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BEFORE THE

CALIFORNIA ENERGY COMMISSION

In the Matter of:	)	Docket No. 15-AAER-06
	)	
Appliance Efficiency Rulemaking	)	
Hearing	)	

PUBLIC HEARING ON SMALL DIAMETER DIRECTIONAL LED LAMPS
AND
GENERAL PURPOSE LED LAMPS

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
1ST FLOOR, ART ROSENFELD HEARING ROOM
SACRAMENTO, CALIFORNIA

WEDNESDAY, NOVEMBER 18, 2015
10:00 A.M.

Reported by:
Peter Petty

APPEARANCES

Commissioners (and their Advisors) Present:

Andrew McAllister, Lead Commissioner, IEPR Committee
Pat Saxton, His Advisor

Staff Present:

Harinder Singh
Gabriel Taylor
Kristen Driskell
Ken Rider

Also Present (* present by phone)

Stakeholders/Public Comment

Lorne Whitehead, UBC
Mark Lien, Osram Sylvania, Chair, Light Source Section for NEMA
Alex Baker, Lumileds
Susan Callahan, Osram Sylvania
Jim Gaines, Philips Lighting
Tom Stimac, GE Lighting
Dave Gatto, Westinghouse Lighting
Dave Woodward, Philips Lighting
Cheryl English, Acuity Brands Lighting
Alex Boesenberg, NEMA
Mary Anderson, PG&E
Gary Fernstrom, PG&E
Aurelien David, SORAA, Inc.
Nancy Anton, member of the public/consumer
Eric Bluvas, Green Creative
Noah Horowitz, NRDC
*David Maciel, representing Sony Electronics
*Greg Merrit, Cree
*Chris Primous, X Light
Mike McGaraghan, IOUs

I N D E X

P R O C E E D I N G S

NOVEMBER 18, 2015 10:03 a.m.

MR. SINGH: Good morning and welcome to the Energy Commission. My name is Harinder Singh.

First, I'm going to make some housekeeping announcements, then I will request the Commissioner to make some opening remarks.

So for those who are not familiar with this building, the closest restrooms are on the left side, located on the left side as you come out the door; also, there is a snack bar on the second floor under the white awning.

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 safety exit the building. Thank you very much and now I will request the Commissioner.

COMMISSIONER MCALLISTER: All right. Thanks, Harinder. I'm really happy to be at this point on these two sets on both the General

Service LEDs and the SDDLs. I really appreciate everybody coming. You know, the rubber is hitting the road, we've got 45-day language, this is concrete stuff that we can talk about and work through, and I think that's really the main point of today and when the comments are due later this month. I think, Kristin, you told me, but I promptly forgot, November 30th? The 30th, okay.

So the comments are due on the 30th. This is 45-day language, so I'm presuming that all of you know what the process looks like and there may or may not be 15-day language, depending on how it goes and what the comments coming in look like.

You know, there is so much innovation going on in lighting. There are high energy savings available and you all know that we have multiple goals in this state for carbon reduction overall, but within that and within the energy sector and within the existing buildings and new construction, all those parts of this puzzle, all those pieces of this puzzle present large opportunities for savings in lighting. And these are two very important categories that do not currently have a Federal Standard and that we

believe there are significant savings available, very cost-effectively. So that's all reflective in the language that you've all seen and will be the subject of discussion today.

So this is part of really an all hands on deck approach we have in California; our Governor and our Legislature have given us very firm direction that we need to go down this path, and so there really is no question about that and I think we just want to make sure we get it right in terms of the technology in the market and really appreciate everybody's chiming in with their expertise and certainly industry and stakeholders, advocates, everybody, we really want you to put on your thinking caps and help us make this the best product it can be.

So with that, to my left is Pat Saxton, my Advisor on this and many other topics, and my office tries to keep our door open as wide as possible, too, so certainly we're paying attention and certainly welcome anybody's thoughts directly or through the process here through the Docket.

So with that, I will pass the baton back to staff. I want to acknowledge Kristin and Mike

and the rest of the team on this, and move forward to the presentations.

MR. SINGH: Thank you, Commissioner. Again, the first part of this presentation is Small Diameter Directional Lamps and also I will present Portable Luminaires and the last part will be General Service LED Lamps, and Gabe Taylor is going to present that.

So with that, this is our opening agenda, there are the staff presentations and then, after the presentations are over, we'll take stakeholder comments. To make the comments, please fill out the blue cards that are on the front desk here and we have a gentleman from the Public Advisor's Office, please submit your blue cards to the Public Advisor's representative.

Once we complete the comments in the room, then we will take the comments from the people who are online, on the telephone, or on WebEx, so that will be afterwards, and we will open the lines and keep them muted during this presentation and during the comments, but once comments are finished in the room, then we'll open the line for online comments. And then we will have the closing remarks once we finish the

presentations and this hearing.

So first of all, I'd like to mention the purpose of this public hearing. Staff will present its analysis of the Proposed Standards and Negative Declaration for Small Diameter Directional Lamps, General Purpose Lamps, LED Lamps, and Portable Luminaires.

And staff will respond to clarifying questions and also will take the comments, and the purpose also is to allow the staff and the Commissioner to receive oral and written comments on the Proposed Negative Declarations and the Proposed Regulations. So this is the purpose of the public hearing today.

And so my next slide is about the Energy Commission, it is the State's primary Energy Policy and Planning Agency created by the Legislature in 1974. Their responsibilities include promoting energy efficiency and conservation by setting minimum Appliance and Building Efficiency Standards, and other cost-effective measures.

The Commission's Appliance and Building Energy Efficiency Standards have saved Californians more than $74 billion in reduced

electric bills since 1975. So we are doing this rulemaking under the statutory mandate through the Warren-Alquist State Energy Resources Conservation and Development Act, Public Resources Code Section 25402(c). This requires the Commission to adopt minimum levels of operating efficiency and other cost-effective measures to promote the use of energy and water efficiency appliances, whose use requires a significant amount of energy or water on a statewide basis. So this is the authority we are using, the statute and authority we are using to propose these Regulations and move forward on those.

Also, we have another statutory requirement, AB 1109, that requires the Commission to adopt minimum Energy Efficiency Standards to reduce average statewide electricity energy consumption from the levels of 2007, reduce the electric consumption in the residential indoor lighting by 50 percent by 2018, and for the commercial lighting, by 25 percent, and reduce the energy consumption for the outdoor lighting by 25 percent by 2018. So this is another statutory requirement that

requires us to reduce the energy consumption.

Small Diameter Directional Lamps are both commercial and residential, and the Omni-directional general service LED lamps are also residential, and some of them are also used in the commercial sector. So the Proposed Regulations will reduce the energy both in the residential and commercial sectors.

So the documents related to this rulemaking are available on the website, Http://Energy.CA.Gov//Appliances 15-AAER-06//Rulemaking. So we have the documents available also that are copies of the rulemaking documents, they can also be obtained by contacting Angelica Romo-Ramos at the address given in this slide, as well as her email address as given here. So anybody who wants to get copies of the documents, please contact her or please visit our website.

The comment period for this, as the Commissioner has mentioned earlier, is November 30, 2015, and the Rulemaking 45-day language was submitted and published on October 16, 2015. Comment period for Negative Declaration ended on November 14, 2015, and Oral and Written Comments

will be accepted for this adoption hearing on December 9th, as well, so we would like to receive your comments by November 30th. And if people want to make more comments, they can submit their comments during the adoption hearing on December 9th.

So the next steps are staff will evaluate the comments received and make recommendations to the Commission for the next steps. Staff may propose 15-day language to make any necessary changes to the proposed Regulations if necessary. An adoption hearing is scheduled for December 9, 2015.

Staff will respond to all written and oral comments in the Final Statement of Reasons. We will respond to the comments if there are some clarifications and questions related to the language, then we will clarify that.

For public assistance, if you need public assistance in commenting, please contact the Public Advisor's Office, as well as we have a Public Advisor's representative here. The telephone number is given on this screen, and their email address is also available here on this slide.

The Proposed Negative Declaration. Staff has prepared a Negative Declaration and this is the environmental impacts of adopting the proposed Standards for Small Diameter Directional Lamps, Portable Luminaires, and General Service LED Lamps. The study shows no adverse environmental impacts and the written comment period was from October 16th until November 14th, and it has ended on November 14th, so the next step is the Adoption Hearing where the Negative Declaration will be adopted on December 9, 2015.

Small Diameter Directional Lamps. These are some of the forms of the lamps, some of the pictures. This is what we intend to regulate. So the scope of the Small Directional Diameter Lamps is we have modified the existing scope to include state regulated Small Diameter Directional Lamps, but the rest of the definition in Section K of the scope remains the same, with the exception of State Regulated Light Emitting Diodes, LED Lamps, and State Regulated Small Diameter Directional Lamps, so this is the underlying language which is added to the existing scope.

We also added a few definitions to

include defining the Small Diameter Directional Lamps, as well as General Purpose LED Lamps. So we added a definition of Beam Angle, Center Beam Candle Power Lumen Output, Electric Power Consumed.

And then also these are the state regulated Small Diameter Lamps that are included in the Proposed Regulation. They are equal to or less than of 2.5 inches in diameter, and should have a base of GU10 and GU11, GU5.3, GUX5.3, GU8, GU4, or E26 Base.

Small Diameter Directional Lamps include incandescent filament LED and other lighting technologies that fall within this definition. And also state regulated Small Diameter Directional Lamps does not include products that use LEDs and have an E26 Base, which are state regulated LED Lamps. So those state LED regulated lamps are not going to be part of the Directional Lamp definition.

So we also have proposed the test procedures. First is the incandescent filament-type testing procedure, so we are going to recommend using the 10 CFR existing test procedure for incandescent lamps that are

federally regulated. So in case there are incandescent lamps or halogen lamps that meet the proposed standard, so we have it as a procedure that will apply to those lamps.

And we also included the Test Procedure for the LED lamps, and that is IES-LM 79 2008, and IES-LM 79 and also for the Lumen Maintenance and time to failure, we have included Test Procedure IES-LM 84 and TM-28 with additional guidance provided in Federal Regulations 3965-396 through 667, and July 9, 2015, so Section 430.23 of the Appendix Subpart B of Part 430 of the Federal Register.

So the Proposed Regulations are for the Small Diameter Directional Lamps are effective January 1, 2018. The minimum rated life is 25,000 hours based on Lumen maintenance, and time to failure test procedure. And the lamps are required to meet one of the following requirements: lumen efficacy of greater than or equal to 8 lumens per watt, or lumen efficacy of greater than 70, equal to or greater than 70 lumens per watt, and a CRI plus efficacy greater or equal to 165. So these are the two requirements lamps have to meet.

We also are going to require some certification for these lamps, and they include the base types, lamp type, power, lumens, lumen output, beam angle, CVCP, then lumens per watt, combined CRI plus efficacy, color rendering index, minimum lamp efficacy, and CCT, Correlated Color Temperature, and Rated Life. So those are going to be a few requirements that the Manufacturers are going to have to submit to certify to the Energy Commission's database.

Necessity for the Standards. Currently there are no federal or state Standards for the Small Diameter Directional Lamps. There are about 15 million Small Diameter Directional Lamps installed in the Residential and Commercial Buildings, and they approximately consume 2,500 gigawatt hours a year. This number is the average between 2018 and 2029, so we averaged it. So this is approximately how much these lamps consume or will consume.

More than 90 percent of the Small Diameter Directional Lamp stock is inefficient incandescent halogens, HIR type of lamps, and there are about 10 percent stock is LED lamps, and out of this total stock, 65 percent is the

commercial stock and about 35 percent lamps are installed in the residential sector.

In the commercial sector, the duty cycle is quite a bit, it's 3,720 hours a year, whereas in the residential the lamps use power on for about 840 hours a year. So there's quite a bit of difference in the commercial usage and the residential sector use.

So the baseline energy consumption, we have tried to calculate that and it's 2018, 2,528 is the consumption, and with the growth in lamp stock, the energy consumption will go to 2,914 in gigawatt hours a year in 2029.

The proposed Standards will save about 84 percent power, so the consumption will reduce from 2,500 gigawatt hours to 371 in 2018, and this will continue and in 2029, assuming the consumption to be 2,914 gigawatt hours a year, the proposed standard will reduce the consumption from 2,900 gigawatt hours to 428 gigawatt hours. So there's a significant energy reduction in this proposal and if the lamps are replaced, there's a significant energy savings available with the Small Diameter Directional Lamp Standards.

The Proposed Standard is cost-effective.

The annual energy consumption per lamp without the Standards is 158 Kilowatt hours a year; and with the Proposed Standard, the consumption is going to be reduced to 25 kilowatt hours a year, so there are savings of 133 kilowatt hours a year with the Proposed Standard. So there's a significant reduction, it goes from 158 consumption to 25 kW, so there's a big energy savings opportunity here.

So annual operating cost of the lamp currently averages $25 a year, and with the Proposed Standard, the cost to operate this lamp will go down to $3.81. And again, there are $22.00 savings a year just for operating these lamps. So this is a big dollar savings for the consumers and big energy savings overall per lamp.

Cost effects that we have seen from the learning curve and other studies done one pricing, we have found that the price of the lamps is going down so rapidly in all wattage beams, there is a continuous drop in price and so we see the market trend seeing the product efficacy is going up and the price is coming down.

And there's another chart we have drawn, and this is again unit price trend projected through 2018; it also shows the price drop from $18.00 to $10.00 or $14.00, and it continues to go to $10.00 or less by 2019. So there is a continuous price drop in the LED Small Diameter Directional Lamps.

Incremental Cost Decrease. We have done some studies on it and we find that the relative cost per unit, per year, is dropping drastically, and if you look from 2009 to 2015 projections, it's a lot less cost. We have evaluated optics, assembly, mechanical or thermal shields, and LED packages, and the cost in every sector is going down. So we find that the prices are dropping, incremental cost is dropping, and the efficacy of these lamps are going up.

Based on the market data, staff found that the price of SDDL is dropping and the efficiency is going up, and the quality of the lamps are improving. So it's very difficult and unclear to determine the incremental cost because, as the prices are dropping, efficiencies are naturally going up, there's no way we could figure it out what would be the incremental cost

for the proposed standard because we find 25 or 30 percent of these lamps on the market are already meeting the proposed Standards and the price is dropping quickly. So staff assumed the incremental cost for these lamps to be minimal, or zero.

