BEFORE THE
CALIFORNIA ENERGY COMMISSION (CEC)

In the matter of ) Docket No. 12-AAER-2B
Efficiency Rulemaking )



**STAFF WORKSHOP**
**2012-2013 APPLIANCE EFFICIENCY RULEMAKING**

California Energy Commission
Hearing Room B
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Reported by:
Kent Odell

APPEARANCES

STAFF

Ken Rider
Harinder Singh
Peter Strait

Also Present (* present via telephone)

Alex Boesenberg, National Electrical Manufacturers Association (NEMA)
Mike McGaraghan, Energy Solutions, on behalf of CA IOUs
Keith Cook, Philips
Noah Horowitz, Natural Resources Defense Council (NRDC)
Willem Sillevis-Smitt, SORAA
Gary Fernstrom, Pacific Gas & Electric Company (PG&E)
Joe Howley, GE Lighting
*Richard Greenberg, Southern California Edison (SCE)
*Michael Morin, San Diego Gas & Electric Company (SDG&E)
Pekka Hakkarainen, Lutron Electronics
Charlie Stevens, Northwest Energy Efficiency Alliance
*Jim Baker, Freescale Semiconductor
Daniel Young, Energy Solutions, on behalf of CA Utilities
Amanda Gonzalez, Energy Solutions, on behalf of California Utilities

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P R O C E E D I N G S

MAY 30, 2013 9:04 A.M.

MR. SINGH: Good morning. Welcome to the Energy Commission. My name is Harinder Singh. I'm the Appliance Program Office Engineer.

First of all, let me give you some instructions on the housekeeping items. For those of you who are not familiar with this building, the closest restrooms are located to the right as you go outside; there is a snack bar on the second floor under the white awning, it's up as you go to the left, the stairs are there; lastly, in the event of an emergency and the building is evacuated, please follow our employees to the appropriate exits. We will reconvene at Roosevelt Park located diagonally across the street from this building. Please proceed calmly and quickly, again, following the employees with whom you are meeting to safely exit the building. Thank you.

I also want to let everybody know that today's proceedings are being recorded and the transcripts will be posted on the Commission website in three to four weeks.

Now some background on today's proceeding. The Energy Commission conducted a scoping workshop in August 2011. The Commission approved and issued an Order Instituting Rulemaking, or OIR, in March 2012. The Invitation to Participate, ITP, the Commission issued the

ITP in March this year. And the topics that were listed in the first phase, we posted those to seek comments and information on those comments, and received comments and information and data related to all the topics that were listed in the ITP. So today we are conducting its third workshop, so we're conducting a Lighting Topics Workshop, and the topics are LED Lamps, Dimmable Ballasts, and Multifaceted Lamps.

The next step is the Energy Commission will issue a Proposal Template on June 10th, and issue a Request for Proposal. Stakeholders, if they wish to submit proposals, can use the template, or stakeholders can use their own format to submit proposals. The RFP or the proposals will be due by July 25th.

With this, I would like to hand over the podium to Ken Rider, he is our Associate Electric Engineer and he's going to discuss the LED Lamps. Thank you.

MR. RIDER: All right, good morning everyone. My name is Ken Rider. I'm an Electrical Engineer with the Appliance Efficiency Program at the Energy Commission. You may have worked with Gabe Taylor in the past on this subject and other subjects in this presentation. Gabe Taylor has moved on to, at least temporarily, in an Adviser role and will not be at this time continuing the work on these efficiency projects. And Harinder and I have split these projects; I've taken on LEDs and Harinder has taken on Dimming Ballasts and MR 16s, at least for the time being.

The purpose of this workshop, it's the last step of the Invitation to Participate process. We've received several comments in response to our Request for Information, and this workshop is an opportunity to discuss the responses we received. So these are some of the pieces of information requested in the ITP. These are some of the folks that responded specifically to the LED Request for Information, and I want to thank these people for taking the time to submit written comments to the Energy Commission.

So I'd like to begin by talking about the scope of what we mean when we're talking about LED lamps. The scope of LED lamps is fairly similar to the scope of things that are currently regulated, but only for incandescent lamps such as incandescent general service lamps and incandescent reflector lamps, screw-based lamps, and I think that's what we mean when we say today "LED lamps," not some of the other form factors.

So the way I'd like to go through this, this is really about getting further feedback from the stakeholders, it's not really for me to regurgitate all the things that we received in written comments, so the way I like to run this is I'm going to read a couple of the pieces of information received and then state a few discussion questions, and then open it up to stakeholders -- first stakeholders in the room to respond to some of these discussion questions, or generally to the subject, in this case it would be Sales and Stock. And when folks respond, they can go ahead and respond to one, to both, or just generally to the topic at hand.

Once we get through the people in the room, we'll move to people on the phone. And for people on the phone, we'll let you know when the lines are unmuted, so that way you can know when to speak. There's also the possibility to submit responses or questions by chat, and we will read those into the record. Also, when you respond, please state your name for purposes of the transcript.

So Sales and Stock. The IOUs provided in their response some sales and stock figures for general service lamps -- all general service lamps and all reflector lamps. And these are national figures that I've put up here.

They stated that there are 4.39 billion general service lamps and they gave a breakdown of the market percentages; and I think these were 2010 market percentages showing only half a percent of the market being LED. And for reflector lamps, they gave us information that there were just under a billion reflector lamps in the U.S., and 3% of those were LED.

For discussion: The IOU ITP response uses 2010 information. What impacts has EISA had on this market share? So, you know, incandescent lamps now need to comply, especially general service lamps need to comply, with more stringent standards that were passed, and so how does that transform the marketplace? And also, are there any other trends that have changed dramatically over the last three years? Also, are LED lamps likely to displace both incandescent and CFLs in the market? So, you know, they may take on incandescent market share, but to what extent will they also take CFL market share?

And with that, I'll open it to folks in the room if you would like to respond to one of these two questions, or just generally to the Sales and Stock. Oh, yes, please raise your hand and we'll provide a wireless mic to you.

MR. BOESENBERG: Red is live? Oh, okay. All right, Alex Boesenberg, NEMA. I want to thank the Commission for having today's meeting. I want to respond to two of the questions there. What impacts has EISA had on the market shares above? As most folks know, but I'll state for the record, EISA isn't fully phased in, so not all of those impacts have hit their effective dates, much less has the market shifted, and we share the consternation of trying to figure out where it's going; but until such time as the market has shifted, it'll be very hard to make those estimates.

But as far as some of those predictions, and it's in answer to the second question, are LED lamps likely to displace, I can say that in the recent interim technical -- or, wait, preliminary technical support document for the DOE's general service fluorescent lamp and incandescent reflector lamp rulemaking, they did have some predictions regarding LED market share and IRLs, at least. It doesn't -- that rulemaking doesn't address CFLs in their predictions, so unfortunately that's not there, it's linear fluorescent. But as far as IRLs go, the estimates from Lawrence Berkeley Labs, who did the data regression, says that will be completely displaced and the date, I think, is 2025, was it? Something like that? I don't remember, but it's in the public records and on the DOE's website, so that is a small data point, but nonetheless some slightly more recent information.

MR. RIDER: Thank you. Anyone else in the room? Go ahead after him.

MR. MCGARAGHAN: Okay, good morning. This is Mike McGaraghan with Energy Solutions, on behalf of the

California IOUs. And also just want to thank the Commission for hosting the workshop and for giving us a chance to go through some of this information.

You are correct here that this information submitted was based on 2010 DOE data and, interestingly, DOE just released another report a few weeks ago that has a lot of the same information updated to 2012. And we can summarize that and put it in a format into the docket, as well, but, just offhand, you do start to see some changes here that incandescent numbers did start to come down a little closer to 55% to 60%, I believe, and halogen went slightly up to about 1%, and LEDs went slightly up to about 1%, as well. So that report, I think, will do a really good job of filling in some of the gaps between 2010 and 2012. And, like I said, we'll submit that.

In terms of the last question there, I think LED lamps are likely to displace both incandescent and CFLs to some extent, but certainly what we're aiming for in this effort is to ensure that LEDs are providing a level of service equivalent to incandescent lamps, so that's the target socket that we're trying to replace here, where this energy savings potential lies, and I think that's the issue that we are all here to discuss. Thanks.

MR. RIDER: Thank you.

MR. COOK: I do have some hot off the press numbers.

MR. RIDER: Please read your name --

MR. COOK: This is Keith Cook from Philips. NEMA just released some very interesting data, it was released actually on May 28th, and I'll just read what it says. It says, "NEMA's index for halogen A-line lamp shipments showed sharp growth during Q1 of 2013, registering an index level of 528.3, an increase of 127.1% on a year-over-year basis. In contrast, the incandescent lamp index retreated by 28.8% year on year to 40.2. The index of compact fluorescent lamps posted a reading of 167.4, a marginal decrease from 168.4 during the previous quarter. However, the year-over-year comparison confirms shipments of CFLs are well below the 2012 level exhibiting a 6.3 decline." So, as you can see, we're seeing a huge impact from EISA on the market. As far as the LED lamps likely displacing both incandescent and CFLs, from Philips' perspective, we actually believe that's true, as many of you are aware. We're already seeing 28% of our lighting sales are LED-based, and we're expecting that number to grow to 80% by 2020. Thank you.

MR. RIDER: Thank you. Any other -- oh, go ahead, Noah.

MR. HOROWITZ: This is Noah Horowitz for the Natural Resources Defense Council (NRDC). I'd like to address the second question there.  Nobody knows the exact number of what the split will be, but it's pretty clear it's a three-way race both in terms of the A lamp replacements or the general service bulbs, where that's some flavor of an improved incandescent halogen, a CFL, or an LED.  And LEDs are coming on, as just confirmed by my colleague from Philips.  The big question I think why many of us are here and supportive of this standard is it's the price and quality of the LEDs that will determine how much energy savings we get from these products.  Will people buy LEDs or the much lower cost, EISA compliant, halogen incandescent?  So it's the price and quality that will dictate that.

In terms of tracking things, there's probably some confusion and hopefully we can use common language. The A lamps that have a halogen capsule inside them, are those incandescent or halogens?  Different companies call them different things.  But that's currently going to be the low cost bulb on the market that the LEDs will have to compete with.  Thank you.

MR. RIDER:  Thank you.  Anyone else in the room that would like to respond to these items?  Seeing none, Peter, can you go ahead and unmute the lines?  So the phone lines have been unmuted if you'd like to speak to Sales and Stock, or any of the discussion questions, please go ahead and speak. Okay, hearing no comments on the phone, I'm going to go ahead and move on.

So I'm going to show a couple -- I think these are also from the IOU comments, a few graphs that are found in their response to the Invitation to Participate. And then I have some discussion at the end.

So this is a graph that was found in their comment that shows the distribution of CRI in the market. I think this is using the Lighting Effects Database and this, as well, is using the Lighting Effects Database, showing trends and time of CRI in LEDs. It looks like for Omni-directional LEDs.

So IOUs' analysis of LED Lamps here shows that they are centered in the 80's, so the majority of LEDs have a CRI in the 80's, with at least overall upward trends for CRI and Omni-directional lamps.

Discussion questions: What are the market pressures driving CRI upwards? Directional lamps seem to be far more stagnant in CRI improvements. What is different about the market pressures in this market? Some responses suggest trading lumens for CRI; which is a larger driver of customer satisfaction? So if you can sacrifice brightness for Color Rendering Index, you know, where does that breakeven point -- how does that optimize for customer satisfaction?

With that, I will turn it over to the room. Go ahead.

MR. COOK: This is Keith Cook from Philips. I'm not sure that you've asked necessarily the right questions here. There is a bigger question, too, and that is what is the tradeoff between CRI and cost? We know that right now, as far as market adoption for LEDs, cost is the overriding concern. And as you drive CRI up, cost also goes up. And so it's going to inhibit market adoption. We're concerned with the higher CRI numbers.

We agree that there are many applications that a CRI of 90 or better is appropriate, such as in some retail applications, etc. But for the general lighting market such as in residential, 80+ is more than adequate. The problem we're faced with is there's been an overreaction to the poor CFLs that were available in the market in the past where the CRI was typically in the 60's, and as a result people got a very bad taste from those CFLs. The 90 is, we believe, an over-reaction to that experience and that the market is actually showing that 80 is quite acceptable. Thank you.

MR. RIDER: Thank you. And I believe we will go into more of some of the costs of CRI later in this presentation. Any other comments in this room? Yes, please approach the podium.

