

# Roundtable on ENERGY STAR Luminaires

Meeting Notes Revision 2

Meeting Date: March 4, 2010

Meeting Location: NEMA Headquarters, Rosslyn, VA

Attendees:

<b>Name</b>	<b>Organization</b>
Jennifer Amann (via telephone)	ACEEE
Gabe Arnold	Efficiency Vermont
Alex Baker	EPA
Peter Banwell	EPA
Stephen Blackman	Kichler
Alex Boesenberg	NEMA
Keith Cook	Philips Electronics North America NGLIA
Thomas Early	Burgess Lighting & Distributing
Eileen Eaton	CEE
Hesham Elghoroury	Cooper Lighting
Cheryl English	Acuity Brands Lighting
Pamela Horner	OSRAM SYLVANIA
Joseph Howley	GE Lighting
Jianzhong Jiao	OSRAM Opto Semiconductors
Russ Leslie	Lighting Research Center
Clark Linstone	Lamps Plus
Joseph Marella	Aurora
Mark McClear	Cree
Terry McGowan	American Lighting Association
Cameron Miller	NIST
Nadarajah Narendran	Lighting Research Center
Chris Primous	Permlight
David Shiller	MaxLite American Lighting Association
Jeremy Snyder	Lighting Research Center
Tom Stimac	GE Consumer & Industrial
Ralph Tuttle	Cree
Craig Updyke	NEMA
Dick Upton	American Lighting Association
Paul Vrabel	ICF
Craig Wright	Progress Lighting

## Executive Summary

The summary of the recommendation to EPA by the roundtable participants on March 4 concerning residential luminaires is:

The ENERGY STAR specification should include decorative luminaires. Any luminaire that accepts a medium screwbase lamp should not be eligible for ENERGY STAR. Certain categories of luminaires should qualify based on luminaire photometry including recessed downlights, recessed wall washers, undercabinet luminaires, and cove lighting. All other luminaires should qualify for ENERGY STAR based on source efficacy, which includes the driver or ballast.

There was discussion of whether outdoor pole-mounted luminaires (not included in the recommendation) and undercabinet luminaires (included in the recommendation) should require luminaire photometry, but general agreement was not reached on these. Several people indicated that luminaire photometry is not important for under-cabinet luminaires.

Additional topics of discussion included luminaires with “separable” light sources, the merits of the straw proposals that were circulated ahead of the meeting, qualifying products based on the light source versus based on the luminaire as a whole, minimum light output requirements, strategies for energy savings, rebate programs by efficiency organizations and utilities, alternative compliance through time-of-use, lifetime requirements, and the next steps to be taken by the ENERGY STAR program.

## Background Materials

### Meeting Goal

The goal of the meeting was for participants to engage in a constructive dialog about testing requirements for the forthcoming ENERGY STAR Luminaires specification, an integration of the existing RLF and SSL specifications, with careful consideration of the differences between decorative and functional fixtures, resulting in recommendations to be provided to EPA.

### Straw Proposals #1 through #4

Prior to opening up the roundtable to discussion, four “straw proposals” were presented. These had been formulated by the Lighting Research Center only as a means of getting the discussion started, and alterations and additions to these proposals were welcome.

**“Straw Proposal” #1:** All luminaires are evaluated based on luminaire photometry, similar to the existing SSL specification. Various luminaire categories would each have an assigned minimum luminaire efficacy requirement.

**“Straw Proposal” #2:** All luminaires qualify based on source efficacy (lamp & ballast, LED light engine, GU24 based integrated lamp, etc), similar to the existing RLF specification.

**“Straw Proposal” #3:** Two paths to compliance (source or luminaire efficacy), with the path determined by the luminaire category, as defined in the document NEMA LSD – 51. Categories that are defined as decorative qualify based on source efficacy while categories defined as functional qualify based on luminaire efficacy. Some categories are defined as both decorative and functional; products in these categories would qualify based on source efficacy (i.e. they would be considered decorative).