And the other factor in here, in metal halide lamps, or the Small Diameter Directional Lamps, is the life cycle. We find that the life cycle of Halogen or Incandescent, or HIR lamps, the average is 4,000 hours a year. And in the commercial sector, the duty cycle is 3,700 hours. But when you replace this lamp with the LED lamp, which has 25,000 hours of lifecycle or greater, so we find that there will be five lamps that, you know, if you have the halogens, you need five more lamps than if you replace it with the LED. So for example, if the halogen lamps cost you an average of $6.00, whereas the LED lamps cost you around $10.00, so over a period of 25,000 hours, they come out to be six or seven times, so there are five additional lamps that are purchased by the consumer if there are no Standards and that would cost to the consumer $30.00 in replacement cost. But if you buy LED lamps, it's $10.00, so

the consumer is going to save approximately $26.00 over the lifetime in replacement costs, so there is a significant cost savings in the replacement part of it.

We have also looked at the Lighting Facts Data and the ENERGY STAR's data, this is how the proposed standard looks when we draw the CRI and the efficacy for the Small Directional Diameter Lamps, and we find that the high efficacy of the lamps for the high CRI, there are fewer lamps available, but the market is moving. We have seen a significant improvement in the CRI in the efficacy, so by the time the standard takes effect, we'll see that high CRI lamps will be available. There are plenty of lamps already available that are 80 lumens per watt, but 95 or greater CRI lamps also will be available by the time the Standard takes effect.

We also find that there's a significant improvement in CRI and this is what we have come up with, and it definitely shows that the CRI is going up to 97, so in some of the lamps, and so there is quite a bit of improvement over time in the CRI. And this data is 2014 data, so it shows significant improvement and it continues.

Also, there is the beam angle, which is very critical for the directional lamps, and we have found there are a number of lamps that are in the range of 15 degrees, and they go up to 40-45-degree angle, so, you know, narrow beam angle lamps are also available in 80 lumens per watt or greater, so this is also again Lighting Facts Data and ENERGY STAR data that is in this slide.

We also found that the total overall lumens output is improving and there are lamps that are greater than 600 lumens per watt, and the 80 lumens per watt standard, they have 600 lumens overall, so there is a significant improvement in the light output also in the Directional Lamp, especially on the 50 watt lamps which used to have around 700 lumens output. So these LED lamps are catching up, so there is that improvement also. So we find more light output out of these lamps.

Again, I would like to mention the design life of these lamps is 11 years, and the annual energy savings are about 133 kW hours a year. The incremental cost for these lamps is presumed to be zero. And also, the average lamp, halogen or incandescent lamp, costs $6.00, but when you

buy LED lamps, it's going to cost $10.00, so there's the $4.00 cost difference. But again, that lamp is going to last you a long time. So we come up with incremental replacement cost would be about $4.00. And the stock is again $15 million, and the first year energy savings are $22.00. Energy savings generated are sufficient to pay the cost of the lamp within the payback period, which is less than a year. And the total savings over the design life is $221.00 for these lamps. And the first year energy savings statewide would be $1,978 gigawatt hours a year.

The utility bill savings starting in 2018 will be $300 million and they'll go up to $430 million by 2029, so that is a significant dollar savings to the consumer in their bills.

Also, I would like to mention some environmental benefits of this Regulation. I have combined it with the General Purpose lighting benefits, standards will reduce the size of nitrogen by 6,558 tons and then sulfur dioxide by 116 tons, and particulate matter by 1,148, and this would also reduce the GHGs by 10.3 million metric tons per year from 2017 to 2029.

Now, I would move to the Portable

Luminaires. We have made one change in portable luminaires. Currently portable luminaire regulations required to be sold either with a CFL or with an LED that meets these specific requirements. So we propose to amend the language for LED to require state regulated LEDs, so this would help actually to the portable luminaires that they will be sold with the state regulated LEDs which are next, Gabe is going to present what the Proposed Regulations are for general service lamps. So with that, I would like to take the questions and at the end of Gabe's presentation, and thank you very much. Oh, for my contact information, it is on the next slide, I'm sorry. And the Docket Number for written comments is 15-AAER-06. And the email address is given there. With that, thank you. And Gabe?

MR. TAYLOR: Thank you very much, Harinder, and thank you for all the extensive amount of work you've done on this rulemaking, thus far.

My name is Gabriel Taylor and I am an Engineer here at the Energy Commission in the Building Standards Development Unit. I'm also a

subject matter expert in lighting in that unit. And as many of you know, Ken Rider has accepted a position as an Advisor to Commissioner David Hochschild here at the Energy Commission, so I am excited to step in where he's leaving off on this rulemaking, although I doubt I can fill his very large shoes here.

But I'm very excited about being able to participate in this rulemaking because I believe that we collectively are standing at a point in the history of artificial lighting that is no less significant than our transition from combustion sources of artificial lighting to electrification of artificial lighting.

Solid State technology gives us the opportunity to not only reduce the amount of energy consumed in artificial lighting by nearly an order of magnitude, it's almost unheard of in energy efficiency, but also to provide a quality of light that is essentially indistinguishable from the sunlight that our eyes have adapted to perceive.

I think that we will look back in our career and think of this decade as something that we were lucky to participate in and I hope that

we take that seriously as we move forward and think about where we want to be decades from now, where do we want light, artificial light, on this planet to be decades from now?

So to that end, I'm going to focus on general service lighting, the lighting that most represents that sunlight that we artificially provide in our built environment so that people can see what they're doing and can provide the light that they need to do what they need to do in those environments.

The scope is designed to zero in on that part of the light spectrum. I'm going to start with a few definitions from the Regulations and then I'll tease apart the Regulations to highlight some of the points that I think are most significant.

State Regulated Light Emitting Diode LED Lamps, this is a definition that we're proposing in these Regulations that I think will be very critical. So the connected lamps, I believe you're familiar with the need to regulate lamps that have a continuous draw of power that in many cases can totally eclipse the amount of power that they draw to actually provide light. And

you should be familiar with this, it's a technical definition of the distance that the light deviates from its Planckian locus, the white light that we want to zero in on in the scope of this rulemaking.

And finally, the definition of a state regulated light emitting diode lamp. I'm going to pull this apart into basically four sections, we have the form factor, so these are bases E-12, E-17, E-26, and of course, GU-24. This includes retrofit kits that have bases of that type.

The scope only includes lights that are less than 2,600 lumens, so we are looking at General Service Lights, these are white lights that will be used in the built environment for general task lighting, general lighting. CCT, Color, between 2,200 K and 7,000 K, again, white light, general service. And finally, again back to the DUV, this is the scope, not the mandate, this is the scope, a DUV above or below the Planckian locus of .012. Let's drill down to that last two points a little bit more, we have here the Planckian locus and the full spectrum, and our scope covers just that part right there in the middle between 7,000 K, 2,200 K, and above

and below the curve.

The effective date for these Regulations, January 1, 2017, for Tier 1, January 1, 2019 for Tier 2, both effective dates are for manufacturing dates, so this is products that are manufactured on or after these dates must comply with the Regulations. Products that are manufactured before these dates are not subject to these Regulations.

We're only looking at products that are greater than 150 lumens. This is to exclude those products that are purely for decorative purposes, products that are not going to provide general white light. And then Ken has done a bunch of research on this, this equation basically extends at the higher color CCTs up towards 7,000 K. There's a slight addition to the higher allowances to account for variations in the color spectrum at that CCT. And finally, CRI of 82 or greater, but there's an equation, make sure to look at that.

The individual color score -- I think this is a critical part of this Regulation -- we have had a lot of debate, I think, with most people here and I think internally, about the

correct color that would replace an incandescent source. We have to remember that the goal of these Regulations are to manage this transition and this marketplace. As we move from what is upwards of 70 percent of sockets are still incandescent; as we move from those sockets having incandescent products and consumers replacing them with a Solid State source, that saves an enormous amount of energy, we want to make sure that the consumers are satisfied with the color and with the energy savings.

At the same time, we need to make sure that the marketplace sees a level playing field and that the Manufacturers have a predictable path to guide their development cycles.

A power factor of 0.7 and a rated life of 10,000 hours or greater, we all know that the effective life of solid state products can be much larger than this, but we want to make sure that consumers see that order of magnitude increase in the life of the products compared to the incandescent incumbent.

These Regulations propose to make sure that A Lamps that consumers expect to be Omni-directional *are* Omni-directional, and that lamps

that consumers do not expect to be Omni-directional obey the ENERGY STAR decorative light distribution requirements, to distinguish in the market space for the consumer between the Omni-directional lamp and the non-Omni-directional lamp.

And this is back to the communicating lamps. We've seen a number of these on the marketplace and by all accounts the penetration of the marketplace will increase drastically over the coming decades. The .2 Watts or less is on the market already, and some look much lower than that, and I think if we look at the various portable technologies we can see that, communicating devices that consume a lot less than that is technically feasible and the calculations are in the analysis, but if you get much over .2 watts, the standby load begins to eclipse the lighting load. So that's critical.

So as far as technical feasibility, staff has done an extensive analysis of the marketplace as it exists now, we find 537 models of medium screw-based omnidirectional lamps currently meet the Tier 1 efficacy and CRI requirements that will not go into effect until January 1, 2017.

And further, there are more than 100 that meet the 2019 target.

Similarly, for medium screw-based directional lamps, over 600 models currently available that meet the Tier 1 standard, 18 that meet the 2019 Tier 2 Standard, and I believe that should be a fairly easy step.

And then finally, for Candelabra, obviously this was more challenging, it's a smaller form factor, we have a smaller number of products currently in this space, but we're optimistic that that will move rapidly as consumers start to transition and the market expands.

The cost-effectiveness, I probably don't need to go into too much detail here, I think that while the cost-effectiveness of this technology is apparent, the question is just where we land on these Regulations. Again, more cost-effective numbers.

By all accounts, if you look at the upwards, almost 600 million screw-based sockets in the State of California, this doesn't even include the rest of the country or the rest of the world, and the upwards of 70 percent of the

product in there that's currently incandescent, if we were to transition those over to a solid state product, it's many billions of dollars per year of energy savings. This is a very very significant savings, one of the most significant currently left in the built environment.

So again, my name is Gabriel Taylor and here's my contact information. I'll be taking over, again, for Ken Rider, he'll still be an esteemed technical Advisor on occasion, but his responsibilities will be, since he's actually taking over a position that I held a little while ago, his responsibilities will be significant, so I doubt he will have a ton of time to devote to this. But I'm excited to be working with you on this and I look forward to take your comments.

MR. SINGH: Thank you, Gabe. At this time, I would like to introduce and invite Professor Lorne Whitehead from the University of British Columbia to come up and provide some insight into some of the key issues around lighting and efficiency Standards. Professor Whitehead is a member of the IES Color Committee and has led significant research on color quality, color perception, and lighting

efficiency with respect to Solid State Lighting. He is one of the brains behind the new methods for evaluating lighting color rendition, TM-30. We welcome Professor Whitehead to deliver some remarks at this time. Go ahead, Professor. Thank you.

PROFESSOR WHITEHEAD: Thank you very much. As mentioned, I'm Lorne Whitehead. Good morning, CEC, Honorable Commissioners, and staff.

I'm making really overview remarks, and they'll be relatively brief, both on the value of color rendering and also some misunderstanding concerning color rendering.

As mentioned, I think I'm qualified to make these comments and they'll be quite simple. The first involves the value of color. It's obvious that color is important to people, there's a huge color industry consisting of a great deal of time and money being spent, and art, and design, in printing, paints, textiles, jewelry, cosmetics, what have you. It's such an obvious part of our society, we sometimes don't think about it, but it's everywhere you turn.

And in order to take advantage of color, for it to be meaningful, for it even to exist, we

need color vision. So most of us are blessed with very good quality color vision. We sometimes don't realize it, but it's something that people are really good at. But in order to have good color vision, you also have to have lighting that enables good color vision to work, and that's what color rendering is about. So if you have poor color rendering, you're actually impairing the quality of our color vision.

So that sounds like a terrible thing, why would we even imagine that it would make sense to have electric lights that cause color distortion? And the historical fact is we didn't have a lot of choice if we wanted to have energy efficiency, but now we have a choice. So now that we can have excellent color quality, as was mentioned previously, why would we consider not doing that?

Well, I'll answer that, or at least I'll address a few kind of understandable concerns that come up from time to time, and just suggest that they really don't apply anymore. Maybe the simplest concern, I'd call it the "existence of color rendering deniers," there are people that don't care about color. I was recently at a conference were various team persons stood up and

said to the group that he doesn't care about color rendering, and neither does his wife. And that's just fine. There's no need for everyone to care about anything in a great society, there are people that probably don't have good -- or aren't interested in good color vision, or using it. But there are a great many people that really do care about it. They care about color, they care about color vision, and they care about color rendering. So, you know, we're a Democracy, we should be open to a range of use on that topic and not deny those who care about color the opportunity to see it.

So a much more interesting issue is the question of energy efficiency. This is the last place anybody needs to say that the things we value, almost all of them have an energy cost. So comfort, convenience, safety, it never comes for free from an energy perspective. And color rendering is the same. It's another good thing that doesn't come for free from an energy perspective.

But let's just talk about that in a bit of detail. And before I do talk about that question of squeezing a little bit more light out

of a watt of electricity by means of reducing color rendering, I will say one more introductory thing about me. And this is just so you know where I'm coming from. I have dedicated my career to energy efficiency. So I actually have over 100 U.S. patents on things, inventions or devices that use light more effectively to save energy. Personally, I bike to work, my wife and I share a small hybrid care, we're totally into the idea that people should have a smaller energy footprint.

But nevertheless, and again I'm stating the obvious, if you'll pardon me, it's a fact that some ways of saving energy are good. They're better in every way. They make life better, they save energy, it's good; and there are other potential ways to save energy that aren't good in the sense that they cause net harm, even though they save energy. So I'll throw a silly example, but it makes the point, I think. Take automobiles. We could remove from automobiles air bags and seat belts, and they would weigh less and they would therefore be more fuel efficient. Nobody even considers doing that because it would be a net loss. But we always

have to ask, what is the trade-off? What is the relative value? And I'm here to say, caring deeply about energy savings, that the idea of diminishing color quality to save a little bit of electricity is a bad idea, it's in the bad category of ways to save energy, especially because when it comes to lighting there are so many better ways. So I'll just mention a few.