MR. SILLEVIS-SMITT: So my name is Willem Sillevis-Smitt from SORAA. There is in most LED technologies, you could say that there is like a 15-20% lower efficiency when you go from 80 to 90 CRI; that could mean also a 10-15% or 20% lower output for comparable power consumption. We disagree with the comments that were just made by Philips. We believe that it's well documented both for consumer as well as commercial markets that CRI, at least for a substantial portion of the market, is an important factor for adapting energy efficient lighting. Because of the inherent trade-off in efficiency between higher and lower CRI, SORAA has proposed that there will be different lumen that's used for high CRI versus lower CRI.

MR. RIDER: Thank you. Anyone else in the room that would like to make a comment? Please.

MR. MCGARAGHAN: Mike McGaraghan for the California Utilities. I would like to echo a few of the comments just made by SORAA. We think that CRI is a very important metric and look forward in this rulemaking to exploring what that tradeoff point is. I do think it's a good question you're asking. I think there are a lot of instances where higher CRIs is very important to consumers, and I think we've seen that with CFLs. I know Philips just commented that poor adoption of CFLs was linked to CRIs in the 60's, but a lot of CFLs have much better CRI in the 80's and we still haven't seen the type of market adoption that we would have hoped for from CFLs. It's been a very slow road for those, as most people know. You know, it took 30 years to get to market share, you know, wherever it sat, but 30% to 40% of sockets converted, which is an extremely slow market adoption, so we'd really look forward to further exploration of this question, and then the cost issue becomes very important. And I think you've got slides on that later, so I won't get too far into that. But just what I will get into is just the difference in the metrics here and the trade-off between lumens and CRI, there neither is a perfect metric, lumens is a measure of -- specifically Photopic lumens is a measure of total light output with a weighting factor applied to it that over-emphasizes light at 550 nanometers, which is a greenish yellow light. So, sure, we want products that are bright, but if we put the emphasis too much on lumens, we're not considering the rest of the spectrum; and CRI is a metric that tries to emphasize the range of spectral distributions. So both are very important and I don't think we have a perfect answer today on what that sweet spot is, but we're glad that the Commission is looking into this and, as we wait and see what prices do and what the market does, we don't think consideration of 90 CRI should be out of the question. So far, 90 CRI has been a very small part of the market. So as that percentage of the market increases, we'll keep our eye on what's happening with cost, and cost may be coming down very quickly there, as well. So, thank you.

MR. RIDER: Thank you. All right, any other comments? Gary.

MR. FERNSTROM: Hi, everyone. This is Gary Fernstrom representing PG&E. PG&E believes that CRI is an important factor because we're interested in the greatest customer adoption and satisfaction with the progressively larger prevalence of LED A lamps. A key issue here is the cost. We believe from our experience working with Codes and Standards in California and at the Federal level for over a decade, probably 15 years, that when required by standards incremental costs are lower than what is estimated ahead of time. So we're expecting to be able to achieve the higher CRIs at minimal cost, making this a huge benefit for consumers in terms of better lamp performance. I'd also like to mention that the utilities sponsor voluntary rebate programs frequently for these kinds of products, and we're obliged to follow the rules of the California Public Utilities Commission. The CPUC has determined that A lamps for residential and small commercial use, in order to qualify for rebates, must meet the specification of the California voluntary LED spec which the CEC adopted earlier this year. It has a minimum CRI of 90, so we're limited beginning next year in terms of the product that we can provide rebates for to only those products that exceed a CRI of 90. So it's relatively important for California CEC regulations affecting LED lamps to push the CRI to that level because the CPUC has given us a fairly limited conservative, pessimistic view of the energy savings of the LED lamps relative to the baseline. So if we want rebates to be successful in pushing this market, it's important that the state standards, as well as the voluntary standards align at a CRI of 90, which we believe in practice after implementation will have minimal incremental cost.

MR. RIDER: Thank you. Noah.

MR. HOROWITZ: Noah Horowitz, NRDC again. We at NRDC agree that some minimum level of CRI is needed to ensure consumers of a decent experience with their new LEDs and this is really part of a color quality issue and, although it's not on the slide, we think a minimum requirement for R9, which is the part of the spectrum that deals with the red colors, would also be appropriate. So we think the question is how high a CRI is good enough to ensure consumers have a good experience. Is it 80 or 90?

I think that will play out throughout this rulemaking. As we understand it, we think there are two ways to achieve the very high levels of CRI, one of them has a 10 to 20 percent impact on efficiency, so the higher CRI bulb will use more energy than an equivalent bulb that gives off the same amount of light, and that can be done often at little to no incremental cost, or there's a way to do this where this is no efficiency hit, we're getting the same level of energy savings, but that's at a price increase of numbers, you know, 10 to 20 percent, we've heard, as well. Our advice would be to track the market carefully as a lot of new products will be coming, and we'll get a lot more information. We may well see several new products that do hit the CRI 90, and let's see what those actual incremental prices are, at least on the market are. Thank you.

MR. RIDER: Thank you. Any other --

MR. HOWLEY: Joe Howley with GE Lighting. After listening to the comments, my reaction is there really is no one right answer to the consumer with regard to CRI. CRI is a color metric, so it depends on what you're lighting in the space whether or not you can benefit from a higher CRI or not. So in some cases, consumers would be better off having a lower cost product with higher lumens in many applications because color simply isn't that important in that particular application, and in other applications they may benefit from a higher CRI, but it should be really the consumer's choice as to whether they want to pay more money because it is true that, as you go with higher CRI, there will definitely be a tradeoff with higher cost and lower lumens. And that certainly isn't the right answer in all applications.

EPA has evaluated this with their ENERGY STAR program and decided that 80 CRI is the proper level; perhaps California could consider an option in that area, but I think it's important that we continue to provide consumers with choice on color and on CRI, and let them choose what the best product is for their particular application.

MR. RIDER: Thank you. Anyone else in the room? Go ahead, Keith.

MR. COOK: Keith Cook from Philips again. Just one quick comment. The Lighting Research Center at RPI in Troy, New York has done an extensive amount of research into CRI, especially with LEDs, and I would just ask the Commission maybe to take a look at some of the work they've done because it does show that we can be misled today with the existing CRI standard, so something to investigate.

MR. RIDER: Yeah, Keith, if you could, and also for other folks, I think there's been several new studies by other folks, if you could email those details to me after this workshop, that would be great, so I can follow-up. Or, if you'd like to submit them in further written comment, that would be fine, as well. Anyone else in the room?

MR. GREENBERG: This is Richard Greenberg.

MR. RIDER: Okay, now to the phone, I suppose. Go ahead, Richard.

MR. GREENBERG: Yeah. I just have a couple of comments, that if we're just talking about Omni-directionals, or Omni-directionals and BR 30s, I think CRI is critical that it be of the higher CRI across the board. But when it comes to other types of products and applications, I think we would tend more to the use in non-residential installations, and therefore there would be much more specificity to the need, which may not include a high CRI. And so there should be some kind of exception for those types of products.

MR. RIDER: Interesting point, Richard. Thank you. Peter, is the line generally unmuted?

MR. STRAIT: The line is generally muted. And I'd like to just say, just as a instruction to people that are on the phone lines, you can mute and unmute your own phones. If there's not a lot of background noise where you are and you'd like to make a comment, you can go ahead and unmute yourself, and when we move to the phone comments, you can go ahead and jump in as Mr. Greenberg just did. Afterwards, I'll be opening all of the phone lines to capture those people that aren't attending from their computers and can't unmute themselves. When I do that, I will be immediately trying to mute people that have a high level of background noise, so just be aware of that.

MR. RIDER: All right, so with that, any folks that can unmute themselves, go ahead and speak. Okay. If you could unmute all the lines? So all the lines are unmuted. Go ahead and speak if you have a comment.

MICHAEL MORIN: This is Michael from San Diego Gas & Electric. I'd like to ask all the people in the room on the call if there is market research data for Plan 30 (ph) that determined the customer acceptance rate as a function of CRI and cost for some popular bulb such as Omni-directional A-19 by the 75 watt equivalent, or 100 watt equivalent.

MR. RIDER: What was your last name, Michael?

MR. MORIN: Michael Morin, SDG&E.

MR. RIDER: Thank you. And you -- was that a question to everyone?

MR. MORIN: Yes, it was a question if there's market research data for Plan 30 to collect customer acceptance rate for CRI as a function of cost for a popular bulb type, especially for Omni-directional A-19s, 75 watt equivalent, or 100 watt equivalent.

MR. RIDER: So, Michael, I've asked everyone in the room here if there is additional information to go ahead and provide it to me. The purpose of this ITP is to get all of that information available to everyone on the Web, so if as a result of this meeting we receive something that answers your question, we'll be sure to forward it on to the Web, and share it with everyone. Also, if you shoot me an email, my contact information is at the end, we can try to follow-up on that question. Any other comments on the line?

MR. MCGARAGHAN: Mike McGaraghan again for the California Utilities. I wanted to make one more comment about tradeoffs in lumens and what is noticeable, and tradeoffs in CRI and what's noticeable. I think we would all benefit from further study of this, but in terms of how we consider these metrics from a lumen standpoint, in lighting design it's generally understood that the human eye doesn't even detect light output changes around 10 to 15 percent, but when we're talking about CRI, if we are comparing 80 to 90, I think this is a point that was made at a prior workshop by Lorne Whitehead from University of

British Columbia, but 100 CRI is no color distortion and that's our starting point, that's the incandescent incumbent product. And as we reduce from that, we're increasing color distortion. So if you flip it and look at it from that perspective, 80 CRI is actually twice the amount of color inaccuracy or color distortion as 90 CRI. And anyone who has done a side-by-side comparison of 80 to 90, you can pretty clearly see the differences, especially in redder colors and orange colors. It's just a different way of looking at the incremental change that we're talking about for CI versus the incremental change we're talking about for limits. Thanks.

MR. RIDER: Thank you. Did you go ahead and mute the phone lines?

MR. STRAIT: I did re-mute the lines when a person here speaks, I'll go ahead and unmute them again.

MR. RIDER: Please do. And thank you for muting it temporarily. Again, the lines have been opened. If you are on the phone and you would like to comment on this, please go ahead. Okay, not hearing anything, I think we'll move on to the next subject. And thank you, everyone, for this great conversation on CRI.

So Design Life and Duty Cycle. The IOUs submitted an estimate of lifetime of approximately 35,000 hours for LED products and noted that five-year warranties are somewhat common. ENERGY STAR requires three-year warranties. NRDC submitted that 25,000 hours was a fairly common life and suggested that the lifetime may actually be decreasing with time as folks try to decrease the cost of LED lamps.

So for discussion: To what extent do ENERGY STAR and the California LED specification lamps have a different lifetime from general LEDs? And also, will the rated lifetime drop to lower LED first cost? Would this lead to higher or lower lifecycle costs? And also, any other comments folks want to make on design life and duty cycle -- or, I guess there's not really much on duty cycle here, but design life. Please go ahead and I'm going to open it up to the room. Go ahead, Gary.

MR. FERNSTROM: Gary Fernstrom representing PG&E. We'd like to recommend that the CEC either enforce or add a requirement that lamps be marked with their date of manufacture because I don't save the receipts when I buy a light bulb, I don't think most people do, and it's kind of impossible to tell if a lamp fails, you know, whether it's before or after the three-year warranty. So our recommendation is that lamps be marked with their date of manufacture such that we can determine if products in the market are compliant with regulations in general when they're sold, and so consumers can determine whether they're younger or older than three years, five years, whatever the warranty may call for. Thank you.

MR. RIDER: Actually, Gary, can you stay one more moment? So the California Energy Commission, when it does a Regulation or a Certification, one of the things that is generally required for anything that is in our database is that the manufacturer is marked on the product and also the date of manufacture is marked on the product; however, we also allow for things such as serial codes and other codes to replace the common what we would see as the date of, you know, the common date form. Would you recommend, then, are you recommending that the actual -- that perhaps for this product we really want the date so that consumers would be able to determine the date of manufacture?

MR. FERNSTROM: Yes, that's the recommendation. Codes providing date of manufacture information are often difficult, if not impossible to interpret by those knowledgeable in the field, let alone consumers. So we would like to see the actual date of manufacture on the products.

MR. RIDER: Thank you. Go ahead, Keith.

MR. COOK: Keith Cook from Philips. I can attest to the fact that we have come out with a line of LED replacement bulbs that are at the 10,000 hour point.

We knew going in that they would not meet the ENERGY STAR requirements, but we also knew that the cost differential was so great that it would exceed the rebates available from ENERGY STAR, and therefore we decided to introduce them to the market and, although I can't give you numbers, the sales have been extremely robust of that product line.