**“Straw Proposal” #4:** Two paths to compliance (source or luminaire efficacy), with the path determined at the discretion of the manufacturer. When setting the qualifying source efficacy

requirement, a low fixture optical efficiency could be assumed (i.e. set a high source efficacy requirement) to encourage manufacturers to qualify based on luminaire efficacy. Also, manufacturers could be allowed to choose the qualifying path for luminaires up to a certain input power, but luminaires with a higher input power must qualify based on luminaire photometry.

## Discussion

### Straw proposal #5 introduced

Pamela Horner presented an alternative proposal, which is referred to as “proposal #5” in these notes. She proposed that decorative luminaires should be able to qualify for ENERGY STAR labeling, except those with a socket that can accept a filament lamp. Most decorative luminaires would qualify based on their light source (including the driver or ballast), except for some specifically named luminaire types which would qualify based on luminaire photometry: downlights, wall washers, under-cabinet luminaires, cove lighting, and any luminaire with an “inseparable” light source (which are treated as “throwaway” luminaires). Pamela would require these luminaires to qualify based on luminaire photometry because the first four are intended to be concealed (and therefore are not decorative) and there would be technical issues with testing just the light source of inseparable luminaires. The rationale for this proposal is the “white shade/ black shade argument:” if decorative luminaires are subjected to luminaire photometry, then only luminaires with certain physical appearances (such as white shades) would be able to qualify, and it would be intrusive for ENERGY STAR to govern consumers’ choices. This proposal is intended to be technology neutral.

### Separable/ inseparable luminaires

Proposal #5 required inseparable luminaires to qualify based on luminaire photometry.

Jianzhong Jiao said for an LED lamp, the light source includes the driver and thermal management. Also, a separable functional luminaire could create a loophole, based on the principle that replaceable socket luminaires cannot qualify for ENERGY STAR.

Keith Cook supported proposal #5. The luminaire types that are called out for luminaire testing will be tested this way anyway in order to specify them. Manufacturers can make a business decision to make integrated luminaires that will require luminaire photometry.

Stephen Blackman said that almost all LEDs are integrated into the luminaire because heat is a major issue. The decision should be reframed as socket vs. integral rather than functional vs. decorative luminaires. For example, sockets like GU24 can support LED products, and if ENERGY STAR allowed these in the light source matrix, then many LED products will come onto the market. He asked, based on the principle of technology neutrality, should all light sources be on the table, such as HID?

Cheryl English said that rather than differentiate based on functional vs. decorative or socket vs. integrated, she would prefer to differentiate based on whether the luminaire is intended to direct light or spread light (e.g. pendants). She suggested adding consideration of integrated controls into proposal #5, like porch lights are treated now.

In response to a question from Dick Upton, Alex Baker answered that the ENERGY STAR specification will be revised every few years. The RLF 4.0 specification has been in place since 2007. In light of changes to the incandescent baseline, Alex expects the new specification to be in place for about 5 years before revision.

Craig Wright cautioned that luminaire manufacturers “bend metal” around anything, which can cloud the definition of “inseparable.”

Russ Leslie, as moderator, decided to move the topic of inseparable luminaires to the “parking lot,” indicating it will be further discussed later in the meeting if time permits.

### **General discussion**

Terry McGowan expressed support for including a process to qualify decorative luminaires in the ENERGY STAR program. He said that some “green” builders, utilities and others are already specifying or requiring “100% ENERGY STAR” for lighting in projects. Not having decorative ENERGY STAR luminaires would severely limit the types of luminaires available and compromise designer and consumer choices.

Eileen Eaton said that efficiency programs are concerned about luminous efficiency of luminaires, and so they would like to see more luminaires be required to qualify with luminaire photometry. She communicated that efficiency programs supported straw proposal #3, where fixtures that fall in the both decorative/function category would under go luminaire photometry and include a watt limit suggested in proposal #4.

Ralph Tuttle noted that the ENERGY STAR label currently serves as the only mark of quality for LED products. If all LED products could qualify for ENERGY STAR, this wouldn't be a problem. However, if only the top 25% of LED products could qualify, then consumers would be left without a quality-indicator for many LED products. Peter Banwell responded to Ralph that the intent is to have the top 25% of all shipping products qualify for ENERGY STAR. Because the total market is about 100 million luminaires per year, ENERGY STAR won't cut off LED products until they reach about 25 to 30 million luminaires per year. So for now, all LEDs are eligible for ENERGY STAR.