In this room, as an example, the surfaces are dark. If the surfaces were ever so slightly lighter in this room, we could use significantly less electricity and see just as well. The Luminaires in this room and virtually every room could be made much more efficient by using just slightly more reflective surfaces that are commercially available, and just aren't the cheapest or most cost-effective thing to use.

And those savings don't even compare to what's possible with better lighting controls, making sure that every lumen counts. But, you know, even if you don't want to do those, if you want to get high quality color, you can simply back off the lumens, say 10 percent, which nobody can see. So there are at least four really good ways to save energy and reducing color rendering

simply isn't one of them. And I think there's widespread agreement with that now, and I applaud the fact that CRI is taken into account in the discussion today.

So that takes us to a third issue, there are concerns expressed about CRI because it isn't perfect yet. And it's not. As was mentioned, I'm one of many people working on improving it. And we are in the process of improving it, we hope within a year or two we'll have a slight upgrade to the CRI. But the upgrade won't really change anything; nevertheless, at least it won't change existing lamps' ratings an amount that would matter for our discussion today. But nevertheless, there are some people that say, "Well, shouldn't we wait until we get the CRI perfect?" And I'll use an analogy for that. You know radar guns that people use, police use to measure the speed of cars, well, they're not perfect, they can have a slight error in the reading. But it's not too big an error. Imagine somebody saying, "Well, we're going to stop controlling speed, or stopping speeders until radar guns are perfect." That would make no sense. And there's I think a similar -- the

analogy applies to CRI. It's perfectly good enough for the purpose and the rulemaking that we're discussing today.

So that's really all that I wanted to say, to summarize color rendering, it has always been and remains extremely important, and the good news today is we really don't have to sacrifice it. Thank you.

MR. SINGH: Thank you very much. Now we're going to take the comments. I have received some blue cards. The first one is from Mark from Osram Sylvania.

MR. LIEN: Thank you, Harinder and thanks to the Commission for allowing me the opportunity to speak here. I'm Mark Lien, I'm the Director of Government and Industry Relations for Osram Sylvania. Previous to working for Osram, I ran the educational facilities for both Cooper and Hubbell Lighting and taught in those.

I'm also the Chair of the Light Source Section for NEMA, and you will be hearing from some NEMA representatives today. We agree with all of the Efficacy Standards that are laid out in this current version of Title 20. And we understand the need in California to move forward

with progressive regulations on energy efficiency and to do so rapidly. So we're supportive of that. We're also supportive of performance metrics, that there are some metrics that bring us a higher quality light and differentiate products in the marketplace for consumer preference.

Our research that we've been doing extensively over the last few weeks has revealed that in Title 20, we can't find any products that meet all of the requirements. We can find products that meet any one or two of the requirements that are listed, but you'll hear from representatives today that we don't have products that can meet this. And the timeline is very aggressive. And you'll hear why.

Now, we've raised these concerns before at previous meetings and in written comments, but today we brought a team of globally recognized technical experts to go into some detail on this, so you will hear specifically what the concerns are and why they aren't attainable. Some of it is what Lorne referred to earlier, is trade-offs. You indeed can get to one of these categories, but you're going to trade off another. And so

you'll get some technical background on that.

Title 20 does have quite a reliance on CRI and, as the industry has recognized, it is an incomplete metric. An argument could certainly be made that it is what we had and have had since 1964 with some revision in 1974, but basically for 50 years. Yesterday, I was at the Solid State Lighting Conference in Portland that the Department of Energy puts on, and another member of the same committee that Lorne is on at the Color Metrics Committee, actually the task force for TM-30, presented, Michael Royer. And he showed his latest research, some of which hasn't been published yet, on color preference studies that he's actually doing at PNNL Labs. And what was shown were samples of light fixtures on specific objects -- fruit, scarves, things with lots of different colors. And in every instance, the fidelity, CRI being a measurement of fidelity, the highest fidelity was not preferred. And in the studies that he has done, the preference is for higher color saturation. But there's a tradeoff: when you raise color saturation, you lower color fidelity numbers. And this new research that's coming out of TM-30,

and from PNNL Labs specifically on color preference, it's showing us some of the problems that are inherent in using CRI as synonymous with quality. It's not synonymous with quality at all, and when you raise the saturation for specific applications and for consumer preference, you will reduce the fidelity metric. So some of these fidelity metrics are going to limit the types of products that consumers would actually prefer in the marketplace.

I would encourage the Energy Commission to engage some of your technical experts, and certainly at the CLTC, you have Michael Siminovitch and Michael Costa that are extremely knowledgeable in this area, they could work perhaps on your funding programs to deliver some more research to validate the quality discussion that's ongoing and accelerating in the lighting industry right now. Thank you.

MR. SINGH: Thank you, Mark. Before I move to the next commenter, I'd like to mention that our staff diligently looked into all the products that are available in the market and we find the proposed regulation there are products available currently, a number of products, so

with that I would like to move to the next comment from Alex Baker from Lumileds.

MR. BAKER: Good morning. Alex Baker with Lumileds. I'm the Director of Standards and Regulations at Lumileds. So good morning, ladies and gentlemen. I'm here representing Lumileds, as I said, one of the three largest package manufacturers in the world, LED packages and, of course, all these lamps and luminaires are built on a plurality of LED packages. We have research marking and production facilities located in San Jose.

We're concerned that the 45-day language discussed today proposes a series of requirements which, taken individually, would set a very high bar, but when combined together create a leading edge performance specification, which we don't think is an appropriate floor for the California market.

We respectfully submit that the CEC's well-intentioned efforts to drive quality along with efficiency is sort of upside down, with the proposed regulation representing higher performance than the CEC's so-called voluntary California quality LED Lamp specification.

We have four technical comments for the Commission's consideration. The chromaticity requirements create a two-step band of acceptability which is too restrictive and would eliminate more than 70 percent of LED packages falling within the American National Standard for LED chromaticity. So Lumileds requests that you simply make normative reference to Table 1 of the American National Standard and CC78.377, the 2015 version. That takes care of it and makes it very simple, straightforward, and aligns with what the industry is doing.

Secondly, the minimum 82 CRI requirement is inconsistent with how Lumileds and how our competitors bin for CRI. LED packages in the market are not binned this way. A typical distribution would be a minimum of 80 with the typical of 82, in which no parts on the reel would have a performance below 80 CRI. And it is those two additional points that provide margin for LED lamp manufacturers to hit the 80 CRI at the lamp level. So, thus, the CEC's proposal results in a requirement that's essentially a minimum 85 at the LED package level in order to hit that 82 at the LED lamp level. So Lumileds

requests that the Title 20 require a minimum of 80 CRI, rather than 82. This would be more consistent with the way the business is done. All the lighting vision scientists also agree, or I think most all of them agree, that two points are completely imperceptible, anyway.

Third, the minimum R1 through R8 requirements, while they appear to benefit one specific California manufacturer, in simpler terms this boils down to a CRI minimum of 85. If you take all of those together, you end up with simply an 85 minimum CRI requirement. No one is binning LED packages for CRI between the 85 and 90, thus to fulfill this requirement at the LED lamp level would require LED package binned at a minimum of 90 CRI. So altogether, you end up with essentially a 90 CRI spec by way of these sort of various piece parts.

So again, for the sake of rapid market adoption, Lumileds requests that Title 20 require a min 80 CRI at the LED lamp level.

And then my fourth and final technical comment is that Table K-14, Minimum Compliance Scores, would then further reduce the number of LED packages available to support products for

the California market. To ensure LEDs are available to support the market at consumer friendly shelf prices, we restate our request for an 80 CRI requirement at the LED lamp level, and ask you to consider a reduction of the minimum compliance scores.

So in closing, the Title 20 proposal for LED lamps is a somewhat arbitrary definition of high performance, which would drive up cost and leave most LEDs that could otherwise support the CEC's effort to reduce energy consumption, would leave most of those LEDs behind. So echoing what you will hear from other manufacturing colleagues, there really is no adoption problem; rather, there's a problem with initial consumer cost that needs to be addressed, and this proposal works against that goal. Thank you.

MR. SINGH: Thank you very much, great comments and we will review it and recommend to the Commissioners for their guidance. Thank you. The next commenter is Susan Callahan from Osram Sylvania.

MS. CALLAHAN: Good morning. I'm Susan Callahan, Manager of Energy Relations from Osram Sylvania. I'd like to point out that Osram is

the second largest manufacturer in the world of LEDs, and we have locations also here in California. I'm going to comment in particular on our values and CRI and their impact on the proposed specifications.

First some observations. Generally, LED lamps with very high CRI, in the neighborhood of 90+, have lower efficacies than LEDs with CRIs in the 80s. LM-79 reports are not required, too, so they may not include all of the R-values required in this version of Title 20. Generally, LED lamps with very high CRI have R1 through R8 values greater than 72. LED lamps with CRIs in the '80s are deficient in one, but not more than two R-values. It is disingenuous to suggest that 82 CRI LED lamps will be able to meet the proposed specification.

It appears that R9 has been used in error as a proxy for R8, leading to the incorrect conclusion that there are large numbers of lamps in DOE's Lighting Facts and EPA's ENERGY STAR Database that will meet the minimum requirements of 72. There is no physical basis to use R9 as an indicator of other R-values, particularly R8. R9 is a saturated red and R8 is an unsaturated

light reddish purple. We are concerned that the R1 through R8 minimum requirement of 72 is more relevant to fluorescent rather than LED lamps which are a unique source in many ways.

It may be possible to obtain an R8 greater than 72 LED lamp with adequate efficacy by using an RGBW chip set, essentially a dumb smart lamp. This is a very expensive solution to the problem. A solution proposed in the Staff Report, the addition of red LEDs to a white LED, increases the driver complexity, requires color mixing capabilities, and also increases the cost.

Another solution proposed in the Staff Report is the use of a red phosphor, which will have the effect of reducing efficacy. The minimum compliance equation, which is based on a combination of efficacy and CRI, and the 72 minimum R1 through R8 requirements, runs the risk of forcing consumers to seek out less efficient products due to cost, or lack of available LED products that meet their needs.

Osram Sylvania with our NEMA partners is very interested in working with the CEC to save energy and to increase LED adoption rates. Rational reasonable appliance Standards for

lighting products can help us meet these goals together. We encourage the CEC to revise the proposed additions to Title 20 to ensure quality products are available to meet every application at the highest possible efficiency levels. Thank you.

MR. SINGH: Thank you. You know, I think we'll hear all the comments before we make a comment at the end. So our next commenter is Jim Gaines from Philips Lighting.

MR. GAINES: I'm Jim Gaines from Philips Lighting. I'd like to thank the CEC for the opportunity to give comments on the proposed 45-day language. We recognize California's goal to capture the increased energy savings promise to buy LED and we support that goal. However, we are very concerned that the scope of the current proposals, as written, are so broad and the various requirements taken together are so high, that if enacted without revision it will fail to achieve these goals. The lamps won't be adopted.

Instead, we believe the overall effect, while unintended, will in fact slow the adoption of LED products and greatly reduce the amount of actual energy savings it's possible to achieve

with more reasonable Standards.

I'd like to make a comment on Lorne's remark. The person who mentioned that he and his wife don't care about color is Francis Rubenstein, who is a very well-known California lighting expert. He didn't say he doesn't care about color, but that they don't see the difference between 80 and 90 CRI.

I'd also like to make a comment on what Mark said. NEMA has been operating under the assumption that the written text regarding DUV in the 45-day language is correct. Mark's statements were based on the document, which limited DUV to less than plus or minus two MacAdam steps from a band of less than two steps. That was changed in the presentation we just saw this morning, so there are actually some products that do meet the spec with that DUV change; however, that doesn't change our objection to the elevated color performance specs.

So we're pleased that CEC has realized the error in the definition of the color uniformity requirements and in the future we'd like to see a greater level of scrutiny and internal checking of the technical analysis and

requirements prior to publication of the language. Industry members spent a lot of time fretting over the color uniformity spec and investigating its technical feasibility, doing data mining and analysis. Given the short time period between publication of 45-day language, this hearing, and the deadline for public comments, it's very unfortunate that considerable time and effort was wasted on the incorrect spec.

We're looking forward to seeing 15-day language with corrected color chromaticity requirements.

Okay, regarding CRI greater than 82 and R1 to R8 greater than 72, the minimum CRI requirement of 82 actually inherently conflicts with the mandatory requirement that all Rs be greater than 72. With today's technology, data from chip manufacturers, analysis of our own lamps and the study done by CLTC, shows that CRI, if you require R1 to R8 to be greater than 72, you have to have a CRI of at least 85. And that means, as Alex said, you have to design for 86, 87. So in some sense, this is still a CRI 90 requirement given the unavailability of LEDs from 85 to 89.

The CRI requirement implies widespread feasibility between the minimum CRI score of 82 and the individual R factor minimums. They're interdependent. If the CEC's real intent is to only allow nominal CRI 90 products into the market, then this should be clearly stated in the proposed legal requirements, and the CEC should clearly take responsibility for proposing that consumers can only purchase these less efficient and/or more expensive CRI 90 products.

By having unrealistically high requirements for R8, manufacturers will be forced to effectively supply nominal CRI 90 products to the market; the net result is going to be that the California consumers is going to be forced to buy the more expensive and less efficient CR 90 lamps. Compared to consumers in the rest of the country, Californians will have to spend more and get less efficient bulbs.

We're not aware of any scientific evidence in the U.S. or other countries that consumers want CR 90 greater than 90 overall as their minimum, nor has the CEC produced any evidence to support this claim. What we do see are strong sales and strong adoption of CRI 80

products in today's market, despite the availability of both CRI 80 and 90 products. This is very clear based on greater than 80 million CRI 80 and above LED lamps sold in the U.S. in 2014, and we see similar trans-globally. However, CRI 80 products are almost always more efficient and cheaper than CR 90 based on the laws of physics and the additional design complexity required for CRI 90.

