-spectroradiometer, which is a different tool completely. So, however, if all you’re measuring is lumen output, then a goniophotometer can be used for that purpose. So, the instrument that was defined in LM-80 allows us to in fact, test all of the critical parameters of the LEDs during the test procedure. Does that make sense? Okay. So again, if all we’re interested in is how much light is coming out of the LED, it’s really a relative number over time, and there’s a variety of different instruments that can be used to perform that measurement.

MR. BROOKMAN: Okay. Either then. Yes. It

specifies either for those three, correct? Yeah.

MR. BOESENBERG: Alex Boesenberg, again. As was previously stated, particularly for those people who like the approach that uses LM-80 because they're already undergoing that testing, logically there's no reason to specify other devices, and as was already stated, just stick with LM-80 because that's the agreed to industry standard.

MR. BROOKMAN: Got you.

MR. BOESENBERG: Options are nice, but in this case, they just complicate things.

MR. BROOKMAN: Matthew. We have someone?

MR. WALKER: Yes, we have comment from Timothy Rasinski regarding issue 16. "Labs are accredited for standards as written. If accreditation is involved, notations will have to be made in the scope and could it confuse clients expecting LM-80 to be run as specified." I should point out, that Tim Rasinski is from NVLAP.

MR. BROOKMAN: Okay. Thanks to him, that's useful. Yes. Do we have any additional comments on this stream before we move on. Okay.

MS. THAKKAR: Moving on to lumen maintenance measurement. DOE proposes that the lumen maintenance should be measured as specified in LM-80 and TM-21.

Additionally, DOE proposes to adopt some relevant guidelines from the Energy Star guidance document for measuring the lumen maintenance of LED sources. These guidelines specify that the CCT of all the LED sources being tested must be the same. Further, the guidance document provides guidelines on testing three types of sources that are listed at the bottom of this slide. For LED lamps that contain both phosphor converted white and single color LED packages, the LED array units that are tested should incorporate both types of LED packages. For LED lamps that contain LED arrays with either a common phosphor layer over all dyes, or individual phosphor layers over each dye, the LED array units that are tested should be the largest LED array in the lamp and the average current through each dye in the LED array should be equal to or greater than the average current through each dye in the lamp.

Finally, for LED lamps that contain an LED array that is an assembly of LED packages with their own phosphor layer, the temperature at which testing is done should corresponds to the in-situ temperature of the hottest package in the array.

DOE requests comment on adopting these guidelines from the Energy Star guidance document for measuring lumen maintenance of the LED source.

MR. BROOKMAN: Ralph, please.

MR. TUTTLE: Sorry. Item one, about phosphor converted white and single color LED packages, integrated together in a lamp, is something that we, in particular are having discussions with EPA on right now. What this is referring to are LED sources, if you will, or bulb products, which incorporate both white LEDs as well as red LEDs in order to reach a certain chromaticity and CRI. There’s a question as to whether or not the LM-80 data from individual red LEDs plus LM-80 data from individual white LEDs is acceptable, rather than putting them both together on a board and performing the LM-80 testing on the board itself.

At this point in time, it’s my understanding that the EPA has accepted our proposal that both individual LED data be used. So I think it’s preliminary right now until we get better definition from EPA on this.

MR. BROOKMAN: And you’re thinking that – oh, you anticipate that what EPA is specifying here, that will evolve?

MR. TUTTLE: Yes, absolutely.

MR. BROOKMAN: Okay. Is that sufficient?

MS. THAKKAR: Yes. Could you also please

provide more information on that in your written comments?

MR. TUTTLE: Sure. Absolutely.

MS. THAKKAR: Thank you.

MR. BROOKMAN: Okay. Yes, please. Dave.

MR. SZOMBATFALVY: Clarification. What about lamps or replacement lamps that have phosphor that’s external to the LEDs, in other words, around the lamp itself, not over the LEDs. Remote phosphors. Is that covered.