Jianzhong Jiao suggested considering “replaceability” in the specification. This concept is included in the NEMA ALA LSD-51 document.

Hesham Elghoroury expressed concern that if the top 25% of luminaires are ENERGY STAR qualified, then all LED products will qualify, but only high quality products should be allowed to qualify. Peter Banwell responded to Hesham that the ENERGY STAR program won't “open the floodgates” to reach the 25% mark. It's ok if ENERGY STAR products represent only the top 5% of products if that means they are high quality.

### **Straw proposals #1 and #2**

Russ Leslie asked the participants if straw proposal #2 could be eliminated from consideration.

Jianzhong Jiao said that if all products are inseparable, then straw proposal #2 is ok with him.

Pamela Horner said it is ok to eliminate proposal #2 because there will always be the need to put some luminaires in an integrating sphere.

Dick Upton, while he favored #5, said he would need to discuss straw proposal #2 with the rest of the ALA attendees before committing to eliminating it.

Russ Leslie said that due to a lack of expressed support, proposal #2 wouldn't be discussed further, although it isn't completely off the table. He then asked if straw proposal #1 could be eliminated. No objections were voiced, so proposal #1 was eliminated from consideration.

## Source vs. luminaire qualification

Russ Leslie asked if there was support for proposal #4.

Stephen Blackman said he supported the current “matrix” approach, which allows manufacturers to manage costs.

Cheryl English said that downlights and other performance luminaires should qualify as a luminaire rather than a source. Perhaps a power threshold would work.

Jianzhong Jiao said that if the light source is replaceable, then only the light source should be able to qualify for ENERGY STAR.

Clark Linstone said that it is possible to do component testing and the conversation shouldn't focus on how removable the light source is (e.g. removable with a screwdriver vs. welded in). He voiced support for proposal #5.

Chris Primous said that it is preferable to manufacturers to test light engines, which is similar to the current “platform” approach for CFLs. Some product types should be tested as a complete luminaire.

Cameron Miller asked if thermal management would be an issue with testing just the light source. Chris Primous responded to Cameron that the test would be done with the light engine, which accounts for thermal management.

David Shiller noted that the discussion so far would require downlights to be tested as a luminaire. Right now, downlights do not require a lamp to be included in the shipment. It would be problematic to require photometric testing of non-lamped downlights. Cheryl English suggested that the product label could say that an ENERGY STAR lamp must be used. David Shiller noted that testing a luminaire with one lamp contradicts what manufacturers are trying to do, such as with GU24s. Jianzhong Jiao said that if a downlight is tested with a light source, then the luminaire gets the ENERGY STAR label. If only the lamp is tested, such as a PAR38, then just the lamp gets the ENERGY STAR label. As of August 31, 2010, ENERGY STAR qualified lamps for downlights will be available. Narendran said that if you do photometry on a light engine, then the luminaire gets the ENERGY STAR label.

Pamela Horner asked for clarification regarding whether a luminaire with a GU24 socket would automatically qualify for ENERGY STAR. Alex Baker responded to Pamela that if a luminaire ships with an ENERGY STAR GU24 lamp, then the luminaire can be labeled ENERGY STAR. If it doesn't ship with a qualified lamp, it can't be labeled. Keith Cook pointed out that there's nothing preventing the use of a non-ENERGY STAR lamp being used in the luminaire at a later time. David Shiller said that this is an issue with all decorative luminaires right now. Russ Leslie said that an important point of discussion is luminaires that accept multiple lamp technologies. Tom Stimac said that in Europe, regulators are making sure lamps are efficient, and are not focusing on the luminaires. Pamela Horner said that one difference between the U.S. and Europe is that U.S. manufacturers want to be able to label luminaires as being ENERGY STAR qualified. Keith Cook said that a second difference is that the European regulation is a minimum standard, as opposed to the ENERGY STAR program.

Stephen Blackman suggested that another socket/ module/ connector that could be approved for ENERGY STAR in a similar vein as the GU24 socket.