We would like to propose that the R8 requirement be reduced to greater than 50, as we stated in our last series of comments, and the minimum CRI to 80. This will allow CRI 80 products to meet the color rendering requirements and allow more efficient and cost-effective products to be sold in California. This will also mean that Californians have the same access to less expensive and higher performance products as the rest of the country, and most importantly will allow the State of California to address its energy conservation needs. Thank you.

MR. SINGH: Thank you, Jim. I think our next commenter is Tom Stimac from GE Lighting?

MR. STIMAC: Good morning, everybody. My name is Tom Stimac. I'm the Chief Innovation

Manager for GE Lighting. I've spent the last 15 years of my career focused 100 percent on LED lighting, everything from signage products that you will see outside of your building façade, to indoor downlights, cobra heads, LED lamps. As part of my role, my main job is to understand how to move LEDs into everyday life for the consumer.

As a part of the overall work that we have done as part of NEMA, GE has some specific inconsistencies that they've seen as a part of the Staff Report versus the terms that have been published. Number one, the DUV. As Jim mentioned, we spent a lot of time focusing on the overall DUV equation that was in the action express terms. As a part of that, what we have actually seen and would like to make light of is that the overall specifications today for DUV come from ANSI. That overall standard has been in effect since 2008. ENERGY STAR has used it as part of their overall certification since 2009. We have not seen an outpouring of disapproval from the consumers regarding that spec, and we continue to see mass adoption in other parts of the country and in the world with that spec as the baseline.

Our recommendation is actually to keep it consistent with the actual ANSI spec so that in time when we would like to make an update as technology does increase, we can make small changes to the overall regulation to add total control.

The constriction of the DUV space from seven steps to four has a fundamental cost impact. That cost impact is, as Alex has described, is at the LED level, but is even greater at the lamp level. So every time an LED actually costs more, it actually is also very difficult for a manufacturer like ourselves to handle all the different bins of LEDs. Currently today we have to recipe LEDs which essentially is a technical way of taking one LEDs from one reel to another reel to try to mix them together and actually get a consistent color point.

Once you start taking down the number of bins that we can actually go through and mix, you actually start to us to lose yield, right? And once you start to lose yield, your economies of scale grow much much smaller, and that fundamental cost impact will be simply passed on to the consumer. So to say that there's no cost

impact with respect to going to a four step eclipse is fundamentally technically wrong. We have found that the number one parameter for adoption is cost. If you were to go ask any consumer what DUV their lamp is, and what they really would like, they wouldn't be able to even explain to you what it is. I spend some of mine, and people laugh, at least one week a month in a big box retailer or a store simply sitting in the lighting aisle trying to understand what the consumer habits are.

You know, at GE we feel that the consumer is the ultimate voice. And what you'll see is that most of them don't understand the majority of the different technical discussions we're having today. And what we kind of try to do is use them and understand and be their trusted advisor.

The other large inconsistency that we see is something called the White Color Space. In the Staff Report, there was a discussion of the white color space or, for those that might be more familiar with the DUE definition, Modified Spectrum Lamp. That is no longer found in the express terms. There are products GE reveals,

one that we manufacture today, that actually operate in this white space. This is below the black body, and what has over time shown a consumer preference for that color of white. We've talked a lot today; you've heard a lot of different people talk about preference. Well, what you need to make sure is that you are offering the right amount of preference to the end user.

These products are just as efficient and actually have seen a higher amount of adoption. The Lighting Research Center and others back as far as 2012 have actually shown this in real world data and studies that this color point is something that is real, and with more research you will see more and more products be manufactured to that spec.

Indeed, the Staff Report indicated the CEC intended to allow this lamp type to continue, however, the proposed restrictive color requirements were not allowed the continued sale of this lamp.

The next point is more on the small diameter lamps. The current expressed terms go so broad that it includes many different

specialty MR16 lamps for which there is no LED replacement. These specialty lamps are used in expensive specialty equipment, have different operating voltages, different focal lengths, and other technical characteristics that LED lamps of today or future will be unable to match.

Industry is proposing new scope language for these products that focuses on very specific technical characteristics that would allow them to be excluded, to ensure that there are no issues in the marketplace and to ensure that people can still use the equipment in other specialty applications.

The final comment is regarding off state wattage. You know, as we have seen more and more, the idea of a smart lamp has come about, nobody wants a dumb product anymore, everybody wants the overall lamps or the lighting in their home to be intelligent. Yesterday we actually heard some feedback from different people at the DOE meeting from Intel, Google, Apple, everyone else, that lighting is the prime real estate of the future. This will be the actual avenue for controls, for video, for being able to talk from room to room.

With this in mind, the express terms show a .2 off state wattage specification. This is very limiting and doesn't allow much functionality or room for development. The current specification would actually eliminate the use of certain technologies like WiFi because of some higher off state wattages that are needed to ensure that that technology works correctly.

The Commission is actually in a very unique position as they can actually enable and accelerate the use of this technology and to ensure that the overall system gains of reduced wattage in the home, if someone leaves their lights on, they can turn it off from their phone; if their kids are playing with the lights, they can turn them off; if their neighbor forgets the lights and you have the password, you can actually turn off your neighbors' lights. There are a lot of different things that can be done and we really recommend that the Commission as a whole allow the one-watt allowance that you see, or use other industry specs such as the EPA and others that have a much wider tolerance. Thank you.

MR. SINGH: Thank you, Tom. The next

commenter is Dave Gatto from Westinghouse.

MR. GATTO: Good morning. My name is Dave Gatto with Westinghouse Lighting. Westinghouse Lighting is a small business, we're actually family-owned, don't let the name fool you. Based in Pennsylvania, we have our largest distribution center right here in California, it's located in Chino and it services our national retail partners nationwide.

I have been with Westinghouse before it was Westinghouse. I'm the Director of Compliance currently, and I've held different roles along the years, most of them involving product, but also product marketing, and retail and consumer sales, so kind of a little bit of everything going on there.

You heard a lot of technical comments this morning and I'm supportive of them, particularly the ones related to CRI and consumer preference. I'm mainly going to talk about the scope for a few minutes. I am going to break it into two pieces because I think it's different, we have some different concerns with general service LED lamps than we do with Small Diameter.

So as outlined in the recent Staff

Report, we recognize the goal is to capture the energy savings that are outlined in your goals, AB 1109, and with what the Commissioners look for.

Jim said something that I really liked the way it sounded, I think the challenge that we have here is that the current proposals as they're written today are so broad, and the requirements are so detailed that we run the risk of eliminating the very products we want to sell. And that would take us backwards from energy savings.

We do strongly support the energy savings goal of the Commission. Westinghouse has added more than 100 new LED lamps in the last 12 running months, and we have, God help me, hundreds more probably on the horizon. But we're concerned about the scope.

So as it relates to general service LED Lamps, the expanded definition is just simply too broad. It impacts products that it is not possible to replace with LEDs that are available today, and to be perfectly honest, in some of the smaller decorative styles, it will not be possible to replace them any time soon,

definitely not in time, or at least we don't think so, to meet the compliance date.

From a general service standpoint, true general service, we would agree that the efficacy requirements are appropriate and I would kind of repeat Mark Lien's statement that, you know, in the absence of some of these other requirements, we wouldn't have any objection at all. But within the scope, we think that the inclusion of E-12 and E-17 base, particularly with no exemptions or room for small profiles, small diameter lamps, as well as specialty lamps that are not general purpose in their normal use, sign, display, and other specialty applications, that you're going to unintentionally pull into scope products that consumers need and that there's nothing to replace.

The definition actually doesn't describe the general service lamp very well because it includes all these specialty applications, so we think a more practical approach would be to limit the scope to the proposal so it more accurately covers the products that you're aiming for, and we do think that at least from a base-type standpoint, you wouldn't necessarily be able to

stick with simply E-26 and GU-24. I think if you bring E-12 or potentially E-17 in, then you're going to need to, and we would propose some exemptions for specialty lamp types, not just lower lumens, which is something that we're going to dialogue, but there are some appliance lamps that are very tiny that have 300-400 lumens and would not easily be replaced by LEDs, particularly with the CRI requirements that simply don't apply for our appliance.

In addition, even though we believe that the scope could be changed to better represent the product types that you're aiming for, the CRI and other requirement taken together would pose greater challenge than I think the Commission realizes. While we do see some products that meet one or two of those together, we are also unable to find many, I hate saying "any", but many products that meet them all.

Finally, on the general service lamp application, or general service LED lamp definition, we think the inclusion of recessed downlight reflector luminaires is inappropriate. These products are considered luminaires, they're not lamps. ENERGY STAR recognizes them as such,

and so does the industry. A traditional replacement lamp is one thing, but LED downlight retrofit kits typically are designed to replace the entire luminaire. They have optical and glare components that are not typically things that we're concerned about with lamps, and these products would be less easy to lump in with the way the proposal is currently written.

As it relates to Small Diameter Reflector Lamps, unlike general service LED lamp Standards being proposed which only apply to LED light sources, the small diameter reflector lamp standard will impact every product made that meets the definition, regardless of the technology currently used to make the product.

The product definition for this category is very broad and, in conjunction with the Standards, it could result, I think will result, in a huge reduction of available products in the market. The increased cost to consumers, while I understand the Commission has addressed the incremental cost, what we believe has been left out of the analysis is the loss of stranded assets. There are products that consumers own today, decorative and commercial fixtures, where

there will not be, and is not today, an LED product that can replace. High wattage, low diameter MR-11 and MR-16, alternate voltages, as Tom Stimac mentioned, that go into certain medical and other specialty equipment, this equipment is part of the installed base for California residents, and we would hate to see them have to throw that equipment away, and we think the cost of those products that they already owned should be included in the feasibility analysis.

(Pause) Forgive me, I was making changes in my notes because other people covered some things, and I don't want to duplicate it. What I would suggest, or what I think we would suggest from some conversations with other NEMA members is a continued dialogue, 15-day as part of your process, but with industry and other stakeholders, we think with scope changes and some minor changes in the proposal itself on the regulation side, that we can find something that works for everyone and can actually meet the goals that CEC set out to address with this regulation. Thank you.

MR. SINGH: Thank you, Dave. One of the

things we like to have from you is type of products you mentioned here, what are those products, what are the bases for the lamps and things like that, very specifically, you know, stating what products you're talking about so that we can look at it and we have not seen -- we conducted a workshop last year and there was a lot of time and we haven't heard back anything from you folks, so if you could provide us, that helps us to look into what products you are talking about so we can review those. Thank you.

MR. GATTO: Well, Harinder, I would like to respond to that. I agree. For me personally, and I shared this with someone else this morning, we are a small business, but we are trying to be more engaged, so I can appreciate that we may not have shared some of the information you would have needed to properly analyze. What I can say is that not just Westinghouse, but many lamp manufacturers, and NEMA is coordinating this feedback, we're working very diligently to try to find the list of items that you would need to make a better analysis. So I appreciate that you don't have the information and we're going to work very hard to give it to you.

MR. SINGH: Great. Thank you.

MR. SAXTON: I would like to add that the more that you're able to describe those products with electrical or physical characteristics, rather than just base types, would be very helpful.

MR. GATTO: Sorry, Patrick, I was looking -- I heard the voice, the voice of God coming at me.

MR. SAXTON: No problem.

MR. GATTO: I think the short answer is that's what we're aiming for, we're looking to provide specific like literally wattage voltage lamp-type shape. I think in some cases that will be easy, particularly in the Small Diameter because there are some very specific models that have already come up for a lot of us that, while I don't necessarily make some of these, I can clearly recognize that there's no current or path to an LED that would replace it. I think in General Service, it's a little tougher and it's tougher because of how big the variety is. There's literally hundreds of shapes and sizes and wattages that would fall in scope, so we're going to point as many out as we can, but if

nothing else we would appreciate the Commission's interaction and it doesn't just have to be here, but as we provide this information we know that you're going to respond, but also maybe have an open dialogue because there are some things that I think we could be missing, as well.

MR. SAXTON: Okay, thank you.

MR. SINGH: Thank you, Dave. Next commenter is Dr. David Woodward from Philips Lighting.

DR. WOODWARD: Good morning. I'm Dave Woodward. I'm the Standards and Regulations Manager for Philips Lighting for the Americas, so everything from Alaska down to Argentina. I've been in the Lighting Industry for 27 years and I've headed Philips' North American operations for product development of HID, fluorescent, halogen lamps, and also all of our indoor LED luminaires. So I have a pretty good perspective on new products and product development, in general.

Philips, the lighting industry, the California IOUs and the CEC want to promote SSL adoption to stimulate widespread energy savings. Product cost is recognized as the most

significant hurdle to adoption, I think everyone knows that. It's the very reason why rebate programs exist in many states for high efficiency products.

Low cost, but good performing products with CRIs of 80 and 65 and above lumens per watt products are flying off the shelves in stores nationwide. They're typically priced in the $5.00 range and in 2014, over 18 million CRI 80 lamps were sold in the U.S., alone.

At the same time, the sale of CFL products has slowed dramatically as customers show a clear preference for led bulbs. It's obvious in the market that the conversion to SSL and away from incandescent halogen and CFL products is occurring rapidly, and the mistakes that hindered CFL adoption are not being repeated. This is being clearly articulated by the DOE in recent reports where the led adoption rate is almost a factor of 50 times faster than CFL was in a similar stage of its product lifecycle. Given the radical market shift voluntarily towards led products, we're extremely concerned that over regulation may slow the adoption of led products and greatly reduce the

amount of actual energy savings it's possible to achieve with more reasonable Standards.

The CEC should not be mandating high performance as a state minimum, only to increase the primary obstacle to adoption, i.e. cost. The high end commercial SSL products which feature the high degree of color performance advocated by the CEC are not selling in large quantities because they are highly specialized and very expensive. Their higher price is not due to economies of scale, it's due to very expensive subcomponents, mostly RGB W chips and other features.