MR. RIDER: Thank you. Anyone else in the room? Go ahead, Noah.

MR. HOROWITZ: Noah Horowitz, NRDC. We think for this proceeding that it's really important that we set a floor to ensure consumers, regardless of what brand or type of LED bulb they buy, that they have a good experience. And a key part of that we need to guard against is premature failure. If that bulb dies in the first year or two years, that's clearly unacceptable to consumers. And for the last 15 versus 20 years, I don't think that gets into the realm of consumers being dissatisfied and not coming back for an LED, and we think it's really important that we take a look at things like cycling and stress tests to make sure the electronics are robust, look at lumen maintenance so even the bulb is "still alive;" if it gives off a lot less light than when it did out of the box, that's a concern for consumers. So that's really important. I agree with Keith from Philips that first cost is also important and we are starting to see some bulbs that are coming into the market at lower cost. We're not suggesting that the standard should be 10,000 hours, but we think we should be open to potentially setting a number different than 25,000 hours as we better understand the tradeoff between first cost and also how that impacts the total lifecycle cost. Bottom line: a lot of consumers are overly driven by first cost, so we don't want to preclude adoption of LEDs by setting an extremely high lifetime. Thank you.

MR. RIDER: Thank you. Anyone else? Joe.

MR. HOWLEY: Joe Howley with GE. We agree there's a direct relationship between life and cost. Again, we think it's important to offer consumer choice, so if some consumers are buying a light bulb that they'll only burn a short amount of time because of application, it would certainly be better to be able to offer them a lower life, a lower cost product for that application. Other commercial applications certainly would want a longer life. The beauty or the benefit of LEDs is you can design them at a lot of different life and cost levels if you choose to do that, and I think California should allow flexibility, again, options in that area. In terms of a 10,000 hour life, if we estimate the average life of most light bulbs in the home is about 1,000 -- or the average usage is about 1,000 hours a year -- that would provide a

10-year life, which for most products is more than acceptable residentially. You've got washing machines and dishwashers, you know, made only to last 10 years, hot water heaters, much bigger items. So 10 years certainly would be, I think, acceptable for a light bulb.

In terms of the date code comment, I would just say that manufacturers would need flexibility in that area. We understand how the current code is written and we believe that does provide us the flexibility that we need for these products. Different manufacturers have different needs from products that have different needs in terms of whether or not date codes or dates are marked on them. So, again, we would recommend maintaining that type of flexibility for these products. If needed, the date of manufacture can always be determined.

MR. RIDER: Thanks. Any other comments? Mike.

MR. MCGARAGHAN: Mike McGaraghan, California IOUs, again. I just have a point about the lifetimes that we're discussing here. As I understand them, these are all lumen maintenance values based on LM80 testing and then projections using TM21, in terms of IES standards. And my understanding of that test procedure is that it only accounts for lumen output over time and lumen depreciation and it does not account for any type of early failure. And if I'm off on that, I'd love to hear how those test procedures incorporate early failure. But assuming they don't, I want to echo Noah's comment from NRDC that early failure is a key metric that is not captured if we talk about the lumen maintenance and we really encourage the CEC to look at various early failure metrics in a Standards setting. The European Union just adopted Standards last year that included two different types of requirements that are meant to address early failure, I think, though I haven't seen those test procedures myself yet, so I'd be interested to hear from others in the room if those metrics used by the EU are appropriate, or if early cycling is the best way to go, but one way or another we would be very supportive of metrics that get at early failure as opposed to just focusing on lumen maintenance.

MR. RIDER: So just to follow-up on what you've just said, do you feel that -- so you're saying measure something and make sure it meets that threshold; is that in place of, or instead of a warranty type of thing?

MR. MCGARAGHAN: No, I think it could be in conjunction with. The warranty is a good option if we can't come to agreement on an early failure metric, I would say, but both could work together, I think, pretty effectively.

MR. RIDER: Okay. And of course we'll

investigate throughout this process what makes sense, so it's not something we need to come to a conclusion -- thank you very much for answering my question, though. All right, any other comments in the room?

MR. GREENBERG: This is Richard Greenberg.

MR. STRAIT: We still have commenters in the room, please be patient. Thank you.

MR. GREENBERG: No problem.

MR. SILLEVIS-SMITT: So this is Willem Sillevis-Smitt from SORAA. One additional comment on lifetime and the time of testing required to prove that products last, for example, 25,000 hours. The time of testing comes to prove how it is, for example, specified in ENERGY STAR, comes out to 6,000 hours, which is almost a year. If you look at the pace of improvement and the energy reductions that can be achieved in lamps year over year, long life requirements and the testing that is associated with that have a delaying factor, or more efficient products or higher performing products coming to the market. So in that sense, having an option for lower life requirements on new products is definitely helpful to get innovation to the market sooner.

MR. RIDER: So just a follow-up question -- $6,000 per model?

MR. SILLEVIS-SMITT: Six thousand hours.

MR. RIDER: Six thousand hours to conduct the test?

MR. SILLEVIS-SMITT: Yeah.

MR. RIDER: Got it. Thank you.

MR. SILLEVIS-SMITT: And there is an option for preliminary testing, preliminary qualification at 3,000 hours; however, when new LED types are used, you have to go to full 6,000 hours.

MR. RIDER: Thanks. Any other comments in the room? And then we'll get to the phone. Okay, go ahead on the phone.

MR. GREENBERG: Okay, this is Richard. I just want to make a comment that ENERGY STAR Draft 4 has not continued to support a 10,000 hour life. With the 3,000 hour life testing, manufacturers can claim 25,000 hours on the packaging, if it doesn't pass 6,000 hours, it's delisted. But the idea within ENERGY STAR is that they do have a minimum of 15,000 listed, but generally everyone who passes 6,000 hours is going to have a 25,000 hour life rating, and even 3,000 hours, they'll have that.

MR. RIDER: Thank you. Peter, can you go ahead and unmute the lines? The lines have been unmuted. If you're on the phone and you want to speak to this, please feel free. Okay, not hearing any further comments, I'm going to move on to the next subject, which is LED Cost.

So in this case, we're talking about just overall LED cost trends. This is -- I forgot the actual source -- this was located in the IOU comment, but it is from several other sources and, as you can see, the cost of LEDs has come down dramatically over the last couple years, and this even has a projection for the next few years. So for discussion: Do these cost projections for LEDs expect static quality aspects? So this is a question about the data and the projections that have been released. There were other projections, as well, I think from CALPER, DOE, PG&E. As the cost comes down, is quality staying about the same? And by quality, I mean things such as warranty, CRI, and also energy efficiency. Are LED prices approaching a plateau as shown in the projections? Or are they continuing to really dive down? With that, I'll open it up to the room, anyone who would like to speak to either of these discussion questions. Keith.

MR. COOK: Keith Cook from Philips. What we are seeing is I think somewhat of a leveling off, but still not truly flattening out. The cost itself is not coming down significantly, but the energy efficiency is continuing to improve. And as it does so, the number of LEDs required per device is less, and so the cost of the final product comes down.

MR. RIDER: Thank you. All right, anyone else in the room? Okay, if you're on the phone, if you can unmute yourself first, try that. Okay, if you would open up the lines? Okay, the lines are unmuted if you'd like to speak to this, either these discussion questions or LED cost in general, go ahead. All right. I think we'll move on to the next topic, which is LED Efficacy, or the Energy Efficiency of Lumens per watt.

The IOUs submitted some interesting data. Again, I think this is using the Lighting Facts Database. This particular graph is for Reflector Lamps and they also produced -- I didn't put it in this presentation, but they also produced a similar graph for Omni-Directional Lamps. The IOU analysis shows an increasing divergence in the efficiency of LED lamps in both cases, and for directional lamps, the analysis predicts that efficiency is actually getting worse in the bottom of the market; as you can see, the trend line is downwards for those blue points at the bottom, with some products using five times the energy to produce a lumen. So it may be apples to oranges here, I would like to get some feedback on what's going on with efficacy. What is causing this large spread in efficacy? And are there LED Reflector Lamps that approach Incandescent efficacies? If you look here at the lowest point, that blue dot on 20 lumens per watt, that's getting into incandescent territory, so I would also like to hear feedback on that. So with that, I will open it to folks in the room if anyone has any comments on this trend. Go ahead, Keith.

MR. COOK: Keith Cook, Philips. This is the first time I've seen that chart and I do find it somewhat surprising because on the reflector lamps right now, we see the market significantly in the commercial side converting to LED, and it ends up being an energy saving sale, and so you don't want to see a degradation in the efficacy of the reflector lamps, that is really where you're selling it at. So I don't understand the chart, myself.

MR. RIDER: Well, as you can see, the high end is also increased, so it's just this, you know, flashlight looking shape here where, you know, at the top end it's getting better, the middle overall average is getting better, but the bottom is falling out is what it looks like.

MR. COOK: Yeah, and what I don't understand is where are they selling that bottom?

MR. RIDER: I have no idea. Thank you, Keith. Noah.

MR. HOROWITZ: If you could put the chart back?

MR. RIDER: Sure.

MR. HOROWITZ: Noah Horowitz, NRDC. I think this chart clearly shows that there is a big gap in efficiency between directional lamp products and therefore it warrants a standard in California that would say lamps that don't meet a certain efficiency requirement, or their energy use, that's where we should set the bar. I think what might be confusing, and it might be worth peeling apart this data a little bit, let's take lamps of similar light output and see how they're doing, some of those data points might be the lamps that offer the least light and those tend to be less efficient.

MR. RIDER: Yeah. I've got a little bit of an apples and oranges concern here as well, Noah. So, thank you. Good point. Go ahead, Alex.

MR. BOESENBERG: Alex Boesenberg, NEMA. The Lighting Facts Database is a list of all listed products, it's a Truth in Labeling program, so I don't dispute those numbers, but I would caution that those lower efficacy may have no sales, they're just listed. You know, where are they selling them? Great question. I'm not sure they are.

MR. RIDER: Yeah. And maybe we can follow it up. I think they -- correct me if I'm wrong -- the model numbers are available in the Lighting Facts? Yes? Okay, so maybe we could follow-up and talk about that at a later date. Any other comments in the room on either of the discussion questions? Go ahead, Mike.

MR. MCGARAGHAN: Mike McGaraghan, California Utilities. I just want to point out that another way to look at this data is to look at the distribution of products and by efficacy bin, and you can see that there are very few -- if you look at it from that angle, there are very few products at those low ranges of efficacy, most of the products, and that's why the average value is increasing. But a couple people mentioned that it would be helpful to look at a more granular set of data and we can do that. This also includes all directional lamps, including MRs and so splitting out this data by diameter would also help us get a better picture, and as Noah suggested lumen bins. So we can try to provide a little bit more granular picture of this.

MR. RIDER: That would be great. Let's solve this mystery. Thank you. Anyone else in the room? Okay, if you can unmute your line and speak to this, please go ahead.

MR. GREENBERG: This is Richard Greenberg again with Southern California Edison. We highly support an efficacy standard. We feel the manufacturers, when given a challenge to advance technology such as an actual equipment code, rather than a voluntary standard, will meet that challenge. The entire premise on which the State of California bases its Codes is to increase efficacy in terms of providing more energy savings throughout the State of California, and --

MR. STRAIT: One second, I'm going to re-mute everybody and just unmute you to take care of the feedback.

MR. RIDER: Just hold on one minute.

MR. STRAIT: There we go.

MR. GREENBERG: All right. I'm really not in some kind of a stadium or anything. So what I was saying is that we very heavily support an efficacy standard across the board for any kind of LEDs in a non-voluntary code change because the challenge will be met by manufacturers, and you don't necessarily need to base the efficacy standard on what's available today because technology is advancing and this code won't be in effect until it does advance. So I don't think there's a problem being a little bit aspirational in a higher efficacy target for this code change, especially if you consider that right now ENERGY STAR is technology neutral and requires efficacy of a specialty bulb for LEDs, which is far below their technological ability. And the potential efficacy is much greater than it is now, so I just support a good efficacy standard that will drive manufacturers to increase efficacy to take advantage of the opportunity to meet the state's goals for energy reduction.

MR. RIDER: Thanks, Richard. And I want to point out, you know, the discussion on what standards ought to be will continue in this proposal phase, today is more about the data, what's going on in market today. But I appreciate your comment. Anyone else? Well, let me finish the line -- does anyone else have any comments on the phone? You've been unmuted. Okay, thank you for being patient.