Cheryl English said that the new ENERGY STAR specification will differ from the current approach. Certain categories of luminaires should be moved to “the next level.” The performance attributes of directing light, the optics, and the performance of the source should be considered.

Tom Early said that GU24 was originally intended to be an ENERGY STAR process, and asked why only GU24s are included so far. Peter Banwell replied to Tom that EPA can't pass

laws, but it may be in the best interest of participants to encourage the legislative process to be sped up. Pamela Horner said that once a minimum level is set by law, then there's no need for a voluntary program like ENERGY STAR. Chris Primous said that most GU24 products are sold in the commercial market, but today's discussion is on residential luminaires.

Pamela Horner asked if there is a way to test light engines, which would then qualify the luminaire it's incorporated into. Jianzhong Jiao said that there is a test, but it is only for room temperature conditions. The test for using an SSL product at elevated temperatures is being written. Tom Stimac said that the temperature needs to be tested by a third party. Pamela Horner said that this testing would eliminate the separable/ inseparable issue. Cameron Miller said that the biggest concern is whether or not the luminaire will alter the thermal properties of the light engine. He said that a specification can be written for any testing procedure. Clark Linstone said that testing the light engine would allow the same assembly to be used in a variety of luminaires. Terry McGowan said that thermal testing is part of the UL1598 (Luminaires) testing process. It measures the internal temperature of the luminaire. Thermal testing is easier than photometric testing. Narendran said that this is the purpose of the LM-XX standard in development. The test shows what the light engine does at certain temperatures, so once the light engine is in the luminaire, you just need the thermal temperature measurement and then you interpolate. It gives you the source efficacy with the caveat that you de-rate it based on thermal conditions. Jianzhong Jiao said that the LM-XX test is procedural only and the difficult part is writing the qualification criteria.

David Shiller summarized that if the group is ruling out proposal #1 and #2, and Pamela is now ok with removing the requirement to photometrically test "separable" luminaires from proposal #5, then proposal #3 and proposal #5 are the same except for which types of luminaires are "carved out" for luminaire testing.

### **Light output labeling**

Cameron Miller expressed concern that based on the discussion so far, the specification will not provide information on whether or not the luminaire, such as wall sconces, will light a house efficiently. David Shiller responded that that is the purpose of the ENERGY STAR label. Dick Upton asked what labeling is now required. Alex Baker said that ENERGY STAR luminaires must include the warranty, type of lamp that should be used when relamping, and the certification mark. Inside the box must be information on the warranty and how to act on it. The ENERGY STAR program has accepted that it can do only a certain amount to redirect consumer behavior when replacing the lamp. Cameron Miller expressed continued concern that if a consumer were to light a room with 6 ENERGY STAR qualified wall sconces, it will be efficient but will not provide sufficient light. Eileen Eaton said that that Cameron's concerns are shared by energy efficiency programs, and that is why they support luminaire testing for all luminaires that could be considered functional. In response to a question from Dick Upton, Clark Linstone replied that manufacturers would not have any problems with the expense of labeling boxes with information about the driver and light source inside if it is ENERGY STAR rated.

Stephen Blackman said that decorative luminaires should not be required to do luminaire photometry. No one knows how many lumens a chandelier should provide. Manufacturers should provide information to consumers on how many lumens their product delivers. Cameron Miller said that the FTC label will address this. Stephen Blackman replied that a specifier needs to know this information, but it's not needed for a "sconce by a fireplace." Chris Primous said it won't be possible to put luminaire light output or efficacy on the label because that information won't be known without luminaire photometry.

Narendran suggested addressing this with a wattage equivalency. One person may choose to put in a 40W equivalent lamp, another a 60W equivalent lamp. Terry McGowan said that most

people buy luminaires based on looking at them in a catalog or a store. They typically don't look at the wattage, although source lumens may be useful. Gabe Arnold said he believes that in the future consumers will pay more attention to efficacy and luminous flux. Terry McGowan said that years of neglecting the education of consumers has come home to roost, but noted that \$10 million was included in the federal energy legislation for consumer education.