The Staff Report's analysis is inadequate and simplistic. Claims of efficacy and product cost being uncorrelated are simplistic and neglect the value of the brands and perceived quality levels to name but two factors. The cost conclusion sites some preceding paragraphs in the Staff Report which note that design changes and additional components are likely to be needed to meet the proposed specification with added costs, but then goes on to dismiss significant cost adders of as much as 20 or 30 percent, as likely to be swept under the carpet due to market

competition. This is absurd. Adding 20 percent to a bulb cost for a CRI 90 is not doing to help market adoption. The biggest driver of the massive adoption rate of led bulbs to date has been the rapid decline in the cost price. As led bulb prices approach those of halogen and CFLs, i.e. a few dollars, all cost adders are significant. Case in point, and I'm not sure how many people are aware of this: a major home improvement retailer is selling LED lamps for $.99 today. Now, they're not ENERGY STAR compliant, but the point is when you can see they're getting down to that price level, it's crazy to be suggesting adding a dollar to the lamp to put another bad LED in. The lamps will take off and sell when the cost gets down to where it needs to be to compete with the incumbent technologies.

So additionally, the cost analysis is largely based on price trends of entry level CRI 80 lamps, whose performance does not come close to the 45-day performance requirements. As such, the cost analysis has not been done on representative products. High performance commercial grade products more accurately reflect

all the 45-day performance requirements. So the cost analyses should start with them.

As previously stated, relaxing the R8 requirement from 72 to greater than 50 will allow many CRI 80 products to be sold in California. These products are typically 15 to 20 percent more efficient than the CRI counterparts and are lower cost. This will help the adoption rate and will greatly impact the overall energy savings. This would be one of the best things the CEC could do to help the state meet its energy requirements.

We are struggling to understand the logic and energy saving benefits resulting from the timing of the implementation of these Standards, which will significantly reduce the availability of led lamps in the market in 2017, while the sale and supply of halogen and CFL lamps continues unaffected. Surely this is not what the CEC intended -- promotion of less efficient products at the expense of more efficient products.

We believe the overall effect, while unintended, of the proposed regulations will in fact slow the adoption of led products and

greatly reduce the amount of actual energy savings it's possible to achieve with more reasonable Standards.

Now I'd just like to move on and address a couple of other points which haven't been brought up so far. Analysis based on the ENERGY STAR qualified product list shows on average decorative lamps are about nine lumens per watt less efficient than Omni-directional lamps, and we'll provide data to support that with our comments. If you go into that and you look at the top 25 percent, so we'll just shoot for the best products, the numbers between Omni and decorative are the same from the point of view that Omni-directional is about nine lumens per watt more efficient. Now, we do acknowledge that, say, filament led LED decorative lamps have high efficacies, but they're typically not dimmable, which is a very important feature for decorative lamps in most applications. So based on our analysis, in order to ensure accurate, adequate, and reasonable product availability of dimmable decorative LED lamps, we would propose that a separate compliance score for decorative lamps be 267 and 287 for Tier 1 and Tier 2,

respectively, versus 277 and 297 for Omni-directional lamps. So in essence, we would like to see the decorative lamps given a 10 LPW reduction in requirement.

Finally, I'd just like to talk about LM 84 and TM 28. The rule proposes to use LM 84 and TM 28 to measure and project the lumen maintenance of integrated led lamps. The lighting industry globally currently uses LM 80 and TM 21 for measuring and projecting the lumen maintenance of led lamps. LM 84 is relatively new and hasn't received wide industry adoption. Changing current practice to follow LM 84 and TM 28 exclusively would place additional financial burden on the industry and delay certification of products unnecessarily. The net effect would be to stifle innovation.

Led chips are typically not released until TM 21 data is available for a given model. The time to test lamps against LM 84, even though the TM 21 data are known, would add months to the product innovation and certification cycle and would require end product testing of every single model which uses the LED, which represents an astronomical increase in testing costs over

current practice.

LM 80, TM 21 testing has the advantage that the results for given LED may be used for all of the products which use that LED with only an additional in situ led case temperature measurement being required for each individual lamp using that LED to support the lifetime rating.

One important item that LM 84 does not account for is the tremendous rate of change of led development and how that in turn affects the product development lifecycle. Consensus among NEMA members is that the cycle time for new lamp design is six to eight months, and manufacturers have the difficult task of keeping up with led innovation during product development and market introduction. Manufacturers are the experts of their particular designs and need to have an option to be able to change critical components like the LED chip in a short period of time, without having to conduct system-level testing for three or 6,000 hours for every single model that uses the same LED.

The ENERGY STAR Lamps Program, for example, allows product changes including LEDs

which gives manufacturers the needed flexibility to make changes from a high level without having to repeat all system-level testing.

So to summarize, LM 84 is relatively new, at this time manufacture experience with it is low, and it may not deliver any better results for predicting lumen maintenance than the current incumbent procedures of LM 80 and TM 21.

Finally, although LM 84 and TM 28 are not in common use, there may be early adopters that wish to use those Standards, thus NEMA proposes that the CEC allow manufacturers to test and certify using either LM 80 and TM 21, or LM 84 and TM 28, at the manufacturer's discretion until such time as the industry has gained sufficient familiarity with the new Standards so this issue can be reevaluated and a more informed decision made about which Standards are best.

So in conclusion, we're very concerned that the scope of the current proposals as written are so broad and the various requirements taken together are so high that if enacted without revision it will fail to achieve these goals. Instead, we believe that the overall effect, while unintended, will in fact slow the

adoption of LED products and greatly reduce the amount of actual energy savings that is possible to achieve with more reasonable Standards. Thank you.

MR. SINGH: Thank you, Dr. Woodward. Next commenter is Cheryl English from Acuity Lighting.

MS. ENGLISH: Good morning. I'm Cheryl English with Acuity Brands Lighting. We're a manufacturer of Luminaires and control equipment with multiple manufacturers here in California. I appreciate the Commission's interest in promoting energy efficiency and lighting quality market adoption. I think that's really the goal of everyone here, and we're here to support that.

I'm here to talk about two specific items in this Title 20 hearing, the first one being conflicting recommendations between Title 20 and Title 24 JA8 requirements. The second topic I'll talk about is related to the screw base LED downlight retrofits. So I'll start out with the first topic of Title 20 versus Title 24 JA8.

There are many products that have been scoped into this Title 20 hearing that are covered also in the Title 24 JA8, but with

distinctively different requirements. I appreciate that Title 20 is a restriction on the sale of products in California regardless of whether that's new construction or retrofit consumer use, while Title 24 is a building standard.

When JA8 was first introduced in Title 24, we expressed concerns with regard to the inclusion in an Applications Standard or a Performance Standard of the very proscriptive requirements of JA8 that restrict product, because that is really not the goal of Title 24. We're now facing a situation where there are conflicting requirements between Title 20 and Title 24, and the interrelationship of these requirements does not appear to have been studied in the Title 20 Technical or Cost Analysis. So I recommend that the CEC evaluate and resolve the conflicting requirements between these two different Standards.

I will also add that the products that we sell, we sell based on different grade products, so cost versus quality of product. We do not distinguish different products for retail off the shelf sales versus new construction. We allow

the consumers to choose the price point and the quality of the product that they want. So we wouldn't be designing one product for Title 20 in a different product for Title 24, that's just not the way the construction market works.

In the case of retrofit screw-based downlights, these are products, as Dave briefly mentioned earlier, that are designed, they're not Omni-directional, they are incorporated with specific shielding and reflectors to direct the light in specific areas. They consist of products that have different aperture size. They may also have baffles or lenses. The lens may actually be recessed slightly above the ceiling, and all these criteria are designed to reduce glare. And so because of the concern on promoting quality products, glare is a major consideration to consumers, especially for downlights. So the products that have a recess or a baffle or a thicker lens to shield the individual discrete LEDs are the products that are preferred by the marketplace and the tradeoff is in the energy efficiency. These products do not perform at the same lumens per watt level as a product that would just have a think straight

lens that's flush with the ceiling and no baffles.

These products, we were unaware that they were originally included in the scope of this particular rulemaking because this rulemaking is general service lamps. This particular product is commonly recognized in the marketplace and by Federal Standards as a Luminaire because it does incorporate a light source and reflectors.

The ENERGY STAR program recognizes this as a Luminaire and the California Voluntary Quality Spec has the performance for this product referencing residential and commercial downlight Luminaires. So the Commission itself recognizes these as Luminaires in other standards. There's no mention in the Title 20 staff report for this class of product other than the inclusion in the definition and a picture on a slide in the presentation. I found no evidence that the study conducted analyzed this class of product. An analysis of the performance and cost must be conducted before the Commission can set an additional standard or elevated requirements beyond those already described in Title 24(J)(a)(viii). Very recently after we

discovered this was included in the scope, manufacturers evaluated over 40 models of this particular class of product. None of these LED screw-based downlights meet the proposed requirements, the performance not even close to meeting the performance of this class of product. The compliance score of the models that we studied was at least 21 percent lower than those proposed and as much as 33 percent lower. The ones that were 33 percent lower represent the ones that have better glare control. They also did not meet the DUV requirements, although we haven't had a chance since the DUV revision was just posted late last night, we haven't reevaluated that and we believe that that will help meet that requirement, not all of the products, but some of the products may meet, but they still will not meet the compliance score and many will not meet the lumens per watt and will compromise the glare quality control of these products.

Due to the late date in this rulemaking, we recommend that this class of product be removed from the scope because we do not believe within the timeframe that you described at the

beginning of this particular workshop these can be effectively evaluated in terms of the technical and cost criteria, and we look forward to reevaluating and working with you on this particular class of product in the future. Thank you.

MR. SINGH: Thank you, Cheryl. You know, I'd like to mention that there's no conflict between Title 20 and Title 24 products, but we will provide a detailed response in our Final Statement of Reasons when we evaluate your comments.

The last commenter is Alex Boesenberg from NEMA.

MR. BOESENBERG: First I'd beg everyone's indulgence, I may read slower than I usually would and a little less flowingly. I got my seasonal sinus infection yesterday morning when I woke up, but I'll do my best.

So I think as most of you know, I'm Alex Boesenberg. I am the Manager of Regulatory Affairs for the National Electrical Manufacturer's Association. I represent all of the persons there who preceded me, starting with Mark Lien, as well as numerous other NEMA member

companies who manufacture and sell in the lighting sector.

We want to thank the Commission for acknowledging the concerns we expressed regarding color consistency, we noted the change in the presentation to the DUV equation, and as we've noted we're going to go back and examine that and get a better picture of how well our products can do in terms of meeting that requirement. But I want to say that that was not an isolated error. Unfortunately, the proposal has numerous errors caused by a combination of factors such as a lack of statistically significant datasets, a pattern of not, I'll say, honoring industry comments given the weight they have based on their experience and their technical expertise, you know, they're the ones who design these products and know what they can and can't do. And the well detailed focus on what are at times arbitrary quality metrics because there have not been the necessary studies to be sure that what can be measured should be measured.

We agree with having minimal requirements, everyone agrees that there's a need to protect the marketplace and consumer

satisfaction from poor quality, but at the same time a minimum spec is very different from a high performance specification and too much of the proposal pushes into the high performance area, and I don't need to belabor it, I think my members did a pretty good job already. So as you've heard, we have many concerns.

And so to talk about datasets and things like that, and where the data is being gathered from, over the past two years during the proposal development process, the Commission and those doing the analysis have built up a view of the performance of LED lamps using a very small amount of data, and at times with small sample sets. And the hazard in failing to use statistically significant sample sizes or lot-to-lot purchasing, for instance, is that you can get a misinterpreted view of the capabilities of mass manufacture to meet a consistency level or always exceed a threshold level reliably.

I'll give two examples. One, we know that a lot of folks have looked at the database for the DOE's LED Lighting Facts Program regarding the expressed and claimed performance capabilities there. This database, while

extensive, is very rarely swept and updated. Data, once it's in there, can often stay for a long time and some of the data itself is suspect if you look at something like the LM 79 tests that are posted there. That's something that was tested once, but then the lamp enters mass manufacture, and then you get production variation that can significantly, or at least noticeably change. And there are tolerances granted by DOE for the Lighting Facts label that are not part of the tolerance ranges in this proposal.

Another example would be the more recent studies done -- oh, he's not here now -- done at CLTC, wherever Michael Siminovitch is, where they examined up to 26 different lamp types and up to 10 samples of each, but not always 10 samples of each. Ten is not a very big number. And in that data, while it's very interesting to look at the CRI variations and the efficiency variations among those lamps, those were all purchased off the shelf, so they're a single lot of manufacture, they don't represent the widespread variance that can happen as manufactures source their components for multiple vendors and combine

those to make a product. So if you look at the CRI capabilities in there, you say, "Oh, look, we see lots of stuff that comes above 82 CRI, even though it says 80 on the package, and so why don't we make the minimum CRI 82 in the spec?" Well, the reason they're at 82.4, 82.7, is because they want to be sure through an annual variation of manufacture they're always above 80 because, as we all know, there will begin to be Title 20 enforcement and fines levied against those who fail to meet the minimums and no one wants to be the next iRobot and having to pay a $1 million fine here. So, yeah, we can hit 82, but if it tells you have to hit 82, we have to design 84. And it's all about giving an acceptable amount of variation because those economies of scale everyone is counting on, if you're going to mass manufacture you have to over-design. Something taken in a snapshot may well have been a good day and perform quite well, but it's not indicative of its siblings made at another factory even though it's the same design, different components, different day, different people. So we're concerned that things like this can result in inconsistencies or misunderstanding

of what's capable.

So besides fixing the technical feasibility of the proposal, there's also gaps in considerations that have to be made relative to scope. Mr. Gatto spoke at length on that, I won't belabor it, but as he mentioned during the follow-up question, we are doing our best to put a matrix together of what the different lamp types and offerings on the market are, and where we know based on our product offerings or awareness of other manufacturers' product offerings, there simply is not or we are not aware of any LED alternatives there. We know that's important because, as is printed right on the front of the building, the Warren-Alquist Act says that, as we understand it, that a product has to be available on the day of adoption that meets the requirements. And if there is no LED offering in some Small Diameter particular beam shape MR lamp, then there isn't one.

I think there's been an assumption during the proposal development analysis process that if there's a lamp that doesn't look too different from it, then it's a simple matter to adapt and simply offer that in the new base type or beam

shape. If that were so simple, then they really would be there already. There's reasons why they are not offered, it's not just market demand, but also technical feasibility.