MR. FERNSTROM: Gary Fernstrom representing PG&E. We have a lot of folks interested in lighting in the room and I thought I would bring for everybody's amusement a couple of samples of the achievement we've made over the last 100 years, where we started from and where we are now. So we're working to get an incremental improvement and efficacy, but over the past 100 years we've made a lot of improvement and I have -- thank you, Joe -- a roughly 100-year-old General Electric light bulb here, carbon filament with an efficacy of in the order of 2 to 3 lumens per watt. I'm going to be passing that around. And just to keep balance among some of the major manufacturers, I have this Philips L lamp which is pushing 100 lumens per watt, and I thought the group might be amused seeing these. Thank you.

MR. RIDER: Thank you. You're going to need to submit those to the docket now. No, I'm just kidding. Thank you, Gary. Any other comments on this in the room? Otherwise, I'm going to go ahead and move on to the next.

And I think we already discussed this a little bit, I'm sorry this is a bit gray; I copied this I believe from SORAA's comment. But this characterizes some of what we were talking about earlier, which is the trade-offs between CRI and cost and actually efficiency and cost, as well. This was from the SORAA comment. This one is from the IOUs' comment, it shows the relative price relative to CRI and also relative to watts. But it looks like the gap is pretty constant across the watts.

So responses to the ITP indicate a fairly significant increase in cost for improving CRI. So for a couple discussion points: As the price of LEDs generally continue to decrease, which we saw in that graph that was really sharply going down, will the incremental cost for improved CRI decrease, as well? Kind of along that same curve? And will that reduce the incentive for manufacturers to balance CRI costs with decreased efficacy? In other words, if the cost comes down low enough for CRI, does that really negate the need to decrease efficacy to increase CRI? Another discussion topic: Should the incremental costs of improved CRI be evaluated as a lifecycle cost, rather than a first cost due to associated decreases in energy efficiency? In other words, if you pay more for a lamp with higher CRI upfront, will you get a lower efficiency? If you end up using more energy, should that be accounted for in the cost of increased CRI? With that, I will open it up to comment in the room. Keith.

MR. COOK: Keith Cook from Philips. Gary brought along just a great example. The L Prize was a Philips product, 90+ CRI, like you said, almost 100 lumens per watt, and was in production here in the United States. At the same time, we came out with another lamp, same size and shape, a little bit less efficacy, and instead of 900 lumens, it was producing 850 lumens, instead of 10 watts, it was 12.5 watts, and instead of 90+ CRI, it was mid-80's. We ended up discontinuing the L Prize, there was no market for it, people were not willing to pay the cost differential between those two products. The lower performing product was an overwhelming success and is still on the market today. The L Prize -- nice product, but no market for it.

MR. RIDER: Thanks, Keith. Any other comments in the room? Go ahead, Mike.

MR. MCGARAGHAN: Mike McGaraghan, California IOUs. Just in response to the last question there, we would encourage the Commission to look at all of the metrics in conjunction, and if we are improving CRI and efficiency with standards, and if we compare the batch of products that meets the standard to a batch of products that don't meet the standard, there would be an efficiency -- an overall decrease in wattage when you consider all of the elements of the proposed quality spec together.

MR. RIDER: Makes sense. Thanks, Mike.

MR. SILLEVIS-SMITT: Willem Sillevis-Smitt from SORAA. So if you look at cost and CRI and efficacy, those three are sort of tied in a triangle and the harder you push one of them, the higher the cost goes. What we have seen in LEDs, not just in lamps but in many markets, is that LED adoption was in many markets, for example, traffic signal largely driven by LEDs getting sufficiently efficient to make sense, and once they made sense -- and Keith Cook already mentioned this -- once the LEDs get efficient enough, you can get the same output and the same efficiency with fewer and fewer LEDs by driving the LEDs harder and harder. And that's when the cost really starts to come down. I think what happens in, for example, the L Prize lamp, is that it's not only a high CRI lamp, but it's also an incredibly high efficiency lamp, and if you push both on the efficiency side and on the high CRI side, that's when you end up with very expensive products. For this reason, we believe it makes sense that, if you say there is a higher standard for -- you could define the tier for higher CRI products and requiring a slightly lower lumen per watt, and then the cost differential can be relatively small. If you keep high CRI and low CRI product the same lumen per watt requirement, that drives always relative cost increases beyond just the decrease in efficiency of higher CRI LEDs. So that's why it makes sense. If you want to create a level playing field and if you want to give consumers a choice between high and low CRI at a comparable cost, it has to give somewhere, so it's either the lumen output or the lumen per watt, and we believe the lumen per watt might make the most sense.

MR. RIDER: Thank you. Any other comments? Gary?

MR. FERNSTROM: Just one last comment back to Keith. At least I was balanced -- I brought two lamp products, neither of which are still in production.

MR. RIDER: Okay. Thank you, Gary. On my note, I just wrote "joke." Noah.

MR. HOROWITZ: Noah Horowitz, NRDC. Hopefully the joke comment doesn't apply to my comments here, although that might qualify as a joke. I find it really interesting, we're in part of the Invitation to Participate, which is really a data request.

MR. RIDER: Right.

MR. HOROWITZ: We hear from one manufacturer there's a lot of value in going to high CRI, and in order to do so the lamp should be allowed to be less efficient; another manufacturer said we made the high CRI lamp and nobody bought it, so we're going for a lower CRI bulb, and that's the one that consumers are demanding, so it would be great if there's any market research that the manufacturers have that can show whether or not consumers are valuing the high CRI. Clearly at least one company is going in that direction and I'm assuming there is some basis behind that and we'd love to see that. Thank you.

MR. RIDER: Thanks, Noah. And I obviously would like to second that request, that in order for us to really do the right thing and make good policy, we need to understand what's going on in the market to get to the right place, and understanding what's been done in the past is certainly a key part of that. So if there is available information, we certainly would love to review and understand that information. Any other comments in the room? Okay. If you're on the phone and you can unmute yourself, go ahead and do so and feel free to speak. Okay, Peter, if you can unmute the lines? Your lines have been unmuted. If you're on the phone or on the computer and would like to comment on this, feel free.

All right, I'll move on to the next subject.

So this is the last opportunity for comment on LEDs. This General Comment section, you know, there were a lot of comments received about a lot of different subjects, I didn't cover them all in this presentation today, but I've provided this slide as an opportunity to comment on any of the information data received in the Invitation to Participate on LEDs. So if you'd like to comment on kind of any of the subjects that we asked about, or that we received data on, please feel free to do so at this time. Anyone in the room. Go ahead, Alex.

MR. BOESENBERG: Alex Boesenberg, NEMA. I had a comment that's been brewing for the last 20 minutes and wasn't sure where to put it; General Comments sounds about right. A lot of the points that have been made are related to not only energy, but also consumer satisfaction. And there's a growing concern in industry and in my member base of the lighting manufacturers that regulatory and incentive bodies are getting deep into consumer satisfaction issues. And while we share concerns of consumer satisfaction, and you want people to buy our products and want them to buy more of them, there's also the concern of treading into areas which deal with free market and competition between manufacturers, the desire of certain companies to stress certain aspects among their products, "ours go to 11, ours are purple, ours have two inputs always," whatever, I'm making that up. We've taken very strong concerns to the EPA and, in fact, we're meeting with them later in June to raise it again, on what we call in the ENERGY STAR realm non-energy attributes -- consumer satisfaction. We're driving the lumens per watt to the point that it's very hard to find the top tier, so now EPA in the lamp spec, which has been mentioned many times here, so I'll pick on them, the lamp spec has become a happy spec, a lot of the new areas are not energy specific. And we understand that the point of that, as the EPA put out in their 2012 Strategic Guidance and Principles document, was they want people to not only save energy with the ENERGY STAR product, they want them to like it so much they buy another one. And, I already said, we understand the desire for repeat sales and the need to get the rest of those sockets in the house, but when you drive the satisfaction areas, when you add more and more criteria to a product requirement, what obviously happens is commoditization because you end up with only one or two ways to meet those requirements in terms of design. We've raised the IP issues with the Energy Commission before, not in lighting, and that's a real error. Once you come up with a very strict way -- very strict requirements can only be met a certain way -- not only do you run into commoditization and the reduction in performance and choice, you also run into IP. So we would caution the Energy Commission to bear that in mind and just stress that it is the Energy Commission -- we're talking about energy savings here. I would point out that somebody mentioned that ENERGY STAR is tech neutral -- it's not tech neutral yet -- that is the spec that is in its fourth draft and there may be a fifth, and every time we think we're finished we're not, and it has to do with those non-energy attributes. And I would also stress or ask you, Ken, to clarify or affirm that the Title 20 Appliance Regulation is about the minimum performance, right? It's about good enough. And there are other specifications such as ENERGY STAR or, in this case, as was mentioned by Gary, the California LED Quality spec, which is a very high performance spec, and we made the point at the last hearing there's not a product alive that will meet it right now, or there wasn't at the time. The L Prize Lamp, gosh, they spent a lot of money on that -- or Keith -- it doesn't meet the LED Quality spec. That to me seems like a problem. And I won't belabor it because we've voiced that before, but I would stress or beg the Commission to bear in mind, and restate for everyone here, we're talking about the threshold -- Noah used that term -- the floor where we want, as we move forward, and I know that's not the topic today, as we move forward I thought we're setting the floor and that is, yes, it's low. And I know when I was in my previous position at NEMA and we wrote SSL4, the minimum screw base lamp requirements, 1) I haven't found anyone who will endorse that standard outside of NEMA because no one wants their name on a minimum quality spec, and 2) that spec took me two solid years of pounding just to get it through NEMA because, again, a lot of members didn't want their name on a "floor." I understand first-hand emotionally and deeply the aversion to being associated with a floor, but that's my understanding of what Title 20 does, and there are other specs for high performance. I want to differentiate those.

MR. RIDER: Yeah. Thanks, Alex. And I'll go ahead and speak a little bit to that. So mandatory standards we currently have are, as you said, floor standards, especially efficiency standards, they're the minimum performance something needs in order to be able to be offered for sale or sold in the State of California. This particular -- and I'll get to this actually in the next slides -- this particular process and the Request for Proposal stage will include those kinds of floor standards. We're also hoping to design it such that we can do other things than mandatory standards, perhaps work on educational opportunities that we can work on, and the LED specification you reference, that's a voluntary, that's not a mandatory requirement. So the Energy Commission is kind of looking at other tools in its belt beyond just the mandatory standards, but certainly still looking at mandatory floor standards, as well. And as you referenced Title 20, Title 20 is a mandatory kind of floor standard. There's also a few products where we test and list, there's also some labeling requirements we have in there. Any other comments? Mike and then Noah.

MR. MCGARAGHAN: Mike McGaraghan, California Utilities. I just ordered two Cree A Lamps from Home Depot online last week, and they were both 2,700 Kelvin when I placed the order and the box showed up and inside was one 5,000 Kelvin lamp and one 2,700 Kelvin lamp. And of course being a lighting geek, I noticed right away, I didn't have to put it into the fixture to find that out, but most consumers are not going to notice that, they're going to install two lamps and see that they're wildly different colors, and one of them is much whiter and brighter than they'd hoped for. So I'm not trying to raise that to start a discussion about color temperature specifically, I'm just using it as an anecdote to talk about the tradeoff between allowing a lot of consumer choice and sharing high quality. In the color temperature example, that's not a great example because there are applications where consumers would actually prefer 5,000 Kelvin, but for a lot of these other quality perimeters, there have been comments today that we should allow this range of choice, and I would speculate that consumers are not on the whole savvy enough to take advantage of those choices in the residential sector. You'll end up with consumers who get products that don't perform how they expected if there is too big a range in that choice. So I understand the argument, I just think there's a middle ground. And so that's our perspective that a lot of these metrics are perfect for standards because there is no specific need for a lower performing product. Thanks.

MR. RIDER: Thank you.

MR. MCGARAGHAN: Oh, sorry, I meant to mention one other thing, too, that we tried to pull together a lot of this data for the ITP, but PG&E is currently funding a lot of LED lamp testing at the CLTC, and some of that didn't get wrapped up in time for the submittal, but it should be wrapping up in the next four to six weeks and a lot of pieces of that testing should really help this effort, and specifically they're doing a lot of dimming testing on different dimmers, looking at how lamps perform, looking at flicker, looking at compatibility with dimmers, and a number of other elements hopefully will make it into that testing that we weren't able to submit last week, or two weeks ago. So we'll provide that as soon as we can.