MR. TUTTLE: I’m wondering if that’s – it’s our understanding that’s covered in item two here, which is LED arrays with either a common phosphor layer overall.

MR. BROOKMAN: Okay. Thank you. That’s helpful. That’s clarifying.

MS. THAKKAR: Okay. So moving on. The final step in the three step process is to determine the rated lifetime of the LED lamp, is to project the lumen maintenance data that was obtained in the previous step. DOE proposes that the rated lifetime should be projected as specified in TM-21. If the projected rated lifetime according to TM-21 is greater than 25,000 hours, then the rated lifetime should be 25,000 hours. If the projected rated lifetime

according to TM-21 is less than 25,000 hours, then the rated lifetime is the projected value. Once the rated lifetime is determined by this projection method, it should be calculated in number of years based on three hours per day of operation as required by FTC for the lighting facts label.

DOE proposes that the rated lifetime should be rounded to the nearest tenth of a year, for example, 22.8 years, which is also a requirement for FTC's label.

MR. BROOKMAN: Alex.

MR. BOESENBERG: Alex Boesenberg, NEMA. This is another issue we are discussing with FTC, 10.2 year lifetime really isn't something that consumers necessarily might embrace, but it's an issue we are working on.

MR. BROOKMAN: Mark.

MR. DUFFY: My previous comment about resolution comes in really important at this point. Especially since, in the consumer market, they might consider that 20.2 and 20.3 are really different numbers in the consumer market. So I think we have to think about – something I installed 22 years ago, I may have sold that home, it might have gone with the appliances, so the LED is really outliving many of the

things that we're –

MR. BROOKMAN: Probably outlives the drapes.

MR. DUFFY: It outlives the drapes for sure in my house.

MR. BROOKMAN: Thank you. Ralph.

MR. TUTTLE: And then again, not to beat a dead horse, but in fact IES TM-21 does not project rated lifetime. It projects lumen maintenance.

MR. BROOKMAN: Okay.

MS. THAKKAR: Okay.

MR. BROOKMAN: Yes, please, John.

MR. GREEN: John Green, sorry. The decimal point might make a difference if the lifetime is short. I mean, 1.2 years might make sense, but not 22.2 years. So maybe two significant digits is the way to look at it, rather than tenths of a year or something like that.

MR. BROOKMAN: Okay. Good. Thank you.

MS. THAKKAR: We already heard a lot of feedback on all these issues, but at this point, if there are any final thoughts or more feedback on the proposed test procedure?

MR. BROOKMAN: Take a quick peek at 19, 20 and 11, and see if there's anything else you wish to contribute at this point. Julia.

MS. FARBER: We’ve got a clarification question on UL 1993. It is that the temperature test apparatus for 1993 is considered a representative severe test of thermal performance, as the can itself is very narrow in diameter and allows for very little heat dissipation. So it’s not an overlay worst case environment, but it is intended to represent the most challenging of foreseeable installation applications.

MR. BROOKMAN: A severe case.

MS. FARBER: Yes, so it’s supposed to allow for a worst case scenario installation, I guess, or the most severe, not the worst case.

MR. BROOKMAN: To test for the safety of the heat.

MS. FARBER: Exactly.

MR. BROOKMAN: Okay.

MS. FARBER: So that it’s safe in all conditions.

MR. BROOKMAN: Pam, please. Thank you, Julia.

MS. HORNER: This is Pam Horner with Osram Sylvania. I just – maybe I missed it, but could you please just briefly summarize why a 25,000 hour cap? Thank you.

MS. THAKKAR: So you’re asking why a cap or

why the number 25,000? Well, the cap was put in place because there's so many unknown variables right now, like we don't know the driver lifetime, the interactions of the components, and also the proposed test procedure is, like you said, not doing the systems approach, but it's only looking at the source and determining the lumen maintenance of the source, so 25,000 hours is basically put in place to provide a conservative estimate and not have like a 50,000 or 100,000 years of lumen maintenance, which is just based on source, when you're actually going to – when you put this on FTC's label, it's going to represent the life of the lamp, so 25,000 hours was put as a conservative estimate to not like give – so that you're basically not disappointing the consumer if it dies before then.