Tom Early said that consumers are more concerned about foot-candles than efficacy. Russ Leslie suggested that this shows a need for lighting design.

Alex Baker said that consumers aren't familiar with lumens, but they know watts. We've got a ways to go until consumers understand lumens, and the FTC's lamp labeling effort may assist this education. This issue should be put in the "parking lot" for today's discussion. Chris Primous said that the FTC label will use the word "brightness" in a way that's technically incorrect but more understandable for consumers. Tom Stimac and Cheryl English discussed listing the luminaire power on the package for consumers, but there was concern that consumers would treat this as "fine print" and wouldn't consider it.

### **Minimum light output**

Tom Stimac said he is in favor of proposal #5, but feels there should be a minimum light output requirement for the source. Craig Wright said that luminous flux isn't an indication of good luminaire design because it depends on the intensity distribution. Chris Primous said that the minimum luminous flux requirement in the specification should be removed.

Russ Leslie moved the issue of minimum light output to the "parking lot" to be taken up later if time permits.

### **Energy savings**

Eileen Eaton said that efficiency programs do not support proposal #3 the way it is currently outlined because too many luminaires would be tested based on source photometry. Efficiency programs are in favor of requiring luminaires defined as functional or functional/decorative to undergo luminaire photometry and including a wattage requirement

Narendran said that there are issues with subjecting decorative luminaires to photometry such as their size (i.e. fitting inside the test apparatus) and the lack of meaning of test results with colored light. Consumers are used to choosing 40, 60, or 75W lamps.

David Shiller argued that luminaire photometry for categories labeled "both" in LSD-51 would reduce ENERGY STAR market share. The four categories considered "both" are now sold as decorative products, and manufacturers wouldn't be able to afford to qualify them for ENERGY STAR. Clark Linstone agreed with David on the cost issues. If photometric testing were required on decorative luminaires, then the market would bifurcate. For example, a sconce with clear glass would be ENERGY STAR qualified, while one with an off-white shade would not be. The decorative aspect of luminaires limits their efficiency. But it's preferable to allow for lower efficiency luminaires to be ENERGY STAR qualified based upon their components rather than for only the most efficient ones in terms of lumen output. Eileen Eaton said that the current SSL specification manages this concern by having manufacturers test the least efficient luminaire in a family, not test every SKU. Because LEDs are a new technology, it's acceptable to change the way we consider them for energy efficiency. Also, state energy programs are now saying that energy savings can no longer be claimed simply by putting in a CFL. Instead, the total light output of the luminaire must now be considered.

Stephen Blackman said that the goal of ENERGY STAR is to save energy across the country, not on individual products. The way to meet this goal is to encourage energy efficient

luminaires to be sold in the market. Requiring luminaire photometry would have the net effect of reducing energy savings nationwide.

Jianzhong Jiao said that LSD-51 called for both “decorative” and “both” categories to qualify for ENERGY STAR based on source efficacy.

Gabe Arnold said that ENERGY STAR should go to the next level of energy savings. Efficiency programs are under pressure from regulators due to new federal standards and increasing baselines that are reducing the energy-savings programs can claim from simple efficiency measures such as higher source efficacy. In order to achieve savings and meet goals, programs must seek out the next level in energy-savings, including such things as luminaire efficacy, system approaches, and controls. Ideally ENERGY STAR would take the specification to the next level, but if they don’t, some programs may move in this even if ENERGY STAR does not. For example, some programs may require luminaire efficacy for some categories that are “both,” even if ENERGY STAR does not. An example of this is surface-mount “drum” luminaires. The photos in LSD-51 make these luminaires look the same, but one has twice the efficiency of the other due to high-performing glass. The programs may only support the fixtures with high-performing glass.

In response to a question from Joe Marella, Alex Baker said that market share for RLF rose is now at 10% for indoor and 20% for outdoor luminaires. This rise in market share is attributed to GU24 and basing qualification on source efficacy rather than luminaire efficacy. Joe added that market share has increased 2 to 5 times in the past two years.