MR. RIDER: Thanks. And that reminds me, we're going to be open to data throughout this entire process. I don't know if I stated this in this presentation, but we're always looking for data at any stage of this process. Obviously, the Invitation to Participate was a data intense process really focused on data, but throughout this entire rulemaking and pre-rulemaking and proceeding we're always open to data, and don't ever think that it's too late to provide that to us. Noah.

MR. HOROWITZ: Noah Horowitz, NRDC. I think we're all in agreement that the purpose of this potential standard would be to ensure consumers have a good experience with LED lamps, and then as the process moves forward the question is how high should that floor be, and there might be different opinions within the room. But I think the common goal is people try the LED, they like it, and we can continue to see increased adoption of LEDs which may well likely be the most efficient lamp on the market and we could harvest even greater savings and meet many of California's policies related to energy use and carbon savings. Alex from NEMA mentioned concern that we're diving too deep into consumer satisfaction, and there's probably some sweet spot there, but I want to point out that we already have Federal legislation that deals with the quality of CFLs, we have in particular during the Enron era, everybody was rushing to get CFLs out there, they put them in and six months later they died, and that really hurt many of us for a long time in terms of people willing to move towards CFLs. So there's a Federal standard that's based largely on the greatest hits of ENERGY STAR 2, and NEMA supported that, as well. So there is a history of the industry supporting consumer satisfaction, not just efficacy for lamps. I want to point out that there are a couple of other metrics or aspects that weren't included today in the conversation that I want to at least put out there, that we at NRDC and hopefully others will address in their subsequent proposals, one is dimming. If a lamp is marketed as being dimmable, we think it should dim -- that gets to the basic consumer satisfaction issues. How far down do you need to dim? And then, when it is being dimmed or operated, connected to some dimming circuit, there shouldn't be objectionable hum and flicker. And that's another big consumer dissatisfaction, and I think a lot of the spec, besides how efficient the bulb is, it should be on these issues that we want to get rid of things that turn off consumers to LEDs, so one is making sure if they are marketed as dimmable, that they dim, and they do it in a way that's a good experience. Also, we think if someone is making an equivalency claim, just like ENERGY STAR has guidance, the Federal lamp labeling doesn't include this, so if you say it's brightness is a 60 watt bulb, let's ensure that that bulb is roughly as bright as the old 60 watt incandescent. While we all would like consumers to buy based on lumens, the reality is they're not there yet, so make sure the bulb is as bright as promised, in other words. And that ties into equivalency claims.

Another issue is, whether it's 1 in 4, or whatever the right number is, fixtures in people's homes are "enclosed fixtures" where there's some sort of glass enclosure, and those tend to be a higher temperature environment that's harder on the bulbs, and I just went to Home Depot and all of the bulbs in the Home Depot main lighting aisles say "not to be used in enclosed fixtures." So we need to find a way to address that in the specification here, as well. Thank you.

MR. RIDER: Noah, before you leave, so you mentioned that equivalency isn't in the Federal lamp labeling. Is dimming? Dimming marking? No?

MR. HOROWITZ: No.

MR. RIDER: Okay. Thank you. Gary.

MR. FERNSTROM: Gary Fernstrom representing

PG&E. I'd like to make a comment spinning off Mike and Noah's point. Earlier, Joe made the point that we should let the market decide, largely let consumers choose what products they like to buy, and Keith made the point that a lower cost product that may be compromising a little in performance largely outsells a very high performance lamp that is more costly. And I think, in finding a balance between efficiency and performance, we need to appreciate that, as much as we'd like consumers to really understand lighting, it's a difficult task to educate all consumers such that they do. But consumers definitely understand price, so the market left to its own means is usually going to find some consumers buying a low price product that they'll get home and ultimately be dissatisfied with. So as Noah said, our objective here is to reach a good balance between price performance and acceptability. And I don't think the market left to its own means really can do that very well because it will drive itself to the lowest price and the poorest quality. However, supported by reasonable standards, we can assure that consumers get reasonable performance at reasonable price.

MR. RIDER: Thanks, Gary. And it almost sounds -- yeah, go ahead, Pekka. It seems like we're almost talking about, instead of satisfaction, extreme customer dissatisfaction that we're trying to avoid here, so not trying to make it the best lamp ever, but trying to make sure that some of the really -- some of the worst stuff doesn't get in there where people remember it forever, how terrible LED lamps were. Go ahead, Pekka.

MR. HAKKARAINEN: Pekka Hakkarainen, Lutron. I just wanted to respond to Noah's comment on dimmable lamps a few minutes ago. Industry has done a great deal of work in this area and I would like to draw your attention to recently published NEMA XSL7A --

MR. RIDER: Can you say that slower? NEMA what?

MR. HAKKARAINEN: XSL7A Standard.

MR. RIDER: 7A?

MR. HAKKARAINEN: Yeah. That speaks to the compatibility between lamps and dimmers, so if you are moving in this direction in the specifications, then I would certainly request that you keep us involved in that process. Industry is very interested in that particular topic. In addition to that, of course, the ENERGY STAR specification Draft 4 has language on dimmer and lamp compatibility. I would not like us to diverge between different agencies.

Secondly, as I was listening to the conversation earlier, I wanted to just clarify that my understanding is that the minimum mandatory standards that we are talking about in Title 20 require products to be technologically feasible and economically justified. So would you clarify for us what technologically feasible means? Does it, for example, mean currently commercially available?

MR. RIDER: Thanks, Pekka. Yeah, we'll respond to that. Well, first of all, let me say our Proposal Template will be providing further guidance on the aspects necessary to meet the requirements in the Warren-Alquist Act cost-effectiveness, technical feasibility. In the past, technical feasibility has taken a few different forms, but it means that you can make this product, and that's really what it means. And of course, that kind of is covered in cost-effectiveness, as well, because if you can't make it, it can't be cost-effective either. But it's really -- sometimes, depending on the product, we get into more depth, like can manufacturing be ramped up in time for whenever the standard may come into effect? So it covers a broad array -- it's not even just that it's available somewhere, sometimes we look at things like ramp-up rates and a broad array of issues. We want to make sure that we don't do something that then kills a marketplace, that no one can meet it; really, it's to avoid emptying the shelves of some product, it has to be able for manufacturers to have to be able to do it so that there are products available at the end of the day, otherwise we essentially would be eliminating product from the market altogether. Go ahead, Keith.

MR. COOK: Keith Cook from Philips. Just a quick comment or observation. This discussion so far almost comes across as being the manufacturers versus others, and I don't think that's really true. I think we're all on the same team here, in fact, generally speaking we use California's Title 20 and 24 as examples of how energy standards should be in place, especially when we're on the Hill talking to Federal Legislators. So the thing is, though, as maybe Joe pointed out, is where do we establish that floor is really the key point, that's the only issue here. We also agree with establishing a floor, as was pointed out. We actually developed SSL4 which was a NEMA proposal on a minimum performance standard for SSL products. And for whatever reason, we have had trouble getting it adopted on a Federal level. But, again, it may be very applicable in California as something to consider.

MR. RIDER: Yeah, Keith, and again everyone is welcome to submit proposals in this phase, so since you guys have done that hard work, we'd love to see a proposal from NEMA or anyone. Any other comments in the room?

MR. STEVENS: Charlie Stevens with the Northwest Energy Efficiency Alliance. Today I think I'd like to just say a word here on behalf of the earth. We're all --

Keith is right, we're kind of all on the same boat here, we all depend on the earth utterly for our existence. About a year ago or so, I bought a reflector lamp by one of the manufacturers here in the room that I am pretty pleased with, and I noted as I installed it that it was heavy enough to probably bludgeon someone to death with it. I understood why, but the amount of aluminum in there was surprising to me. And I guess what I would like to urge the Commission to at least consider here is that not all consumer attributes are equal and that lifetime actually matters. Year ago I modeled all of this on a planet-wide scale and discovered that the biggest factor that caused the system to fail was the rate at which we threw things away. And that's still true. I would suggest that lifetime actually matters on a lifecycle energy basis, and I don't know whether the Commission is able to actually look at that aspect of energy use in the deliberations here, but given the amount of resource that typically goes into a solid state product, and particularly one with the amount of cast aluminum that's in some of these products, I think lifecycle resource consumption is a very important issue. And short lifetime is a very bad attribute in that regard. And I would urge the Commission to at least weigh that. Almost none of the energy that is used to do that casting of aluminum is priced in the marketplace directly, the impacts of it are not priced. Depending on where that aluminum was cast, the impacts on the climate are radically different and not priced in the marketplace, and I suspect that even the part that is priced, the aluminum casting electricity was probably half the cost or less of the electricity that we're talking about saving. So I don't know why that's true, or why you can justify that. But in any case, I would suggest that the Commission, to the extent it can, take lifecycle energy use into account in these products when they look at things like lifetime.

MR. RIDER: Thank you, Charlie. And of course, I think the more information we can get to better do that would be critical, I think we'd have a tough time doing that out the gate and would need more data, but I think that historically we've looked at every aspect that stakeholders raise, and we also look more broadly at environmental impacts to the State of California, and we even do environmental assessments on the impacts on things for every regulation we issue, we do CEQA analysis on it. So the more information you can provide on that, I think we are very interested in looking at that aspect. Any other comments in the room? Anyone on the phone, if you can unmute yourself and go ahead and speak? Okay, Peter, can you unmute the lines?

MR. BAKER: This is Jim Baker. I hope you can hear me. I am representing Freescale Semiconductor in AC (indiscernible) which haven't been mentioned so far in a design approach. They have simplified drivers without the (indiscernible), which means that they can be more compact. LEDs do have flicker at 120, but this is in the invisible region where it is respectable and it's respectable in many applications. Response to flicker in this invisible region above about 70 Hertz is not well understood. So the newer versions of AC LEDs have improved optical wave form which broaden the optical wave form and reduce invisible flicker at 120 Hertz. We would urge the California Energy Commission to (indiscernible) so that the customers can use the best product in each application. And I would just like to weigh in on this discussion that's been going on here about the consumer choices. There are many areas where consumers are quite capable of making intelligent choices. When you think about cell phones, for instance, cars, all sorts of things, the trouble that we face in lighting is that so very long there was just one choice and customers -- consumers didn't have to think about it too hard. And they have fantastic dimming and they have fantastic color. And I think one thing we can be thankful for right now is our CFL friends because they have started the consumers down the path of learning that they do have to think about these tradeoffs in lighting. And I think we're underestimating the consumers if we think that they can't learn to make these intelligent decisions over the next 10 years as LED come in. Thank you.

MR. RIDER: Thank you. All right, any other comments on the phone? Okay, hearing none, I'm going to move on.

So Next Steps. So this concludes the ITP process for LED Lamps. So we're moving now into a Request for Proposal phase. We've already released a schedule for the Request for Proposals, it will run from June 10th to July 25th. We will be issuing a Proposal Template and guidance, which will go into things such as cost-effectiveness, electricity rates, a lot of background information necessary so that we can evaluate everyone's proposals on an equal footing and make sure that we've got everything that we need to kind of make some policy decisions on what we want to do to improve energy consumption in the state.

Obviously, the ITP, we've put everything on the Web, you can use any of that information as a source to create these templates, and also any additional information you can gather is welcome to be included in the proposals as background.

I want to really emphasize Commission staff are available to discuss any questions about any part of this process and certainly proposals as they're being developed over this time period. In this case for LEDs, I'm at least for now the contact person for this subject. So just to give you -- if you've seen this graphic before, we've moved past this nice green square of the Invitation to Participate and we're moving into this Request for Proposals. Again, this is my contact information. Feel free to contact me at any time -- during business hours, of course -- you can leave a message, I'll get back to you. I'm probably not going to be here at 6:00 a.m., sorry. Anyways, thank you very much. And I think we now have -- the agenda shows a break. It is exactly what time we're supposed to end this at and we'll be moving into a break. It's 10:47, it looks like we expect people back here at 11:00 a.m., so feel free to meander or use the restrooms. The restrooms are around the corner on that side. If you want coffee or a snack, go up the staircase, it should be to the left side when you get to the top of the staircase. Thank you very much.

(Break at 10:46 a.m.)

(Reconvene at 11:04 a.m.)

MR. SINGH: All right, welcome back. This is Harinder Singh again. So I am presenting the Dimmable

Ballasts.

The purpose of the workshop is the Commission is gathering information to determine how to proceed with the Dimmable Ballasts in Phase 1 of the OIR. So during this session, we will discuss the information and data we have received from the stakeholders related to the Dimmable Ballasts.

We have received comments from the response to the ITP from the stakeholders, and we want to thank all the stakeholders for submitting their comments. And it's helpful for us to look at the comments and look at the data there. So thank you again for submitting the comments.