MR. BROOKMAN: Keith.

MR. COOK: Yeah, Keith Cook. But it's – it's still an arbitrary number. I mean, as far as you know, the driver fails at 12,000 hours. So I think that you're better off with nothing, and base it upon real testing of the system, and that's what we've got to work on.

MR. BROOKMAN: Okay. Mark.

MR. DUFFY: So just for the record, on your

issue 11, everything about that may be okay, but UL standard 1993 should not be used to determine normal operating temperature.

MR. BROOKMAN: Normal operating temperature.

MR. DUFFY: Correct, because that’s what you’re going to be using to project your lumen maintenance.

MR. BROOKMAN: Yes, because that’s what Julia just brought to us. Okay. Got you.

MS. THAKKAR: I have a follow up question to that. Would you have some thought on what could be used to determine the in-situ temperature, if not UL 1993?

MR. DUFFY: Well, I may be able to speculate. I think it would be helpful if I work with my NEMA compatriots to give you a NEMA response to that.

MS. THAKKAR: Okay. Sure.

MR. DUFFY: Did you note that, Alex?

MR. BOESENBERG: Yes.

MR. BROOKMAN: Okay, so now we’re to sample size requirements.

MS. THAKKAR: DOE proposes that the sample size requirement for testing the LED source should be as specified in TM-21, which is necessary for the

projection method outlined in TM-21 to be valid. At least ten units should be tested at a given case temperature and drive current to project the lumen maintenance data.

DOE requests comment on the proposed sample size requirements for testing the LED sources.

MR. BROOKMAN: We already touched on this a little. Have we addressed this, or is there more to be said? Alex.

MR. BOESENBERG: Alex Boesenberg. The previous discussion was about lifetime lumen maintenance testing. This is a different test, hence the different – ten appears here versus 21 on the previous. But what –

PARTICIPANT: The 21 was about lamps, LM-79. This is LM-80. This is sources.

MR. BOESENBERG: Yeah. So I don’t know, I would ask Ralph, what does TM-21 say for sample size?

MR. BROOKMAN: Ralph, please.

MR. TUTTLE: Actually TM-21 recommends a minimum of 20 LEDs to be used during LM-80 testing to allow projections of long term lumen maintenance. We did allow fewer units to be used, but then reduced the maximum number of hours that could be projected with the fewer units. But for a minimum of actually 35,000

hours, we recommend 20 LEDs.

MR. BROOKMAN: Okay. Do we have additional comments on this point? I see none. Okay.

MS. THAKKAR: Okay. The next topic is the estimated burden to small businesses. DOE is required to analyze the testing burden to small businesses once this rulemaking is established. Do you have a question?

MR. COOK: Yeah, I do have a question.

MR. BROOKMAN: Keith, please.

MR. COOK: I'm sorry, Keith Cook. Repeatedly, it seems like the question is whether or not we should make changes to an already approved standard, and I'm really concerned that if we follow that path, it's going to lead to a lot of confusion out there, as to which test I'm running and which data needs to be supplied to who. I think we need to be consistent and stay with something that's already been approved.

MR. BROOKMAN: Okay. Thanks for that comment. Got it. Now to burden on small businesses.

MS. THAKKAR: So DOE is required to analyze the testing burden to small businesses once this rulemaking is established, and if it is adopted by FTC for the lighting facts label. To determine this

burden, DOE estimated the number of small businesses that manufacture LED lamps in the United States, and estimated the cost burden to these manufacturers. DOE estimated that of the 32 manufacturers of LED lamps in the US, about 17 manufacturers are small businesses. Further, DOE estimated that these small manufacturers produce about 17 basic models of LED lamps each. For these 17 models, DOE estimates a one-time setup cost of $12,000 to build racks to test the LED lamp. The cost to test these lamps will be approximately $68,000 for determining input power, lumen output, CCT, and rated lifetime for the first year. The cost for subsequent years should be less than $68,000 because only new products or redesigned products would be tested.