Chris Primous was concerned that previous speakers had implied that if ENERGY STAR doesn’t qualify based on luminaire efficacy, then the states would offer rebates based on their own requirements. This would lead to different requirements in different states, which would be problematic for manufacturers. Gabe Arnold clarified that his comments were on the topic of luminaires in the “both” category. For decorative luminaires, it’s unnecessary to do luminaire photometry. Gabe would be in favor of a wattage limit, above which luminaire photometry would be required.

Terry McGowan stated that he doesn’t believe that luminaire efficacy is a predictor of energy use in non-functional luminaires, so there is no point in using it.

David Shiller said that it’s easier to save energy with higher source efficacies than higher luminaire efficiencies. For example the ENERGY STAR specification is now in the 50 lm/W range while fluorescent sources can achieve 70 lm/W and LEDs will quickly exceed this. Gabe Arnold responded that there are also energy savings to be had with improved luminaires. David responded that this is based on possibly faulty assumptions about the marketplace.

Joe Howley suggested that a middle ground might be a wattage limit. Since the main concern is really power reduction, not source efficacy, if all sconces were to use the same power, then it wouldn’t matter what their covering was made of.

Cheryl English said that if surface-mount luminaires required luminaire photometry to qualify for ENERGY STAR, then the qualified luminaires would be “glare bombs” with thin material and bad aesthetics. Nothing that looks good will be ENERGY STAR rated, and luminaires will go back to incandescent sources. Also, a wattage limit can be gamed. For example, a low wattage downlight will be ENERGY STAR qualified but will result in unhappy homeowners.

Tom Early said that ENERGY STAR products that are sold as replacement products do well, but do not do as well for new construction. People usually qualify new construction for ENERGY STAR using other appliances such as air conditioning. If it were more economically feasible for more decorative and LSD-51 “both” luminaires to get ENERGY STAR ratings, then Tom would expect more energy efficient lighting would be used in new houses.

Dick Upton expressed his support for proposal #5. It will increase the number of efficient luminaires, and will reduce power. Testing every product will be too costly. The ALA partners effectively with CEE and will continue to do so in the future.

Jianzhong Jiao said that in LSD-51, the three functional luminaire types are track, task, and downlights. Cheryl English said that track and task luminaires should not be treated as functional. Because they are aimable, photometry won't provide useful information. Cheryl expressed support for proposal #5.

Jianzhong Jiao said that in reference to Gabe's comment regarding California, Title 24 is based on source efficacy. Jianzhong is in favor of a power limit, as Joe suggested, plus source efficacy.

Keith Cook suggested that there should be only two considerations: the energy a product uses and customer acceptance. Energy use is based solely on the source, and a black shade doesn't matter.

Russ Leslie said that he heard a hint of convergence around proposal #5, but some discussion was needed on which luminaires would be carved out for luminaire photometry, such as ceiling mounted kitchen fixtures.

### **Electric Utility Industry**

Russ Leslie asked for information about the electric utility industry and efficiency programs, based on requests he heard.

Eileen Eaton said that two changes in the efficiency programs are "baselines" shifting upward and moving from "widget-based," "one-for-one" replacement to comprehensive lighting approaches including daylighting, design, and controls with a W/ft<sup>2</sup> metric where luminaire photometry will become more important. Eileen mentioned there had been some talk of ENERGY STAR covering controls. Also, a pilot program in Massachusetts targets residences and includes a lighting designer from the beginning. Cheryl English expressed support for the W/ft<sup>2</sup> metric.

In response to a question from Keith Cook, Gabe Arnold replied that plug loads are addressed at the electronics/ appliance level or with power strips with occupancy sensors built in.

### **Alternative compliance routes through time of use**

In response to a question from Russ Leslie, Chris Primous said that the alternative compliance pathway for outdoor fixtures was problematic for manufacturers. Home builders were having many problems. California said that motion sensors would not be needed there, so manufacturers built efficient products specifically for California. This is still the case in California. Craig Wright added that builders moved to screwbase self-ballasted lamps to avoid the problems with photosensors. Education on proper use is needed.

Cheryl English said that the specification should not retreat from motion sensors. Perhaps other quality criteria are needed to make sure they work. Motion sensors could be added for indoor luminaires too, such as those intended for garages.