The information requested in the ITP was the definition scope, test procedure, sales data and stock, and the design life and the duty cycle of the product, and the cost of the product. And we have received some information and we hope that we will get all the rest of the information when we get the proposal; that is probably July 25th or afterwards.

You know, one of the issues raised in the comments and the information submitted was the preemption issue related to the Dimmable Ballasts, and the IOUs state in their response that, in the subsequent updates to the Fluorescent Ballast Standards, scope definition has explicitly excluded Fluorescent Ballasts dimmed below 50 percent, full output from the scope of the coverage. And in contrast, NEMA has provided their response, and they have mentioned that the U.S. Department of Energy included Fluorescent Dimming Ballasts within the scope of the Final Rule of October 28, 2011, the 10 CFR §430.32. Quote: “(10) Each fluorescent lamp ballast (i) Manufactured on or after November 14, 2014; (ii) Designed (A) To operate at nominal input voltages of 120 or 277 volts; (B) To operate with an input current frequency of 60 Hertz; (C) For use in connection with fluorescent lamps as defined in §430.2; and (D) For dimming to 50 percent or less of the maximum output of the ballast.”

So since we have this information, we'd like to open this discussion for you to comment on that comment. So if you could please come up.

MR. YOUNG: Hi. I'm Daniel Young with Energy Solutions on behalf of the California Utilities. I'd like to also thank the Commission for the opportunity to have this workshop and for us to clarify our comments.

So with this preemption issue, the language in the Federal Code is actually very clear, so this is Section 10 that NEMA has pulled out, and it does define fluorescent ballasts that do dim below 50 percent, but this is actually referring to a very specific subset of those ballasts. So the actual standard language for fluorescent ballasts is actually defined in Section 8, and Section 9 very clearly states that a ballast that is designed for dimming to 50 percent or less of the maximum output of the ballasts, except for those defined in Section 10 are exempt from those standards. And the ballasts that are defined in Section 10 apply very specifically to -- I can give you a list here -- it's 1F34212 lamp, 2F34212 lamps, 2F96212ES lamps, and 2F96T12 High Output/ES lamps. So aside from those very specific T12 lamps, dimming ballasts designed to operate T-8 lamps, any other lamps that do dim below 50 percent of maximum output are not covered in Federal Standards, and so we do not see preemption as a concern for those products.

MR. SINGH: Okay, thank you. Anybody else in the room? Okay.

MR. STRAIT: For those that are attending remotely, after we check for comments in the room, we will then check for comments for our remote attendees. If you're attending from a computer, you do have the ability to mute and unmute your own line. We would ask first that people unmute their own line if they would like to speak; afterwards, we will be opening all the phone lines and hopefully there won't be too much noise for those that are attending solely by phone, and that will be your opportunity to comment or speak on a topic. Thank you.

MR. SINGH: Peter, could you please open the lines for the comments? If anybody has a comment, please go ahead. Okay, it seems like no comments, so I'm going to move to the next slide.

The next slide is about the Sales and Stock information. IOUs submitted DOE's Dimmable Ballast Technical Support Document (TSD) information for 2011 Rulemaking. And it includes the sales and stock information and data related to all Dimmable Ballasts.

So the question is: What annual sales data is available for the Dimmable Ballasts that dim below 50 percent? So it's not separated, so the data is in the TSD, so no separate data has been provided, so we'd like clarification from the stakeholders on that. And the second question is: How many Dimmable Ballasts are installed in the existing buildings, residential as well as non-residential? I don't think there's going to be much of residential buildings that have Dimmable Ballasts, it's mostly the non-residential, but we would like to get some clarification and information on that, and if you could come and comment on it. So I will open the lines. Thank you. Yes, go ahead.

MR. YOUNG: So, Daniel Young with California Utilities. So to clarify, the sales data that we did provide came from the DOE Federal rulemaking for Fluorescent Ballasts, so you're absolutely correct that it's not specific to Dimming Ballasts, and there's no separation in terms of in DOE's analysis which did they consider to be dimming, which did they consider to be fixed output? And, in fact, their focus was more on fixed output ballasts. So the numbers that they have provided, we would propose that they can be used almost directly for California for the purpose of a Dimmable Ballast measure because of the impact of the new Title 24 Standard. And just to clarify, the new Title 24 Code which will be effective starting January 1, 2014 is going to essentially require for all spaces where the power density is greater than .5 watts per square foot to have a minimum of four steps of dimming ability. And so the result of that is going to be that, in all new installations and retrofit installations, instead of purchasing a fixed output ballast, you will have to purchase a fully Dimmable Ballast. And so we believe that the data that DOE provided in their fixed output ballast rulemaking can be transferred into the State of California. And so just briefly, in terms of just the commercial ballasts without residential ballasts or sign ballasts, DOE estimated roughly 80 million nationwide in 2014, and that scales up to roughly 120 million in 2025, and so we believe that those are the types of data that we can move over to California and say the majority of these fixed output ballast sales in California are not going to be fixed output ballast sales, in fact, they will be Dimmable Ballast sales because of the new Title 24, the requirements.

And to address the second question regarding a Dimmable Ballast installed in existing buildings, we agree that there's not a whole lot of data out there today to understand what that number is. And if industry does have an idea and can provide more information, that would be great, and we would love to see that. However, we don't believe that it's necessarily critical for understanding the potential impact of a standard on fluorescent dimming ballasts just because of the change in landscape that's being spurred by the new Title 24 regulations, so without Title 24 kicking into effect next year, it's hard to say if there would be a lot more dimming ballasts installed over the next, you know, 30 to 50 years. But understanding that that is happening and, you know, we think there's a great opportunity here to really capture this product that otherwise doesn't have any standards to regulate its efficiency.

MR. SINGH: Okay, thank you. Anybody else in the audience want to make a comment, please? Okay, if no comments, then we'll open the lines for comments. The lines are open, so please make your comments on the Dimmable Ballasts. All right, I guess no comments. And we're going to move to the next slide.

Our next slide is about the Design Life and the Duty Cycle of Dimmable Ballasts. So one of the questions that we have is: What is the duty cycle for non-residential and residential Dimmable Ballasts? If there is any information, we have not seen any in the TSD, Technical Support document of the DOE because it's mixed information, and so we have not seen any information related to the ballasts that are dimmable below 50 percent. So that's one of the questions that we'd like some response. And the second question for discussion is: What is the design life of Dimmable Ballasts? And those two, we'd like to get information or discussion on. And the reason the duty cycle and design life information is essential is because we use it to determine the cost-effectiveness and the total energy consumption and energy savings. So it's critical that we get this information if there's a proposal to do Standards on it, so you know, we would like to open this discussion now and then, when the proposal is submitted, we'd like to have this information in there stated clearly so that we can do our analysis on this product. So with that, I would like to have the comments received in the audience. So if somebody has a comment, please come forward. Yes, sir.

MR. YOUNG: Daniel Young again with the California Utilities. So again, for these questions we would refer back to the DOE Technical Support document for the fixed output ballast rulemaking. You know, fixed output ballasts and Dimmable Ballasts are designed to serve exactly the same function, the same application. There may be some adjustments needed for Dimmable Ballasts in terms of the duty cycle, but for the purposes of estimating the impact of the standard, I think the research conducted by DOE serves as a useful foundation. So they've estimated 2,700 to -- I think it's 3,500 operating powers annually for fluorescent ballasts in commercial applications, and I think that's an acceptable duty cycle for dimming ballasts, as well. In terms of the design life, DOE has estimated 13 to 15 years for fixed output ballasts and, again, they're essentially constructed of the same components. We don't see any reason why you should expect Dimmable Ballasts to last much longer or much shorter than fixed output ballasts. But, again, this is an area where we would welcome input from manufacturers, as well, if they have analysis to support either longer or shorter lifetimes for Dimmable Ballasts in relation to fixed output ballasts. But as of right now, there doesn't appear to be any measurable difference between the two in terms of these two factors.

MR. SINGH: Is there any study on that or information or research on --

MR. YOUNG: Comparing the design life of Dimmable Ballasts with fixed output ballasts?

MR. SINGH: Yes.

MR. YOUNG: Not that I know of. There are studies that have evaluated the use of light control sensors and that impact on energy use over a year, and that can be useful, I think, for guessing at adjustments to duty cycle. DOE actually in their technical support document provided separate lifetimes for commercial ballasts that were operated with and without an occupancy sensor, so slightly different in that they're not necessarily dimming. But in the sense that one is obviously at the lower operating hours with the use of an occupancy sensor, that is something that can help calibrate a final estimate, too.

MR. SINGH: Great, thanks. Yes, Keith.

MR. COOK: Keith Cook from Philips. I guess I'm a little confused on where this is actually headed. The reason I'm saying that is, when you look at the Sales and Stock information, you can probably talk to each individual manufacturer on a one-on-one type basis, and they can tell you the percentage of their total ballast sales which is dimming. Right now, I don't believe that NEMA actually gathers that information, so it's not something we can do as an industry whole to provide it. But it's almost an academic question because, as previously stated, with Title 24 adoption, those numbers no longer really have any bearing in California. The adoption of a Dimmable Ballast is going to be much much much higher than what those previous numbers will ever show you.

The other thing that has got me concerned is that a lot of dimming today, there aren't Standards as far as efficiency, and that's really I think what the focus of this study was supposed to be on, and we need to determine how we're going to get to that end result, how to establish such a Standard. And that's what drives the questions about duty cycle. You know, if you come up with a specification, or how to test for it, then it should be predicated upon that duty cycle and I don't know of any concrete data that shows that. Another source you might want to contact would be Francis Rubinstein at Lawrence Berkeley --

MR. SINGH: Right.

MR. COOK: -- and they've done an awful lot of work on controllable lighting and may be able to provide some data along those lines. As also previously stated, the design life of Dimmable Ballast is the exact same as the fixed output, no difference.

MR. SINGH: You know, one of the questions I have is, what is the percentage of this ballast in 100 percent duty cycle, you know, 100 percent capacity, what is the duty cycle in 50 percent or 30 percent? So that is really essential for --

MR. COOK: Again, as I think was previously pointed out, it is so predicated upon the application, it's just unbelievable. I mean, there are some control systems where you set the system up initially where it never sees 100 percent, and the ballast may never operate at 100 percent. Then, of course, you have the duty cycle where it has daylight controls and in those cases they will only operate when the sun is out, so you end up with a different duty cycle than one that's under an occupancy sensor where it's going on and off all day long. So it's very very dependent upon the application.

MR. SINGH: All right, thank you. Yes, please.

MR. HAKKARAINEN: Pekka Hakkarainen, Lutron. Just commenting on the duty cycle issue. As Keith said, we probably don't have the data in the form that you are asking for here, but I am wondering if that is even necessary because what you are saying here is that the ultimate goal is to determine the potential energy savings out of it. Keith mentioned Francis Rubinstein, he certainly had some data available. As an industry, we have -- well, actually, I take that back, that wasn't in the NEMA context -- in the ASHRAE 90.1 development context, we have collected a set of published papers and case studies that we could give you all the references for. I believe most of them are today, including though in the overview paper that Lawrence Berkeley National Laboratory published in the *Leucos* last year, and Francis was one of the authors. So there is a reasonable set of data available for determining what energy savings are available from control systems that use dimming ballasts. We will put those into our comments.

MR. SINGH: Okay, thank you. Yes, Alex, please.

MR. BOESENBERG: It wasn't scripted, but I'll segue right off of Pekka's comment. NEMA has attempted -- I'll give a little background -- NEMA has attempted several times in the past to pursue either -- well, we've tried to pursue incentive plans, or national recognition for systems which have the potential to save energy through the use of lighting controls, a Dimmable Ballast, a linear fluorescent, is one example of a subset inside that umbrella. And the challenge has been proving you will save energy because you have the capability of saving energy. And Keith and Pekka alluded to that. It has a lot to do with the application. And I would further state that we have done studies, we did a study with CLTC in some of the Davis classrooms on whether or not they actually dim the systems; even though it's capable, sometimes they just like to throw full on. And there's other studies that CLTC has done where the data can be conflicting, that ultimately it has to do with the operators, first proper commissioning, and proper maintenance. I will freely admit, inside NEMA's own offices, I have battled with the Office Manager to use the right fluorescent lamps in our dimmable areas because when he buys the utterly cheapest one he can find, sometimes they die early and they don't dim well, but that is just proof that even somewhere where we know what we're doing, you can still mess it up. And I'm mentioning this just as a caution; whatever estimates the Commission does, or the proposal the development teams do of, "oh, it's going to save this much energy," that a lot of grains of salt have to go in with that because we don't know if people really will use it or maintain it correctly in the lifetime. The initial install might be very efficient, but then fall into disrepair and not save any energy over any fixed output ballast.