Something no one has mentioned is the fact that a lot of these incandescent sources you're trying to offset are in fixtures that are tightly enclosed. They are enclosed to protect the consumer from a high degree of heat that comes off of a halogen lamp. That same amount of insulation that protects the exterior of it will also retain the heat generated by the LED that it needs to express and get away from so that it doesn't bake itself. So there's a hazard that the LED lamps, if they fit into a lot of these specialty fixtures will not survive very long. We don't know what that is because it's not a sector that NEMA is deeply involved in; we've asked the American Lighting Association to comment if they can on it. But it's one of those things that does stand to reason, but as I said we're going to focus on just what's available and where the offerings are.

Sorry, bear with me here. I'll speak to Dr. Whitehead's comments. The good news is we

are improving color rendering. We're getting away from CFLs which have a color rendering of somewhere in the 70s, so 80, 82, because we over-design, is an improvement. It could be as much as 10 points. And that is noticeable, and people do like it. The hazard of increasing cost, as Dr. Woodward shared, is that if cost becomes a problem at the point of purchase, they're going to buy a CFL. CFL is covered by Federal Regulation, it's going to stay in the California market until such time as the DOE phases it out and the indications are they're not phasing it out this time around, so it could be many many years. And so people will be attracted to CFLs if they are in a budget-minded consciousness. And the physical, the performance requirements require that the LEDs be expensive, so I won't belabor that, you've heard it. But the damage of that is it could force the market adoption backwards.

I'm trying to get NEMA data released early because I'm told the third quarter this year shows an uptick in adoption. Again, those are the more affordable products. If we can share it, we'll share it as soon as we can, and

if I can share it in time for this proceeding, I will.

I talked about that…. Mark Lien mentioned it, I'll mention it again, the California Lighting Technology Center is an excellent source of analysis and we've seen in the past year the EPIC solicitations have drifted away from things where, you know, lighting folks sort of think it's finished, we think there's a lot of work left to do, we've mentioned there's a lot of consumer satisfaction analysis that can be done and we think it would be great if CEC solicited that sort of stuff in EPIC, so that CLTC and others could bid on it and continue this analysis because, you know, this doesn't have to be the last time we have a rulemaking for these products. And we want the next one to be as well-informed as possible.

So I talked about the cost debtors…. So what we've tried to do here today is not just criticize, but suggest that there's alternatives where tweaks or relaxations in the stringency could enable the products that are available today to continue to be made available January 1, 2016. One of the reasons why that's important

is, if the redesign of a product is essential to its compliance, you know, to make sure there's adequate availability for competition and choice, the challenge there is because of the long testing timelines required for LED lamps, the lifetime testing can take as long as six months. If you back up from January 1st with the Administrative Reporting time, the test time, and everything else, you're arriving around May of 2016, that's five months away. So a lamp that wants to be available and assure that the prediction is true that, yes, there will be something that meets this January 1st, 2016, for that to be true, that lamp has to enter testing in five months from today. We all know that Thanksgiving is coming, and then there's Christmas, so these are kind of a bust, and so the work doesn't start until January, not in earnest. So it's a very tight timeline and we don't want to delay the January 1, 2017 date, that's not our goal today. The goal is that we set a list of requirements that can be achieved in time of May if they have to enter testing, so that again is part of the basis of the reason for our suggestions and relaxation of certain

parameters.

And so I think I'll conclude there. Thank you very much.

MR. SINGH: Thank you, Alex. One of the things I like to mention here is that starting January 1, 2018, California 45 lumen watts' standard will kick in, and that would mean the incandescent lamps will not be sold in the market in California. And in 2020, the Federal 45 lumens standard will kick in, or they may do a better standard for the incandescent lamps. So having that, the lamps are going to disappear from the market, so we have looked into very thoughtfully and analyzed in detail having what the future is going to be, so the proposed Regulations are well thought looking into the future, and also to provide the consumer a replacement that is going to be, if not equal to incandescent, at least very close to it. So that's where we have come up with this proposal. So you know, that's what I would like to mention here. But now I'm going to have the next round of my cards, which the first commenter is Mary from PG&E, Mary Anderson.

MS. ANDERSON: Hello. Thank you for the

opportunity to participate in this important rulemaking on behalf of the California IOUs.

We are supportive of the CEC's proposal to set minimum performance and quality requirements for LEDs. As with CFLs, an initial sales surge will not transform a market. Low product prices are not sufficient. Product performance is important to customer acceptance and complete market transformation. LED performance has dramatically improved over the last few years. The market has responded to the CEC's 2012 Voluntary LED Quality Specifications with a steady stream of wonderful products, at increasingly low prices and improving efficacy, lamps with extremely high color rendering index, with great dimming capabilities and long life.

The California IOU Rebate Programs have been supportive of these programs for the last two years. While the CEC's voluntary specification and the associated rebates helped incentivize high performing products, it cannot prevent products that don't render colors well, that flicker or buzz when dimmed, that mislead consumers with their packaging from undercutting the high quality products.

Another recent trend in the LED market is a race to the bottom in terms of product quality and performance, with manufacturers value engineering wherever possible and competing on price alone for early market share and early adopters. These products may be reasonable replacement for CFLs, but they don't provide the level of service and amenity needed to compete with incandescent lamp performance and fully transform the market. The CEC's Title 20 proposal goes a long way towards preventing products like this from poisoning the well and reducing customer confidence in LEDs, similar to what happened with CFLs.

The proposed Standard does not require lamps to be the best in class. It isn't as stringent as the CEC's voluntary specification or the California IOUs' proposals, but it does require a solid foundation for minimum performance and establishes a level playing field upon which manufacturers can compete.

We want to commend the CEC for its work with all parties to get to this point. The CEC made several compromises throughout the rulemaking in response to stakeholder input, and

we believe the proposed standard represents a good middle ground that we are willing to support.

With LEDs, we can have high efficacy and great performance, as well, if we ask for it. This rulemaking is California's opportunity to drive this market transformation. If California can convert the remaining 50 percent of sockets that still have low efficacy sources in them to LEDs, the annual statewide savings would be on the order of 30,000 gigawatt hours, which is sufficient to achieve the state's AB 1109 goals in one fell swoop.

We appreciate the opportunity to participate and look forward to continuing to support the CEC in this important cause. Thank you.

MR. SINGH: Thank you, Mary, for your comments. The next commenter is Gary Fernstrom, Consultant, PG&E.

MR. FERNSTROM: Thank you. I am Gary Fernstrom, retired from PG&E and currently working as a consultant for it. And I've represented PG&E and the California utilities at various CEC and Department of Energy rulemakings

over the last 15 years.

As Lorne Whitehead did -- and by the way, in consideration of his perspective on color, I'm wearing my R9 shirt this morning -- I'd like to make a brief statement and a couple of points. In my experience in these 15 years of rulemaking, I have again and again heard industry and individual manufacturers make the statement that products are not available, that it can't be done, that it's too expensive, and that consumers really don't want it. And time and time again, after rules have come into effect, I've seen compliant products come into the market to consumers' delight at reasonable price points. So if we're to use history as an example, products can be made that serve consumers' needs, that work better than expected, and cost less than is represented.

The second point I'd like to make is a few years ago when I had the opportunity I bought one of the Philips L-prize lamps. I still use it at home, it's probably going to last well in excess of 20,000 hours, and it does all the things we're talking about here. It may not be advantageous from a lighting industry business

perspective, but the reality is that these performance criteria that we have recommended, which the Commission has compromised on, can be done. I have the proof in my very own home. Thank you.

MR. SINGH: Thank you, Gary. Now we have Aurelien David from SORAA.

MR. DAVID: Thank you. Aurelien David. I'm Chief Scientist at SORAA. SORAA is a manufacturer of LED chips and lamps based in Fremont, California, and we do R&D and manufacturing here.

I've been doing R&D on LEDs for 14 years and I feel that expertise are efficiency and color science. So before I complain, I'd like to congratulate the CEC for some of the features in this proposal, especially the tradeoff between efficiency and CRI, which I'm happy to see in here. And I think the idea behind that is this regulation should not prevent manufacturers from making high quality products right, there is a tradeoff between efficiency and quality, and you should be able to take the level of quality in full. That is very much in line with SORAA's approach, which is to make high quality products

because we believe in some fields high quality is instrumental for adoption.

And so that brings me to my concerns with the proposal, which is there are many other aspects of quality in an LED product beyond CRI which are not really being considered by this proposal, and the worry is considering the high levels of efficacy in some of these scenarios, it will be hard to maintain other aspects of quality. So I'm going to take one specific example. Let's think about a spot lamp, a 10-degree spot lamp. I have a very nice lamp which has a good beam pattern, everybody likes it. But come January '17, it doesn't meet the spec, it's a few lumens per watt below spec. The easiest way for me to make it meet spec is to go back and degrade my optic in order to add lumens in the scale of the beam, okay? So that's going to boost lumens per watt a lot. It's also going to make for a worse lamp which has more glare. That's bad, right? Consumers don't want that. But again, if that's the only thing I can do to meet spec, I'm going to do that. Now, is that a good thing for adoption? Probably not. And the lumens per watt may have increased, but that's

really artificial because you're putting lumens where you don't want them.

I think to some extent the CEC recognizes this tradeoff because there are two proposals, one is for MR-16 essentially, or Small Diameter Directional, and then there's another spec for everything else. So I think there is some level of understanding that Directional light is more difficult to achieve than diffused light. But I think to some extent the CEC dropped the ball in the middle by putting in the same bag A lamps, BR lamps, and power lamps, which have very different technical challenges. And to be clear, it is more difficult to be efficient in the power lamp than in an A lamp just because of these beam quality aspects.

Shortly, I'll mention other aspects of quality which are not being talked about here, flicker and other aspects of color rendering such as deep red and whiteness. Again, by skimping on these by making an LED with a bad driver which has more flicker, and by having poor red rendering, it is easy to improve lumens per watt by five, 10 percent, and sometimes more. That's probably not a good thing in terms of product

quality and in terms of adoption.

So at the end of the day, the risk for us is the following, right? If we're faced with having products that don't meet these limits in a year, we may have to make the choice of lowering other aspects of quality which are not being monitored by this proposal, so that we pass the spec. We'd rather not do that. So my suggestion is that there be more classes of products in the limits, specifically I think there should be a directional large lamp limit which is in between Small Diameter Directional and Diffuse Lamp to recognize the fact that there are aspects of quality that haven't been taken into account, and to give us more wiggle room to include those. Thank you.

MR. SINGH: Thank you, Aurelien. Next commenter is Nancy Anton, she is public.

MS. ANTON: Good afternoon. My name is Nancy Anton. I'm here as a consumer, it's kind of interesting to me that there's no one else that's taken that role. And I will say, as a consumer, if you are looking for more consumer input, it was very difficult and took a lot of work to find my way here, and I'm happy to give

you some feedback about that, but maybe you don't want more consumer input.

Anyhow, I would like you guys to hear from me how you can help me as a consumer and I've recently had a lot of frustration with lighting related to a home remodeling project and I've become more of an expert than I wanted to be, and I wanted to share some of that experience to help you guide some of the decisions you make.

Regarding LED lighting and a little about me, I'm an energy nut, I don't have a Prius, I ride a bicycle, I use light rail, I worked for the Legislature for over 25 years. I'm currently a Governor Appointee on other commissions, I'm familiar with rulemaking, and regulations, and legal requirements, although not in this area.

I go to buy lights for my house and the first thing I encountered, I'm not always price driven, that is important and I'm sure the manufacturers know that, but I also am willing to spend more to get the product I want and also to generate energy savings. I sometimes wonder if the cost and price point is overrated. I looked the array in specialty lighting stores, as well as big box stores of lighting options, and I was

nearly overwhelmed. I bought some fixtures that said LED because my understanding is that's the way to go. And I found out there are two different -- in fact, I may not be right, this is what I think I've learned -- two different ways to go with LED, I can buy an LED bulb and retrofit an existing fixture, or I could buy a fixture that said LED. I didn't understand that, so I generally went for an LED fixture assuming it was more energy savings, I don't know if that's true. I certainly had many more fewer options. And I get home and the Electrician installs the fixture, which I then learned meant it's no longer returnable because it's now been installed, and I discover that this fixture doesn't take bulbs, it comes with a built-in -- you guys must know the technical terms -- right, which means when this fixture doesn't work, I throw it away. I don't know what the costs of that are. When I hear the discussion about cost, I don't get to replace this fixture with a $3.00 on sale bulb or a $9.00 not on sale bulb, I have to get rid of the whole fixture, which to me I thought was kind of a bargain price at about $30.00, but I didn't realize I have to throw it

away when it ceases working. It says it will be 10 years, and experience I have with a compact fluorescent that was installed five years ago was it stopped working, although I don't know what the guarantee is because, really, do you keep warranties for your light bulbs? I barely keep them for my big appliances.

So I asked my son to take that light bulb out. In the process, I'm going to come back to that example, I'm going to stick with the bulbs or the built-ins. So now I have a $30.00 light fixture that when it goes, I throw it away. We also bought a ceiling fan, again, I didn't understand the difference, it also has that kind of integrated light, once it's installed it's not returnable, it's much more expensive than $30.00. The light comes on, and it's not exactly the color we care for. We can't change it. There are no other bulb options and we can't return it because it's been installed. And this has a 10-year guarantee. We would likely keep the warranty because it's expensive. When that light component doesn't work, what are the chances 10 years from now that I will be able to get a replacement for it? Everybody says zero. Some

friends have said, "Oh, go buy another one now and save it for 10 years so that you don't have to throw out the entire working fan because the light component no longer works." So making a distinction for consumers when it's a bulb and when it's an integrated feature is essential. And I kind of consider myself, which is possibly wrong, on the higher end of the care about energy and certainly educated, and I'm baffled. And I totally have missed this twice.

Other things I didn't understand that I care about is, is it instant "on?" I had no idea that the $30.00 fixture, you flip the switch, nothing happens, you count to two and then it comes on. Is that normal? Is that a feature of LEDs? All of my LEDs don't do that. I don't know. There was nothing that said there's a delay "on" and there's nothing I can do about it now because the fixture once installed is not returnable. So that wasn't made clear on the packaging.