### **Minimum light output requirement, revisited**

Chris Primous said that there should not be a minimum light output requirement for ENERGY STAR.

Tom Stimac said that an equivalency would obviate a minimum requirement.

Eileen Eaton expressed concern that consumers would be unhappy with products, so she would not support removing the minimum light output requirement, but there could be exceptions, such as step lights.

Gabe Arnold noted a strong relationship between price and light output with LED technology. Removing the minimum light output requirement would result in more low-light products, which may be more likely to not meet consumers expectations.

### **Lifetime**

Tom Stimac said that making LEDs last 10,000 hours is different than a 25,000 hour requirement. If the specification is intended to be technology neutral, then lifetime should be equal for all technologies. Right now the specification requires 2.5 times the life from LEDs. Alex Baker said that the specification will not be technology neutral on every requirement, mainly color and efficacy. Other requirements will be different, including life, which differentiates LEDs.

Narendran noted a price-performance tradeoff. Consumers need to pay double the cost to achieve a 25,000 hour life. In response, Alex said that marketing will communicate that consumers will pay more but the product will last longer. Also, product data sheets should have realistic lifetimes. Drivers won't last 50,000 hours.

### **Inseparable Luminaires**

Russ Leslie asked if inseparable luminaires should be allowed to qualify for ENERGY STAR.

David Shiller said there is a precedent with the current replaceable ballast requirement.

Dick Upton said that 95% of the public won't get inside a luminaire. Mark McClear supported Dick's statement. Lighting will be like cell phones: consumers will throw them away if they break. The luminaire should last 50,000 to 75,000 hours. If you replace the LEDs in it, you will have a decrepit driver and it will be hard to get good thermal contact. Electronics should just be recycled instead. Chris Primous disagreed with Mark and said that his company makes products in which LEDs are replaceable with just 2 screws, and there is no need for thermal grease.

Jianzhong Jiao said that the whole light engine would be replaced, not LED arrays. Russ Leslie clarified that inseparable means that the whole unit is sealed and a user cannot replace the light engine.

Tom Stimac said if someone replaces a light source, the luminaire is no longer UL approved. Consumers aren't qualified to make these replacements. Russ Leslie asked Tom if a ballast fails in a residential fluorescent luminaire, then the whole luminaire should be thrown away? Tom said that UL has talked about a retrofit standard for LED products, but right now UL will not allow replaceable light engines in SSL products, and ENERGY STAR should not require something that will void the UL mark.

Cheryl English said that promoting throwaway products is counter to sustainability.

Stephen Blackman said that it would be better to replace the power supply rather than a whole luminaire that has already been installed. Mark McClear responded that this would be better handled as a warranty issue. Stephen responded that power supplies are made to be replaced by qualified people. Keith Cook said that engineers can design a way to replace components, such as snapping them in without exposed contacts. Mark McClear clarified that he meant that throwaway luminaires should be able to qualify for ENERGY STAR, not that all ENERGY STAR luminaires should be designed to be thrown away. Ralph Tuttle said that Cree downlights are disposable due to the thermal engineering that went into it. Clark Linstone

expressed support for allowing efficient, high quality throwaway luminaires in ENERGY STAR.

Peter Banwell posed the situation of an ALA level, \$400 pendant light with alabaster, but it lasted only 1.5 years and has LED “guts” with no replaceable parts. Should this be considered a disposable luminaire? Clark Linstone said that replaceable parts should be considered added value. But ENERGY STAR should not limit saleable products based on if they have replaceable parts, so non-replaceable products should be allowed in ENERGY STAR.

Pamela Horner suggested that due to technology neutrality, the requirement for replaceable fluorescent ballasts should be removed. Mark McClear responded that LED products are changing quickly. The downlight three years ago had 12 LEDs, and the one now has 8 LEDs because each LED is brighter. The whole luminaire should be replaced with one that looks identical from the outside. Tom Stimac added that another difference is that fluorescent luminaires can’t incorporate the power supply inside while LEDs can. Serviceability should be a business decision, and not left to ENERGY STAR to decide.