And the other thing I need to point out, and I might as well do it since I'm up here because I didn't find a good place here, is Keith already alluded to, in absence of standards which specifically test Dimmable Ballasts for efficiency -- and I can't say that NEMA started some while ago developing a standard for that -- we do have a standard for linear fluorescent lamp dimming, LL9, so this is sort of like the companion ballast standard, but I want to caution, as well, or raise the issue -- we'll call it expectation management -- a Dimmable Ballast to achieve dimming one of the things it does is send power to the filament's, cathode heat, to keep them emissive so that the lamp will continue to glow, otherwise you have flicker and early failure as potential problems. So a Dimmable Ballast actually uses more energy for cathode heat than a fixed output ballast. But the tradeoff is you save a lot of energy in output power overall because you're dimming the light. So it's a question of managing expectations, understanding that this is a different technology than a fixed output ballast. You can test it at full output and get an efficiency from it, and we do in the NEMA premium ballast program. I have fluorescent TA Dimmable Ballasts listed in that program, they're tested at full power. And I sort of want to beg the discussion maybe not here today, but in the first proposal workshop of do we really need to put a lot of energy into an efficiency standard and efficiency requirements for a Dimmable Ballast when the real energy savings lies in the actual dimming itself, moreover than the ballast. Thanks.

MR. SINGH: Okay, thank you. Anybody has comments? Okay, go ahead.

MR. YOUNG: Daniel Young, California Utilities. Just to respond to a couple of the comments that were just made, first of all, I think it's a good point that you're not guaranteed savings when you install a Dimmable Ballast over a fixed output ballast, but I think we would argue that that's not really the point of this measure, is to ensure that the Dimmable Ballast that you do install perform better than a Dimmable Ballast that you could install. And so that's really the point that we're trying to make. Whether or not you actually gain savings by dimming your ballast, that's not really up to the Standard, I don't think, but it's more just ensuring a high quality of efficiency amongst ballasts that are dimmable.

And then to the point of duty cycle and how that factors into, you know, whether you're considering standard levels or estimating savings, I think it's also an excellent point that we don't know exactly how every b ballast is going to be operated, so you may operate some at 100 percent, you may operate some never at 100 percent, we don't know. But that, I think, highlights the importance of needing to understand how these ballasts perform when they're not at 100 percent. So if we can find a way to do that by looking at the performance of multiple ballasts as they dim, then we'll have an idea of how to develop a standard to ensure quality performance of products from 100 percent all the way down to their minimum dimming percent. And so to that point, I wanted to just state for the record that the Utilities are funding testing with Southern California Edison for 35 unique dimming ballasts to study exactly this question, which is how do they perform when they're measured at 100 percent, and then what happens as you gradually dim them down until they no longer operate the lamp? And so we think that that data is going to be invaluable in the sense that nowhere else can you look at that right now and say, how does one ballast compare to another across its full living range? But upon completion of that testing we'll have a good understanding of that for a lot of products in the market, from a lot of the major manufacturers. And so we'll look forward to completing that and submitting that to the Commission within the next month or two.

MR. SINGH: Okay, great. Thanks. Anybody else in the audience? Okay, Peter, can we open the lines, please? So the lines are going to be open. Anybody have comments?

MR. STRAIT: Sorry about that. Sometimes it takes me a moment to find out who is making background noise.

MR. SINGH: Okay, the lines are open now. All right, since have no comments, Peter, I'm going to move to the next slide, then. Thank you.

Okay, my next slide is going to be Incremental Cost and Savings. I know Edison did some study on the Dimmable Ballast price survey and we have looked at it, but the data provided lacks comprehensive price information and the kinds of price comparisons we need, what's the price difference in ballasts which goes up to 50 percent, or below 50 percent, what is the price difference? And what's the price difference in 100 percent, you know, no Dimmable Ballasts? So that information we need to have so that we can compare the incremental costs of these products. And stakeholders who wish to submit proposals for incremental cost, we'd like to get that incremental cost as it's a necessity to make the determination on the energy savings and the cost-effectiveness of the product. So we would like to get that information. And if anybody has a comment on the cost or incremental cost, we'd like to hear the comments. Go ahead, please.

MR. YOUNG: Daniel Young, California Utilities. First, just a quick question. You mentioned -- I think you're interested in the price of dimming ballasts versus fixed output versus --

MR. SINGH: Yeah, so that we can see the difference like the 50 percent, you know, dimmable up to 50 percent, or 30 percent, so what's the difference, and for non-Dimmable Ballasts, so to see the cost, what is the incremental? We have to have some baseline to see where the cost is.

MR. YOUNG: So I guess I'm not entirely clear why that data would be helpful. Just from my perspective, we're interested in the incremental cost of higher performing potentially covered dimming ballasts that dim below 50 percent versus lower performing dimming ballasts that dim below 50 percent, all within the same category. So I guess I'm not sure of the value added for understanding the cost premium from going from a fixed output to a 70 percent Dimmable Ballast, all the way up to a 30 percent Dimmable Ballast. But if that's in some way useful to you, we can certainly work to --

MR. SINGH: Yeah, because we would like to see that because both of these ballasts are going to be available in the market because, although DOE is regulating the ballast up to 50 percent, they will be sold in the California market. Also, if we regulate below 50 percent, they will also be available in the market. So we want to see how the consumer goes out to the store and they see the two ballasts, one is $50.00, the other one is $150.00, so how do we tell -- so I think we need that information because once we move forward we like to look into it.

MR. YOUNG: Okay, so to respond to that, I would think that that's this issue of could a consumer comply with Title 24 using a ballast that's not dimmable below 50 percent versus would they have to buy one that dims beyond 50 percent. It sounds like that may or may not be a compliance issue with Title 24, but again, I think we would want to keep the focus on the ballasts that do dim below 50 percent and have that be the product category that we're looking at incremental costs for. So I think you're right that ballasts that don't dim below 50 percent, they will be cheaper, and so --

MR. SINGH: Right. And they will be available in the market, so --

MR. YOUNG: But they wouldn't meet the Title 24 Code.

MR. SINGH: Right. There is a difference in the installation and the sales so that Title 20 is a sales base, so a lot of people are going to be looking at a cheaper ballast and buy it, so how do we enforce? So we would like to see that, you know, how close the prices are so that, you know, to make enforcement better, that if there's a price difference, it's differentially too high, then we may run into some problems later.

MR. YOUNG: Okay, well --

MR. SINGH: So we would like to get this information.

MR. YOUNG: -- okay, we'll look into that and try and provide what we can. And then a couple comments to this slide, as well. So the price survey that we provided as is, I think you're right, isn't incredibly useful for this exercise, but the key to that, I think, is upon completion of the testing with SCE, we will be able to link the price data that we have for a specific ballast to their performance, and so with that information we can perform some analysis and understand exactly what is the cost difference between a higher efficiency dimming ballast versus medium efficiency dimming ballasts, versus low efficiency dimming ballasts, if there is one. So our initial research suggests that other ballast factors such as how many lamps it's designed to operate, or what is the control type, these are things that have a far greater impact on price than just the efficiency component of it. So as far as -- I can see on the market there is no such thing as, you know, the premium efficiency brand of dimming ballasts for each manufacturer yet. So not seeing that and just looking at the other components that impact cost, our initial research suggests that incremental cost isn't a huge piece of this question.

MR. SINGH: Okay, thanks. Anybody else in the audience? Yeah, go ahead Charlie.

MR. STEVENS: Charlie Stevens, Northwest Energy Efficiency Alliance. I didn't quite know where to put this. We just completed a study with the New Buildings Institute on Fixture Level Dimming, and it was presented to our lighting program funders yesterday in a webinar. And I think based on our discussions internally on Tuesday, we think the testing was successful enough that we believe this will become a dominant way of doing dimming, with dimming ballasts, in the future. And it will probably go to the market transformation phase of our work as a result of this study. So we'll provide that to the record and I think it will answer at least a few of the questions, it won't answer all of them, but it will probably get you energy savings, duty cycle, and some of the other costs. The purpose for us was to demonstrate or validate the performance of the systems and the energy savings, and the cost-effectiveness of the technologies. So there's probably some answers in there and I'll send it to you as soon as it is published, which will be sometime, I think, in the next week or two.

MR. SINGH: Okay, thanks. Thank you, Charlie. Anyone else? Okay, Peter, could you please open the lines? Anybody have comments related to the Incremental Cost Savings, please make your comments. Okay, it looks like no comments. I will move to the next slide. Thank you, Peter.

Okay, this concludes the ITP phase and the Commission will request proposals on this topic, and we will issue a Proposal Template by June 10th and would request the proposals to be submitted by July 25th. And the Proposal Template is going to be a guidance document that stakeholders can use to submit their proposals.

And the Commission staff will be available to discuss any of the issues related to this topic or the Proposal Template, so we will be available and any time you want to meet us, or want to have a conference call, or any issues, we'll be available to answer any of the questions.

This slide is about where we are in the process. You have seen it many times, I think, since we started this workshop phase on Tuesday, and our next step is the

Proposal Template June 10th, and then we will move forward. We expect the proposals to be received by July 25th.

And my contact information is here on this slide, so if you need to contact me, this is my information. And thank you very much. If you have any comments, you can make your final comments. But other than that, that concludes my presentation and we will meet I think at 1:30. It's the lunch break now -- 1:30? Yes, thank you.

(Break at 11:46 a.m.)

(Reconvene at 1:30 p.m.)

MR. SINGH: Okay, good afternoon and welcome back. This session we are covering the Multifaceted Reflector Lamps, MR Lamps. And the stakeholders responded to the ITP and proposed the scope of MR Lamps to include Small Diameter Directional Lamps, diameter less than or equal to 2.5 inches, and which includes MR-16 and MR-11 Lamps, and Parabolic Aluminized Reflector, PAR Lamps, PR16s and PR11s, which include lower voltage lamps, MR types, and line voltage lamps. These lamps are widely used for accent task display lighting in museums, art galleries, and retail stores, residential settings, and entertainment venues.

The MR Lamps that the stakeholders proposed comprised of large majority, approximately 95 percent of small diameter lamp market, while the remaining portion of the market of the light is personal communication with the lighting designers. Well, last of the portion comprised in the remaining portion of the market, which is personal communication and lighting designers, the types. So I will move to my first slide and this is a picture of the MR Lamps.

So we received this information in response to our ITP, which we shared in March and all these stakeholders submitted the comments and data related to the request. And I apologize that I didn't include SORAA comments, but you know, we will look at it and include those in our analysis. Thank you very much for submitting us the comments.

The Information Request, we had it in the ITP, we requested the stakeholders submit to us the information on the definition and scope, which we have received the information on the scope of this topic, test procedures, sales and stock information, and duty cycle, design life, and incremental costs and product costs. So we have received the information from the stakeholders on that.

I've move to the next slide which this slide includes the information submitted by IOUs. They submitted information based on the 2011 Navigant report.

And I have this table here which includes some of the sales information, as well as the duty cycle information. And it shows that 65 percent of the market is the commercial market, and 35 percent is the residential market. And one of the things that we want to do here is we want to focus on the commercial market because we, according to AB 1109, Assembly Bill 1109, it requires the State to reduce residential power consumption -- lighting residential power consumption by 50 percent by 2018 from the levels of 2008 baseline. And for commercial, it's 25 percent reduction from the levels of baseline 2008, so by 2018. And also, the outdoor lighting. But this topic, you know, the 65 percent of the commercial market is a good topic for targeting the commercial market. But it also has the residential market, which is 35 percent, and these lamps are rapidly growing in the residential area, so it's good information. And these numbers are actually the U.S. data and I think the table says that the IOUs have submitted this data, 12 percent is California's share.

So with that, I will open this slide and request the stakeholders in the room to make comments, and then we'll open the lines later on once we've finished receiving the comments from the people in the room. Yes, Noah, please.

MR. HOROWITZ: Hi. Noah Horowitz from NRDC. While we agree there is a larger share of these bulbs that are going into the commercial market, it's often indistinguishable between a residential and commercial, so we think it should cover both of them and the small diameter cans are increasingly popular in new homes and remodels, so we think that's going to increase, as well.

In terms of scope and some of the numbers here, it's NRDC's belief that both integral bulbs and also those small diameter reflectors that are run on low voltage with a power supply outside of the bulb, though, should be covered, too, and I'm not sure if these are just integral bulbs, or both line and low voltage. Thank you.