Finally, in its light bulb rulemaking, FTC determined that the cost for changing package and product labeling, as well as the cost for updating retail catalogues would not impose a significant burden on small entities. Because the values would potentially need updating, only for LED lamps, DOE does not expect this to be a significant burden either.

DOE requests comment on the estimated number of small businesses impacted by this rulemaking, as

well as the estimated costs and associated burden to small businesses by this rulemaking once it is adopted by FTC.

MR. BROOKMAN: Mark.

MR. DUFFY: Yeah, this is Mark Duffy. Well, I don't work for one of those small manufacturers. I'm a little concerned by the assumption that they would want to setup an accredited laboratory to do this. I suspect that most of those small manufacturers are going to be sending their product out for a third party test and receiving certification of compliance or whatever, to use for their labels.

MR. BROOKMAN: Would that mean the cost would be higher?

MR. DUFFY: I don't know.

MR. BROOKMAN: Keith.

MR. COOK: I guess I'm not sure where we're going with this particular question. If we show undue burden to the small manufacturers, does that mean they don't have to comply with FTC requirements?

MR. BROOKMAN: No.

MR. COOK: Then this is an academic question. I don't understand why we're even asking it.

MR. BROOKMAN: John. Excuse me. Dave, go

ahead.

MR. SZOMBATFALVY: Yeah, I'm not – you had mentioned that this – the cost was associated with the test procedures for input power, lumen, and output – lumen output and CCT. But what about the cost if we have to execute the test procedure for rated life. I think that's a significant cost to a manufacturer, even like GE, if we need to do that.

MR. BROOKMAN: I guess – go ahead.

MS. THAKKAR: To clarify, the $68,000 that's put there includes the rated lifetime as proposed as well. The assumption there being that the in-situ temperature measurement test is performed by the manufacturer, but LM-80 data is typically available, so you may not have to test the source itself.

MR. BROOKMAN: Yes, go ahead, please.

MR. SZOMBATFALVY: Yes, I was going down the path when we don't have LM-80 data, so there is a significant cost if we don't have the LM-80 data to do that testing that's proposed.

MR. BROOKMAN: Okay. Thanks, Dave. Yes, Chip.

MR. CHIPALKATTI: Chip Chipalkatti. I'm just asking about the number 17, the magic number 17. I think that there's evident and not so evident small

companies that are present today in this field. Though I'm not working for a small company, I do have contact with a lot of them, and I think that might be an underestimate of how many small companies there are.

MR. BROOKMAN: Underestimate?

MR. CHIPALKATTI: Yes.

MR. BROOKMAN: Could you speculate? Twice as many? Ten times as many?

MR. CHIPALKATTI: Twice, heading towards ten times.

PARTICIPANT: Are you talking about just US manufacturers?

MS. THAKKAR: Just the US?

MR. CHIPALKATTI: Yes, US. And that's a speculation, because a lot of these companies are under the radar, if you will, what you call operating in stealth mode, and so on, so trying to get into the market. And I don't know if that's a concern at all, but if the underlying reason for this question is the impact on innovation and new companies and all of that, then that should be a matter for further study.

MR. BROOKMAN: Okay. I saw both Pekka and Alex. I think Pekka was first.

MR. HAKKARAINEN: Pekka Hakkarainen. I

wanted to ask our friend Julia, is it from UL, whether this cost estimate is reasonable for third party testing?

MR. BROOKMAN: Julia.

MS. FARBER: I'll have to get back to you.

MR. BROOKMAN: Alex, please.

MR. BOESENBERG: Alex Boesenberg, NEMA. Relative to the number of small businesses, I would ask, since he's not here I can't ask him, did your offices ask Jim Brodrick, because he is in direct contact with hundreds of companies, some of which will be small.

MR. BROOKMAN: Austin, did you have a comment?