I have no idea why I would pick CFL over LED as a consumer. In fact, I thought CFLs were being phased out, but listening today it sounds like they aren't. I also understand CFLs -- this

may not be right -- have more led, so I gear towards LEDs which I think don't, but I could be wrong. And if I don't know, I guarantee you consumers don't know. And again, there's no consumers here informing you, except me, that's quite a burden.

I also think generally CFLs are much slower to come on, they light up, but then it takes time for them to get brighter, and LEDs don't appear to do that, except for this new fixture that comes on all at once after you wait two seconds.

Also confusing to me, some say "okay damp," so that means it can be in a bathroom, the other ones can't be in a bathroom? In the kitchen? Outside? I've no idea.

I am a person who cares about color, I understand some people don't, I do. I don't have any way of knowing what the color is until I turn the light on. With the bulb, if you're careful with the packaging and depending where you get it, if you don't like it, you can return it, otherwise I don't know the coloring until I turn it on. And some bulbs, you know the kind of packaging I'm talking about, you have to destroy

it to get the bulb out. And if it's a light fixture that contains the component and is installed, I don't know the quality of the light until it's on. I don't know how you address this, some kind of rating system that lets a consumer know relatively what it's like versus incandescent or an independent scale; if incandescent is going to be phased out, let's have a scale that informs people.

I like dimmable lights. I don't understand why, although I've had an electrician tell me this, I don't know if it's correct, why some of mine flicker and why some of mine make noise. I was told it has to be a dimmable compatible light. So now I look for bulbs that say "dimmable." But then I learned some of those still make noise and flicker. And then I found out, oh, you need to have a dimmable compatible switch. Well, that's a whole other kettle of fish to find one and that requires an Electrician to install. Now we've got a different price point. None of that is made clear to me as a consumer, that when I take this dimmable bulb home, it is not going to perform to my satisfaction, or that I'm buying a bulb that

won't even dim.

I wanted to make a comment about my term, what I call projected, the longevity, the technical viability. We had a home remodel project about five years ago and at that time we had to put in compact fluorescent bulbs that have either two or three pins, and what I gather is these are history now. But I have these fixtures that only take them. And the other part of them, I guess not having overtaken the market, is that when I asked my son to change the light bulb, which stopped performing well before when it should have, he, which I thought was reasonable, and he's college educated, which could be the problem, he unscrewed it. Well, as you know, a bulb with pins doesn't unscrew, it's kind of hard, so he turned it really hard. Well, what do you think happened? It broke. So now I have a fixture that doesn't work at all because the pins are stuck in it, and I didn't even know or realize from five years ago that this was a pin fixture. There's nothing that indicates to an average person, I presume an Electrician might know, that when you want to change this bulb hanging down that looks like a compact

fluorescent, it's got pins and not a screw base. I don't know how you let people know that, but for all the pinned bulbs that were sold and installed, and I was told we were required to put those fixtures in, when those bulbs go, I think there's a good chance that people are going to try to unscrew them because there's no way to know, there's nothing that looks different about it.

There's another term I have that it may or may not be related exclusively to LED, but certainly to lighting, and it's what I call asleep lighting. So I have a little frustration, I hope I'm not -- I'm very happy with our television monitor, it's a Vizio, and when you turn it off, the name Vizio lights up, it's on 24/7. When we're not home, it is advertising to my couch that it's a Vizio. It's advertising that to us and I know that. I'm sure someone will say that it uses an infinitesimally tiny amount of electricity. I wonder when you add all that up, what does that amount to? And the message it sends, it sends the message to my kids and to their friends that it's okay to have lights on. Our new dishwasher, it has a nifty

little sign after you run it that says "Clean." So when I run the dishwasher before I go to bed at night, that "Clean" sign stays on all night long when nobody is in the kitchen and needs to know. And when I go to work, it's on all day long because I tend to run it as I'm leaving the kitchen, and when I go on vacation, run those dishes so they'll be clean when I get back? It's on for weeks. I would certainly consider do you need to address that these should just be prohibited? What is the value of them? Particularly the ones that advertise their name.

The last thing I would suggest, based on other aspects, more with my experience with Title 24, is whatever direction you go, consider can one size fit all? My experience in a different area of law is the answer is generally no. So having an appeals process, or a method where exemptions can be granted, I think is extremely important. Allow for expected unintended consequences and a way to be able to deal with them without wringing your hands and going, "We have to wait until the next rulemaking process. We have to go back through OAL, it's too big a process." Have a method where you can stay

nimble and you can stay flexible, and that as technology changes in the future, is LED going to be it, the two-pin and the three pins weren't, that you can be nimble and respond and so can consumers. And I'm happy to give you examples if you want more consumer input about how I think you might better be able to reach people. Thank you very much.

MR. SINGH: Thank you, Mary (*Sic*).

MS. ANTON: Nancy.

MR. SINGH: You know, we usually put FAQs online, these are good questions that you have made here in the comments, and we look into it and see if we can address through some of your concerns through FAQs. Also, our Proposed Regulations address dimmability, flicker, and warranty we have no authority on that, so we looked into it, but it's not one of our authorities here to work on the warranty part of it. But we mentioned rated life for these products, lifetime 10,000 hours for general purpose lamps, and 25,000 for the Small Diameter Directional Lamps.

But anyway, you mentioned about the TV, it's not in the lighting, but you can turn it

off, actually, the Vizio, there is in the manual an option to turn it off. You know, it turns on for 15 seconds and then turns off by itself, but you have to go in and look into the manual for that. Anyway, thank you very much. And those are good comments.

And now we have the next commenter, this is Eric Bluvas from Green Creative. I think Eric. It's hard to read.

MR. BLUVAS: Yes. Hi everyone. My name is Eric Bluvas and I'm with an LED Manufacturer based here in California called Green Creative. I'm not sure if all of you are familiar with us, we are a bit smaller. And I do think it's good, and I'm glad to have the opportunity to comment because I have a unique perspective as a small manufacturer, especially also a California-based manufacturer.

And not that it's an excuse, but given the size of our company, resources are a bit constrained, so fortunately I don't have a lot of sound detailed statistics or data, but I do have some general comments on the overall rulemaking for both of these, the General Service and the Small Diameter that I wanted to get on the record

here, so thanks for the opportunity.

I think one thing that's failing to be addressed is that if you pick apart any aspect of the market today, yeah, there's concerns with all these requirements because a lot of us, you know, some of my colleagues and competitors here don't have products that are going to meet that. But we're not talking about today, these go in effect far in advance, in fact the Small Diameter, it's 2018, as I understand. And although I'm not specifically tied to the R&D side of things with our company, it's my job to track all these requirements, Codes and Standards, utility requirements across the country, so I have a good perspective of what the flavor is across the country and even a little bit internationally, and I want to say about 18 months ago some of the initial proposals for the Title 20 Rulemaking, I ran by our R&D folks, and you know, obviously initially they balked, some of the same concerns you hear from some of our competitors, but once I said the timelines, they said, oh, that's not a concern at all. So the underlying point I want to make is that we welcome this kind of thing because it is a line in the sand. And I'll

highlight some things, but we're there now in a lot of respects, and we'll certainly be there market-wide with the timelines that are proposed, I think the gentleman, the PG&E consultant said it best, and I'll draw a parallel to the voluntary spec that's out there now, that kind of proves that. I mean, once you draw that line in the sand, as long as it's reasonable, and you're accounting for the majority of applications and whatnot, I think the market itself adjusts and matches that.

So I do want to be clear that, as a company, you know, designing quality primarily screw-in and some of these Small Diameter products, specializing in that and the LED space, we support the spec for the most part as it, but we'll try to gather resources if there's any other various specific comments we have taking issue with any of the detail R&D side things. But on the whole we do support this. And I think everything for the most part that's laid out is sound science, we hold in high regard some of the studies that went into this, and we appreciate the fact that cost is factored in. And as an example on that front, I mean, the gentleman up

here mentioned you now have $.99 LEDs in the store. So if that was going to be something, maybe this is a non-parallel, but something required two years ago, everyone in the room would have balked at that. But case in point, within two years the market adapted and the costs have come down.

But what I also see is that's a great motivation, but we also see a lot of lower quality products being supported, you know, at the utility level and on the market sign, of course, it's cost driven. Consumers may have different flavors or appetites, but at the core it is a cost. And if there's not a line in the sand, not some clear mandate, that gets thrown to the wayside and you can see some poor quality things go in, and I don't think that's what any of us want to see.

You know, and I wanted to highlight in terms of the product side, these are two items we have today that meet the majority of these applications, or the majority of the requirements of these specs. So this is a Part 38 product, you know, I'm not trying to plug the brand, but just to show that we are there today, and there

is a Small Diameter product that meets the majority of these requirements.

So in drawing a parallel with the CEC spec, you know, these same debates came up with the California Energy Commission proposed this voluntary specification and, case in point, today we are one of the first manufacturers to roll these out, I'm saying the CEC spec compliant. And we see a lot of our competitors follow suit as there is an incentive to do so, and as the market sort of requires that. So that's the type of parallel we want to draw to this, is that once that line in the sand is drawn, we'll see market-wide, you know, catch-up with our competition.

And again, I wish I had more sound data to back some of this up and we're going to try to muster resources to do so in writing, but some of the concerns that may be raised, and we're hearing them today, things like a low brightness, to me case in point, ENERGY STAR develops things like the TM 21 measurement which requires a specific center beam candle power to match, you know, the given output. And for example, our MR 16 product hits that mark and we can claim a 75 Watt equivalence.

The point is, you know, you can pick apart any number of product and show that it's not there, but once you have the spec, we can design around it and in our view it's not so aggressive that it can't be met.

Other things not ready for all application, there is some truth, I mean, there's niche applications out there that folks are highlighting this today, we're hearing this, but again we stand by the fact that the market will adjust for that. You know, I don't think there's fundamental flaws or I don't there there's a fundamental hurdle to the design aspects for some of these niche applications, and they do represent a small portion of the market.

In terms of compatibility, we welcome the spec because especially in the Small Diameter Space, it will be nice to have more clearly defined definitions, and that's basically because I think all of us want to see some uniformity and more consumer confidence in the application that it's going to work with everything that they have, so when they install it, it does what it should and what they expect it to do.

So unfortunately, again, I don't have a

lot of sound data to back all this up, but I can say as a California-based manufacturer focused on quality, and how we focus specific to the space that these rulemakings cover, we do feel that the majority of the requirements are sound within reasonable -- reasonably achievable within the market and if we don't draw that line in the sand soon, we're going to continue to see a lot of lower quality stuff kind of flood the market. So that's all. Thanks.

MR. SINGH: Thank you, Eric. Next is Noah Horowitz from NRDC.

MR. HOROWITZ: Good morning. I'm Noah Horowitz for the Natural Resources Defense Council. And I know a lot of people are hungry, so I'll be brief here. I'm the Director of our Center for Energy Efficiency Standards and I'm here today on behalf of our more than 1.2 million members and eActivists.

Overall, NRDC is very supportive of the CEC proposal which we believe will accelerate the shift to good quality, energy saving lamps. This has been a long and somewhat contentious rulemaking and we think the proposal you have is a reasonable middle ground, and we encourage you

to move forward in an expeditious manner.

I'm going to comment on three points, one is the stringency of the efficiency requirements as they relate to decorative LED Lamps, which have a smaller form factor; 2) I'm going to point out and make a suggestion, there's a lack of minimum color quality requirements for most of the Small Diameter Directional Lamps, and we think that's an omission; and 3) I have some comments and concerns about the combination of the Labeling and Reporting section and have some recommendations to improve it there.

As a result of what you've heard today, I think it makes sense for CEC to consider all the input and make minor adjustments to the proposal and hopefully that can only trigger -- that only requires 15-day language and you could move forward in a timely basis.

Let me start first with Decorative Lamps. As the data has shown and some of the industry representatives have mentioned, these lamps have a much smaller form factor, think of the little candelabra lamps, they're about 10 percent less efficient, more or less, and our concern is if we squeeze too hard here, we may have some

unintended consequences and provide a boost to the sale of the current bulbs that are 40 watts. Those 40 watt incandescent bulbs are exempt from the next level of ISA depending on how that moves forward, so we want to go from 40 watt bulbs down to bulbs at around 10 watts, and we want to be careful not to squeeze too hard or eliminate all the LED options that are out there. We might be forcing things only to filament type LEDs, and then we've got the dimmability questions where people might not like the appearance of the filament LED lamp. So we encourage you to review the data carefully here and, based on your review, consider a slight relaxation. So if the bulb is allowed to use 10 watts instead of nine watts, we still think that's a win.

I want to move next to comments about the Small Diameter Directional Lamp Specification. We, too, support the establishment of minimum of efficacy requirements. These will ensure that we have energy saving lamps and will be phasing out from the less efficient alternatives such as halogens and HIR. To us, that's the prize that we think everyone should be after here. We can go from a lamp that used to use 45 watts down to

one that uses about nine watts or so. That, we believe, is the primary objective and, again, we need to be careful in this proceeding how far we go in terms of trying to squeeze an additional half watt or watt there.

We also want to make sure that people have a decent experience and we heard a lot of interesting comments from a consumer, which all of us are, as well. We want to make sure it doesn't fail prematurely, and you have some requirements on that. And we also want to make sure that bulb delivers good color experience. While there's been a lot of debate how high you need to go, I think everybody agrees there should be a floor in terms of color quality. And the way the Small Diameter specification is written in terms of color quality, the only time that there's a requirement is if the efficacy is between 70 and 80 lumens per watt. If you're above 80, then you could have a CRI of 50 if you want, and I think we all agree that's not what anybody wants. So our suggestion should be you set a floor and one potential landing point that I think you won't get objection from industry or others is let's adopt what ENERGY STAR has, which

is a CRI of 80 and an R9, no less than zero. That way we can keep the junk out of the market in terms of color experience.

We also think this is important, while two-thirds of the lamps from Harinder's data are in the commercial space, about a third of them are in residential. Consumers don't know anything about CRI, they're going to be confused, we want to make sure they're not disappointed.

Lastly, I want to talk about the Labeling Requirements. I don't have the exact language in front of me, but basically it says if you're making a comparison to an incandescent lamp, including wattage equivalencies, you must meet the following requirements. The lamp temperature, the CCT can't be more than 3,000, the lamp must be dimmable, and you must meet the equivalency requirements.