MR. SINGH: Thank you. Anybody else who wants to make a comment on this slide? Could you please open the lines? The lines are open now, anybody on the event who wants to make a comment, please go forward. Okay, the lines are open. All right, it seems we don't have any comments, so I'm going to move to the next slide, Ken. Thank you.

We also received the information, the Navigant report from the IOUs related to the design life and the cost information. We already received the information on the duty cycle, but this is the design life of these products, so you know, the IOUs also state the upfront cost of the MR Lamps, the halogen-type lamps, or MR Lamps, cost $2.00 to $5.00 per lamp, and the LED replacement lamps range in cost from $16.00 to $45.00, depending on the quality of the lamp. So I would like to seek comments on these two issues, the design life, as well as the cost. Yes, please.

MS. GONZALEZ: Hi. This is Amanda Gonzalez with Energy Solutions, on behalf of the Utilities. And I would first just like to thank the Energy Commission for hosting the workshop and engaging stakeholder feedback.

I wanted to make a comment about design life. We conducted an additional analysis on the lifetime of lamps using 157 different data points from online catalogues from GE, Philips, and Osram, and we found that 65 percent of that sample had lifetime greater than 5,000 hours, and so we found that the spread was between 1,500 and 6,000, with lifetime weighted towards the end of that spread. And we can submit additional information on that.

And then in terms of the cost for the halogen lamps, we found that for halogen lamps the spread was more between $2.00 and $14.00 per lamp, and with LED replacement lamps, as discussed in the measure on LED lamps, we expect that cost to come down from $16.00 to $45.00 to something probably substantially less in the next three years. Thank you.

MR. SINGH: Okay, thank you. Anybody else who wants to make a comment? Yes, please.

MR. SILLEVIS-SMITT: Willem Sillevis-Smitt from SORAA. This might be obvious, but since it is spelled out on the slide like this, obviously LED MR16 lamps have a lot longer lifetime, easily 25,000 hours in many cases, quoted up to 35,000 hours.

MR. SINGH: Thank you. You know, one of the things, we have not received the information we would like to see, the halogen lamps produce a lot of heat and the heat is not calculated in the overall consumption because it requires more air conditioning during summertime if you have the lights on, compared to LED lights which probably will generate lesser heat. So that should be part of the operating costs for the lifecycle costs, should be included in the heat part which, you know, maybe in the wintertime it works the other way, but summertime this should be an additional cost. So we would like to see some of that included in the cost. So if you have any comments on that, please make some comments; if not, we'll move to the lines, open the lines for people who are online to make some comments on it. Ken, please. All right, the lines are open if anybody has comments related to the MR Lamps, so please make the comments. Seems like we have not heard anything, Ken. So I'm going to move to the next slide. Thank you.

So the next slide is related to the Lamp Performance Characteristics and there are two types of halogen lamps here, one is IR and the other one is the two kinds of infrared lamps, non IR and the IRs, and the LEDs Replacement Lamps. So this is the information on the lumens output and the wattage, and the efficacy of these lamps. So we would like to see comments on this information if you want to make a comment. Yes, please.

MR. HOWLEY: Yes, Joe Howley with GE. The one thing that doesn't show up on these slides with regard to performance characteristics is how the beams are being generated. There is a much different optical mechanism happening with the halogen MR16 lamps versus the LEDs. With the LEDs, it's fairly straightforward, the beam comes out pretty much straightforward out of the face of the lamp and to whatever beam spread it's designed, 10 to 60 degrees, but it's a straight beam often with very little field illumination around it, all the energy could be concentrated in a very tight circle of light, or whatever beam spread they're designed for. The difference is that the halogen lamps get their beam spread by bouncing the light from the filament off an elliptical reflector, which is around the lamp, which is where the MR comes from, Multi-Faceted Reflector. The LEDs are sort of misnamed in that it's not really a Multi-Faceted Reflector that is reflecting lights, it's simply a replacement for one. But when it does this, elliptical reflectors will recombine all the light in a very small point, a couple of inches typically, in front of the light bulb itself, and some of the fixtures are designed to take advantage of that in that they'll have a very small aperture opening or slit opening, in which an LED MR16 Lamp simply would not work and would not function properly.

I raise this because there were some comment about it being technology neutral. But in this case, if you made the technology neutral and pushed it up to the efficiency of LEDs, you'd lose all the utility and functionality of a halogen MR16 lamp. So I raise this with the concern that you'd have to look at minimum efficiency regulations separately for these different classes of lamps if you were to set a minimum efficiency. You couldn't set one efficiency, minimum efficiency, for all three; if you did that, you would have the risk most likely of eliminating the halogen lamps and eliminating that optical technology, and also creating problems in fixtures where they're designed to take advantage of that particular fixture of a small sort of how the light reflected comes through the small point. And then there's also field illumination, as well, there's the light that just comes out of the front of an MR16 creates kind of a field glow, so you have both the tight spot of light plus a small amount of field lighting around it, which a lot of lighting designers like, especially in the retail environment. So just some concerns here with regard to performance that does not show up on a simplified chart like this.

MR. RIDER: Joe, before you leave, and I'm not sure if it's in the record already or not because I haven't reviewed these particular comments, but if you have some diagrams that really kind of illustrate the point that you're making, I think I'm hearing the concept, but it would be a lot easier if I could see some diagrams.

MR. HOWLEY: Right. Do you want me to -- I could try to draw if you have a sheet up here, or do you want --

MR. RIDER: If we have time at the end, maybe we could go over that, or Harinder and I could meet with you and you could show it, but just so we really understand, we want to understand what you're saying and I kind of get it, but it would be easier if I could see it.

MR. HOWLEY: Sure. I agree. Thanks.

MR. RIDER: Thank you.

MR. SINGH: Thank you. More comments, please? Gary.

MR. FERNSTROM: This is Gary from PG&E. So I have a question of Joe, let me get his attention. I was unaware that the MR Lamp converged the light, you know, a short distance in front of the lens. My question is, couldn't LED replacements for the MR Lamps be similarly designed to direct the light through an aperture? Or is that not technically feasible?

MR. HOWLEY: I think it would be optically difficult, it's certainly not how they're designed today to operate. The reason that it collects through a single point is, because these lamps were originally used in slide projectors, for those that remember slide projectors, and so that was their original use before we pulled them out of slide projectors to create this new market back in the early '80s and calling them Precise Lamps, and pulling them out of slide projectors and actually having them highlight objects. But that was why they were originally designed with an elliptical reflector to go through a slide in a slide projector.

MR. SINGH: Thank you. Anymore comments in the room, please? Yes.

MS. GONZALEZ: This is Amanda Gonzalez with the Utilities. I also have another question for Joe. I was wondering if you could explain or talk about the market share that that represents, this issue?

MR. HOWLEY: The market share between halogen and LED?

MS. GONZALEZ: No, the market share of the MR Lamps where the small beam spread becomes an issue, where LEDs can replace that --

MR. HOWLEY: I don't know because it's a fixture application issue, so I don't think there's anyone that would have that type of information. I know there are fixture designs to use that particular feature of that lamp, certainly not all of them are designed that way, which is why the MR16s work well in many applications, they just don't work well in all.

MS. GONZALEZ: Okay, thanks.

MR. RIDER: For folks on the phone, Joe said he doesn't know.

MR. SINGH: Yes, Gary, please. No jokes.

MR. FERNSTROM: Gary from PG&E. So I'm going to step up to the microphone so everyone can hear me. If I understood Amanda's question right, the answer would be that all of our lamps are designed to have this convergence -- no? Only certain ones?

MR. HOWLEY: The halogens are designed --

MR. FERNSTROM: Okay, so halogen MR Lamps which is the majority of what's sold today, because they stem from this original design for slide projectors, feature this convergence. They may or may not go into a fixture that has a small aperture, but that's the way they operate.

MR. HOWLEY: Yes, that's correct. They operate that way and some fixtures take advantage of that. Thank you.

MR. SINGH: Thank you, Gary. Anymore comments in the room, please? All right, Ken, can you please open the lines? Hello? All right. Okay, if no more comments on this slide, then, Ken, can you close the lines? Okay, thank you.

All right, then I think we're going to move to the Next Steps on this issue, is we are going to issue our proposal information template on June 10th and we'll seek proposals on the MRI Lamps by July 25th and then after that we will evaluate all the proposals and the information submitted to us, and sometime in August or September, we will prepare our staff report, draft staff report, or some standards which we may propose, and then we'll conduct workshops later on to discuss the staff report or the proposed standards and we'll seek further comments.

We also want to mention that we are available to discuss any issues, questions, and concerns related to this topic any time you wish to contact us or talk to us, please contact us and we are available to discuss any of the issues. And this process is going to be open and transparent all the way until we -- if we decide to adopt the Standards. Yes, Noah?

MR. HOROWITZ: Are you reviewing other issues before you wrap up?

MR. SINGH: Yeah, we are going to be doing that.

MR. RIDER: We have 25 minutes still left in this session, so I think we have enough time for it, certainly.

MR. SINGH: Yes. So this is going to be the next steps, and I just want to go through this slide again, and you have seen it a number of times. And you know, other than that, if anybody has comments you can make the comments, we are open. So you're welcome to come up and make the comments. Thank you.

MR. HOROWITZ: Noah Horowitz, NRDC. This is more a question than a comment. As this process moves on, I think we need to decide, is it all lumens that are counted, or just the amount of light within a certain beam angle? And I wonder if industry has a preference on how this would be structured, and even if we don't get at that today, hopefully there can be guidance in the templates so that we're real clear which lumens are being integrated as we move forward because it's apples and oranges data, otherwise. Thank you.

MR. RIDER: And just regarding the template, I don't think it's going to be down to that level of detail for product specific detail, so I think it's definitely worth a discussion here if it's possible.

MR. SINGH: But one of the things that I just want to mention, that we are in an information gathering phase, so we will talk about it after we receive all the proposals and whatever you want to do. So we don't want to step in right now and start directing people to submit information this way or that way because --

MR. RIDER: Right, so not in context of a Standard, I think it relates about the measurement and how do you measure energy efficiency, is it the lumens within a certain angle being spread?

MR. SINGH: A question for Joe, I think.

MR. HOWLEY: Joe Howley with GE. Just a comment on Noah's question, is in these particular lamps, especially, it would be very hard to define a random beam spread by which you'd need a certain number of lumens. One of the benefits of MR16s are that you can create a very tight beam spread, it's a 12 volt film on a very small filament, and allows us to create with these Multi-Faceted Reflectors a very precise beam control, and therefore if you only need to light a very small object, a little statue or something and you want a very tight beam, you know, all those lumens will be in that one very tight beam. And it's actually a very efficient way to light something like that, you don't have a lot of spill light. On the other hand, they come in wide beams, as well, so you can get much broader beams. And, you know, as a Title 20 product standard, you really don't know what the application will be and that the designer is trying to use this for and so you don't know, you know, you have to leave that up to the designer whether or not they're efficiently using that product, or efficiently using the right beam spread. I think it's beyond the ability to regulate the application, so all you can do is, if you're regulating efficiency of the lamp, I think to start you almost have to use all the lumens coming out of the lamp -- how it's coming out, how tight a beam spread it is, there's just a lot of options in these particular products. I don't think that could be regulated, so it almost has to go to the input wattage and the total lumens coming out of the fact of that lamp.

MR. SINGH: You know, one of the things, the stakeholders submitted the information related to the scope that says that widely used applications, wide usage for accent task and display lighting in museums and art galleries, retail stores, residential settings, and entertainment venues, so this is a fairly wide scope, so I think we expect the information related to that, you know, so that covers all of those areas of the scope. So anyway, any other questions? Ken, anybody has questions on -- can you open their lines, please and see if there are any questions on the Web? Hello, the lines are open if you have some comments related to MR Lamps, please speak up and we will be happy to take your comments. All right, thank you. I don't think we heard anything.

Thank you very much for joining us and this concludes our presentations and time for the workshop, so we are done with the topics for the day today. Thank you very much and we appreciate your taking the time traveling here and thank you for participating and giving your comments to us.

MR. RIDER: And I'd like to second that from the LED presentation earlier today. I don't think I took the time to really thank everybody, you know, 1) thank you very much for the written comments, but 2) to actually make the trip out here and also, even for those people who took their time out to call in and give us even more information and background in these markets, it's absolutely critical for us to understand the marketplace and the background information in order to make an informed decision on policy. So, again, thank you very much and have safe travels back home.

MR. SINGH: Thank you.

(Thereupon, the Workshop was adjourned at 2:00 p.m.)

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