MR. GELDER: Yeah, Austin Gelder. ICF International. I was wondering where the $12,000 estimate came for initial setup, because if you're talking about all of the measurement devices to measure things such as CCT, lumens, power, plus all of the racks, I could see one piece of equipment costing $10,000 to set this up for some of these – some of these small manufacturers who maybe all they're making is they came out and they started making LED lamps. They may not have the lab already in place, so their cost to set up a lab could be a huge multiple of that.

MR. BROOKMAN: Would you – could you provide a range? What do you think to have it, to actually set up a lab, the initial set up, what would it be?

MR. GELDER: Oh, you could easily get over $100,000, between the facilities and all of the additional equipment and the cost to have someone trained to run that equipment, because – in addition, I'm pretty sure we've talked about getting accredited, and that in and of itself ends up being a very expensive process, both from the accreditation standpoint, as well as getting the quality management system in place from a labor perspective.

MR. BROOKMAN: I see. Ralph.

MR. TUTTLE: A type C goniometer, you're probably talking about $200,000. A one meter integrating sphere with the associated equipment is easily $100,000. So maybe building racks would cost $12,000, but that's about it.

MR. HAKKARAINEN: Pekka Hakkarainen. Am I understanding correctly that small business is defined as company that has fewer than 500 people, is that the definition?

MS. THAKKAR: It's – for electric lamps, it's actually fewer than 1000 employees. Electric lamp manufacturers.

MR. BROOKMAN: Oh. Yesterday in the appliance standard proceeding yesterday, I'm pretty sure the slide said SBA says under 500. That's my recollection.

MS. KOHL: This is Betsy Kohl. It depends on the industry. The SBA has a table of size standards based on your industry code, and it's up on their website if you're interested in looking at it, but that's where we get them from.

MR. BROOKMAN: Thank you. The source. Useful. Okay. So thank you. That was also illuminating, that information there. Yes. Are there other follow on questions that you have?

MS. THAKKAR: No. I was going to hand it over to Lucy deButts for –

MR. WALKER: We do have one more – sorry, this is Matthew Walker, Navigant. We do have one more comment from the webinar, webinar participant. Joel Jacobson, "the number of models introduced into the market are increasing rapidly, so cost estimates are significantly underestimated."

MR. BROOKMAN: Okay.

MR. WALKER: Then we have, regarding set up cost for testing, from Jacki Swiernik. "Goniophotometer, $200,000 minimum. Two meter

integrating sphere with accessories, $60,000 average." And that's all from the webinar.

MR. BROOKMAN: Thank you. So at the outset, we promised you another opportunity to make comments at the end of the meeting. We've arrived at the end of these presentation slides and the discussion. Any closing remarks before I turn it back to Lucy? Nothing here in closing. Okay, back to Lucy.

Closing Remarks

MS. DEBUTTS: Well, I hope nobody minds that I'm talking, sitting here and not standing there. Okay. So I just wanted to thank everyone. This actually was very good, productive, and helpful. And to make sure that everybody understands how to reach us, you know, and submit the written comments, the slide represents all the information that you need to have. Several avenues are explained, you know. Of course, we prefer the electronic method, as usual, however if it's not possible, postal service or courier can be used. And Brenda Edwards, our public meeting coordinator would be taken care of – she's out there somewhere – she will be taking care of the comments and – as they come in. We will address them and review them and come back to you if we have additional questions. So hopefully, it's okay for us

to seek some clarification.

Again, comment period ends on June 25th, but to address the previous concerns, if the comments that we receive state that DOE needs to give more time to developing the test procedure as Betsy Kohl stated, there are avenues of doing that as well.

So just want to thank everyone for coming and see if any other questions are there in the room. Back to Doug.

MR. BROOKMAN: Thanks to all of you. Safe travels.

(Whereupon, (end time not specified), 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:

PUBLIC MEETING ON TEST PROCEDURE NOTICE OF PROPOSED RULEMAKING FOR LIGHT-EMITTING DIODE LAMPS

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: April 9, 2012