We think this construct has some unintended consequences and we want to propose an alternate approach for your consideration. And in doing so, we want to point out that most sockets are not dimmable, and by requiring adding dimmability adds cost and could potentially result in a less reliable product if someone puts

in a cheap dimming circuit that could fail. While we agree most consumers prefer and want the lamp that looks like the old incandescent, call it 2,700 or 3,000 K, there's certain people who prefer bulbs that provide a cooler experience, whether it's 5,000 or 5,600 K, and sometimes that's cultural or where you come from; if you come from Southeast Asia, the cooler lamps are a lot more common, and we don't want to prevent people who want that product from being able to see on the package 13 Watts equal 60 Watts. We think people don't understand lumens and in this transition, that sort of equivalency claim makes sense, and that's a very powerful tool.

So in summary, we recommend the following construct that I think goes to what the intention of this language was, but without the unintended consequences: 1) if the lamp is dimmable, it must meet the dimming requirements, if it's not dimmable, you must need to label it clearly on the package, "Not Dimmable." That's different than saying you must be dimmable if you make an equivalency claim.

Second, if you are making an equivalency claim, you know, 13 watts equal 60 watts, or

eight watts equal 40, then indeed you must deliver an equivalent amount of light as the incumbent product. There's a table in the Proposed Standards, we think that table is done right, and the way it should be is, if you make an equivalency claim, you must hit those numbers. But again, if you do make an equivalency claim, that shouldn't prevent you from making an equivalency claim if you're a cool temperature bulb.

And then lastly, in terms of CCT that's already on the package, it tells you if you're 2,700 or 5,600 K and whether you're cool or warm, so we think that's addressed there. So in summary, we think you're off to a great start here, with a few tweaks you'll get across the finish line and you have our support. Thank you.

MR. SINGH: Thank you, Noah. Now we move to the people, stakeholders who are on the telephone or on the WebEx. So Kristen, could you please unmute the lines?

MS. DRISKELL: Yes. The first one is David Maciel. I've unmuted your line.

MR. MACIEL: Hello. Can I be heard?

MS. DRISKELL: Yes.

MR. MACIEL: Thanks for the opportunity to comment. My name is David Maciel, representing Sony Electronics, as far as energy efficiency is concerned. I've been doing this for many years. I've been in several rulemakings, including the Television Consumer Audio Video Products, displays, rulemakings, and now to some degree involving the lighting rulemaking.

I would like to make two comments today, one as a company representative and the other one, if I may, as a consumer.

Going to the first one, there is some concern with the Regulations. I do agree with pretty much everything that Noah has said just a few seconds ago, but I'd like to expand on a comment made by the gentleman from GE where the technology is to a point where lights are shaping the way of the future. To that extent, we are manufacturing and developing new products, and one of them is a combination of an audio-video or audio product combined with a lamp. We recently contacted the Commission to enquire about whether this product would be in the scope or not, and to our dismay, we understood that they are in scope.

ENERGY STAR exempts products that offer other features besides lighting in the lamp, and we would like to request the Commission to either do analysis, or absent the analysis exclude these products from the Regulations. There are a number of factors that prevent these products from meeting the proposed requirements, that there are some technical challenges, those being mechanical and electrical that need to be evaluated before saying rules for specifications for these kind of products, power factor, standby power, it's going to be an issue for these products, so we would like to request the CEC to conduct further analysis before deciding whether these products are in the scope of the Regulations or not.

The second comment as a consumer, I'd like to echo a few things that Mary stated as a consumer. But in fact, when I go out and buy lamps, I do look at three essential factors, one is price, the other one is whether the tone or color of the light fits my needs, whether it's warm white, natural white, or super bright white, and price. Never in my life have I looked at CRI and honestly I can say that it's irrelevant for

the average consumer. So setting specifications regarding CRI, to me as a consumer, is irrelevant. I believe many people do not focus on that, and so I do not see the need to include that on a specification. Any light bulb, any lamp that consumes 13 watts or less, to me is acceptable. If it consumes nine watts or less, that's even better. So without further ado, I would like to ask the CEC to look at the current specifications. If you don't have a complete analysis on everything that is on the market today, please do so before publishing the final language. Thank you.

MR. SINGH: Thank you. We can move to the next.

MS. DRISKELL: Yeah, the next commenter is Greg Merrit. Greg, you're unmuted.

MR. MERRIT: Okay, thank you. This is Greg Merrit from Cree. I'm the Vice President of Marketing and Public Affairs. For those of you that may not know, Cree is a U.S.-based developer of both LEDs and LED lighting products. And we also have a facility in California.

Cree is focused on 100 percent LED adoption and very key to accompany that is better

light experiences. There have been a number of good comments previously today, so I'll amend my comments to avoid being too repetitive.

All of the specs that are contained in the 45-day language are in our opinion attainable and reasonable. We believe Standards for quality, not only color quality, but also dimming light distribution, are very important, especially going forward because, as noted, there is a bum's rush to lower price, lower quality bulbs going on, and I think it was characterized as a race to the bottom earlier.

The CRI discussion, which has taken up the bulk of the comments today, I think as expected, I would comment on a couple of things that were said. I think an RA of 50 is a nonstandard to lay-up, I think the comment about saturated light being preferred over fidelity is valid, but I don't believe that an RA of 72 makes it unavailable to have higher saturation.

I also very much agree with the earlier comment about the use of LM 80 and TM 21 which are widely accepted, and in practice versus LM 84 and TM 28, and would also agree with Noah's comments on labeling of equivalency of bulbs that

use daylight CCT.

A further comment, several products we offer on the market today meet the requirements as specified, including decorative products, as well as retrofit downlight products.

I would also say that I think the many many references to the CFLs in today's discussion are quite appropriate because if we allow or, in fact, encourage LEDs to continue approaching CFL levels of performance, we will create the same levels of dissatisfaction and, I would argue, market failure that the CFLs experienced.

I think this published language with the DUV correction, and I will echo the comments earlier about someone that said they worked, but I think the specs as published represent a good body of work and I offer my thanks to both the staff and the Commission. That's all. Thank you.

MS. DRISKELL: Okay, thank you. We had one comment also through the chat box from Michael Weems with American Lighting Association. I'll just read it for the room: Given that many of ALA's members are tied up with travel to and from today's hearing and with Thanksgiving being

next week, he would like to request an extension to the November 30th comment deadline. Having additional time will enable the ALA and others to respond appropriately to the CEC, especially with regards to the noted changes for DUV.

That's all the comments I have online.

MR. SINGH: Oh, okay. Anyone else on the phone want to make a comment, please raise their hand or call in.

MS. DRISKELL: We have one more comment from Chris Primous. Chris, you are unmuted.

MR. PRIMOUS: This is Chris Primous from X Light. I just wanted to make a quick comment regarding the Omni-Lamp Requirements, the Omni-Directional Requirements for A Lamps. There's a requirement that A Lamps must meet the ENERGY STAR Version 1.1 Omni-Lamp Specifications, also it goes on to talk about the other lamp types must meet decorative requirements. I want to caution on that not to tie it to an old ENERGY STAR lamp specification right now, there's a new one that's under revision, the 2.0 for lamps, it's supposed to be implemented or finalized by the end of this year, maybe the beginning of next year. Also, there is a very popular new lamp

type called the LED Filament lamp. With regards to these LED filament lamps, they are not generally able to meet the Omni-Directional Beam Requirements of the traditional Omni-Directional type of lamps. And you know, these are very popular replacements for high wattage halogen lamps and also they are very efficient, actually more efficacious than a lot of the Omni-Lamps going on the market today, approaching levels up to 130 lumens per watt. And so I would take a look at those types of products and allow them to meet now the decorative lamp specifications for ENERGY STAR lamps and not make them have to meet the Omni-Directional Lamp Beam Requirements. So I would just take that into account as we look at the requirements for the beams. That's it.

MS. DRISKELL: Okay, thank you. That, I think, is officially all we have online.

MR. SINGH: Okay, I have one more comment from Mike McGaraghan from IOUs.

Mr. MCGARAGHAN: Hi. Mike McGaraghan representing the California Investor Owned Utilities. First of all, I want to reiterate our support for the proposals, but I just in addition wanted to add a few comments in response to other

things that have come up today.

So the first one is just on the data that went into these proposals and how reliable it is. We are definitely relying on data that is out in the public sphere. We relied heavily on ENERGY STAR's Qualified Product List, we rely heavily on Lighting Facts database, in addition to product testing that we've completed that PG&E has funded at the California Lighting Technology Center.

So one thing that we've done is to try to correlate the test data to the public databases to see if they match, and the good news is that they tend to match very closely, and I'll give an example. On the DUV, several people have commented on DUV and the requirements. In the Lighting Facts Database of thousands of products, 87 percent of them meet the DUV requirements proposed by the CEC. When we tested over about 30 now Omni-lamps, something like 20-30 par lamps, and something like 15-20 MR lamps, 87 percent of those also passed the DUV requirements, and that is a freak coincidence, of course, both numbers were 87 percent, it's not always that perfect of a correlation. But the point is we are extrapolating test data that we

have because it matches very well with publicly available data, and if the consensus from the industry is that this data that is publicly available shouldn't be trusted, then I'd really welcome them to submit other test reports and data that they believe is more representative of products on the market.

Specifically, I wanted to follow up on Chris's comment just now from Max (*Sic*) Light. Thanks, Chris, the filament lamps in particular it would be great to see some data on their distribution if they don't meet the true Omni requirements of ENERGY STAR. So if you have data that shows that, that would be really valuable to the record.

In terms of products that meet the spec or don't meet the spec, I know there was a lot of confusion about the DUV values, so some people today have commented that the products weren't available, but that maybe if once they do the analysis with the new DUV number, that will change. So our analysis with the right DUV numbers has shown that there are a lot of products that are available, many of which have great price points. They were shown in CEC's

graphs earlier in the presentation today, we're not talking about $2 or $3, in many cases it's $10, $20, $30, or even hundreds if you count all the different variations of products. So in the A Lamp market, there are products from multiple manufacturers, often below $15, even below $10, and some of those are coming down it looks like now $6.00 products that meet all these requirements based on all the data that we have publicly available.

And the same is true of Directional Lamps, there's a lot of products in that $8, $9, $10, $11, $12 range, that appear to meet all of the requirements proposed. So, you know, from the data that's out there, we're very supportive of what the Commission has done, we don't think you're pushing especially hard on this product class. We initially came in with a proposal that was much stronger on a number of things, including color and other aspects, as well, start time, lifetime, so we think you've ended up at a good middle ground and made some really important concessions along the way, or compromises with industry along the way. So with that, I'll conclude and just say thanks for the progress

that you've made here, we think you're doing a lot of great work, and we're on the right track. So thanks.

MR. SINGH: Thank you, Mike. I think we have no more comments. And one thing I'd like to mention is that the comment period is ending November 30th for written comments. If you could please submit your comments earlier, it would be beneficial. Ken would like to say a few words.

MR. RIDER: Yeah, just a couple things that I think are helpful to keep in mind while commenting on this that were mentioned earlier.

One was, you know, conflicting 82 CRI versus 72 individual color score. You know, I worked on this proposal; one of the things is when studying individual color score proposal, the question came up, "Why even have a minimum CRI? You've kind of got it set." So for a while the proposal had no minimum CRI, then after some discussion, you know, about whether a 75, you know, the very neat thing about LEDs is how you can engineer very precisely some of the spectrum.

So is a 72 CRI lamp with just the worse colors across every color acceptable? Maybe not. So that's where the 82 CRI, that's why it

persisted, it wasn't to be inconsistent, it was just, you know, keeping an overall error minimum while focusing on single color errors, as well, so that's why. I mean, that was the thought process and how the 82 -- it wasn't to be tricky between the two, it was really the process I described.

We also had some discussion today about the test methodologies for life and how they may be using some of the newer test procedures. The reason for that is to align with the DOE proposed test procedure.

I just wanted to make sure that everyone clearly understands that what we took and proposed in the Regulations is the proposal at the Federal level, and when that Federal test procedure is finalized, that will be the California test procedure regardless of what was used or how we adjust to the comments here.

So we were hoping to be as close as possible to minimize any changes to the test procedure.

We've gone through changes to test procedures in televisions recently, you know, the differences require re-testing, and that's why we

wanted to be as close as possible to minimize and make sure that the data had transferred over just -- I mean, your comments are still valid and interesting, I just want to make sure that everyone has that context when developing comments, I think it's important to understand kind of the driving factor for making that choice. I just wanted to add those two things. Yes?

UNIDENTIFIED AUDIENCE SPEAKER: If the DOE does something different, will you adopt what they --?

MR. RIDER: Yes. It happens automatically through operation of preemption. So we wanted to be as clear as we could be about what we are expecting and make sure our Standards align with the test procedures that are at DOE.

Any small tweaks made at the Department of Energy and, you know, we have Legal up here, too, if I'm saying something wrong, but I believe it happens automatically, and then we will also go make sure it actually changes in our language. We have cleanup rulemakings essentially on an annual basis because so many things change.

MR. SINGH: Thank you. That concludes

our hearing and thank you for coming and participating. Looking forward to look at your written comments. Thank you.

MR. SAXTON: Thanks, everyone, for your participation.

(Whereupon, at 1:09 p.m., the hearing was adjourned.)

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REPORTER'S CERTIFICATE

I do hereby certify that the testimony in the foregoing hearing was taken at the time and place therein stated; that the testimony of said witnesses were reported by me, a certified electronic court reporter and a disinterested person, and was under my supervision thereafter transcribed into typewriting.

And I further certify that I am not of counsel or attorney for either or any of the parties to said hearing nor in any way interested in the outcome of the cause named in said caption.

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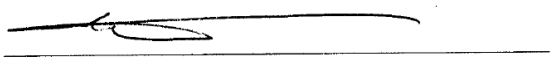

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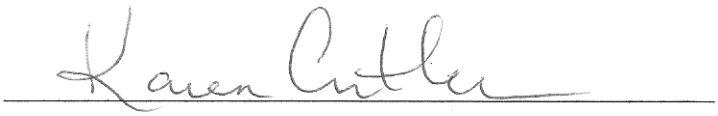

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