Russ Leslie suggested that if the life of the product is under 20,000 hours, then it needs to be replaceable.

### **Proposal #5 discussed**

Pamela Horner summarized proposal #5. The ENERGY STAR specification should include decorative luminaires. Any luminaire that accepts a medium screwbase lamp should not be eligible for ENERGY STAR. Certain categories of luminaires should qualify based on luminaire photometry including recessed downlights, recessed wall washers, under-cabinet luminaires, and cove lighting. All other luminaires should qualify for ENERGY STAR based on source efficacy, which includes the driver or ballast. Pamela withdrew her earlier mention of inseparable luminaires. Pamela felt that this proposal is stricter than the current RLF. A decision is then needed on the light source test. For example, is it based on a “platform” system like today’s matrices, where manufacturers can pick? Another decision is needed about whether the light source efficacy includes the driver, and the answer is “probably.” Jianzhong Jiao said that the LED light source includes the driver.

Eileen Eaton said that CEE would see it as a step backward that fewer products would be tested as a luminaire under proposal #5 than would be under the SSL specification. She suggested that more luminaire types be required to undergo luminaire testing. Mark McClear and Jianzhong Jiao reviewed all of the luminaire categories in the SSL specification. Alex Baker said that the source based approach would eliminate a lot of the SSL specification. He asked if the source based approach drops the cost of testing and leads to greater market share, would CEE support that concept? ENERGY STAR struggles with the “sweet spot” on the greatest aggregate of greenhouse gas reduction. Eileen responded to Alex that CEE would be open to the idea of higher market share. Clark Linstone said he had serious concerns about including more luminaire types for luminaire photometry under proposal #5 because it will result in “glare bombs” and impede getting products to market.

Stephen Blackman objected to requiring inexpensive \$19 fluorescent undercabinet luminaires to undergo luminaire testing. Tom Stimac said a luminaire test would cost only pennies per luminaire sold. David Shiller said it would be outrageous to require photometric testing for fluorescent luminaires. Tom Stimac said manufacturers can negotiate luminaire testing for \$100 per test. If luminaire testing is required for one technology, it should be required for all. David Shiller said that testing 5000 SKUs would be expensive. Tom Stimac said that with families, one test can cover 3000 SKUs. Also, he suspects that many fluorescent luminaires are currently tested anyway.

Dick Upton said that the ALA would have a tough time if ENERGY STAR required luminaire testing for pendant or flush downlights because those decorative product classifications represent a large portion of lighting fixture products. ALA would support luminaire testing for functional LED recessed cans and cove lighting.

Cheryl English said that there is an opportunity for luminaire testing to lead to improved optics, which would step up CFL luminaire efficiency. She suggested that on one hand the levels for residential should not be the same as commercial, and owners don't care about lumens, but on the other hand, we don't want to leave lumens stuck in the luminaire creating heat.

Ralph Tuttle expressed support for proposal #5.

Jianzhong Jiao suggested comparing the DOE specification with proposal #5. Russ Leslie asked the group if any of the 7 types of luminaires on the DOE list should be added to proposal #5. Gabe Arnold said he didn't think it made sense to do luminaire testing on pendant downlights. Terry McGowan said that proposal #5 should remain as is based on simplicity. ENERGY STAR can change quickly and we'll find out soon if the list of luminaires requiring photometry is incomplete. Russ Leslie said that proposal #5 is the first step and that other luminaire types would be considered for photometry by a larger group of reviewers.

Alex Baker noted that proposal #5 doesn't allow compliance with photosensors. Russ Leslie responded that controls are not off the table.

Cheryl English suggested moving outdoor pole mounted decorative luminaires onto proposal #5. Dick Upton noted that luminaires mounted on poles under 10.5 feet high are considered residential. Terry McGowan said that "dark sky" and light trespass issues are important, and can be addressed with shielding and height limit controls.

Joe Marella said that the luminaire photometry will actually require two tests because the technology is not in place to measure both CRI and intensity distribution with one test. Jianzhong Jiao said this can be accomplished with a mountable CRI instrument on a goniophotometer.

Pamela Horner clarified that proposal #5 would require photometric testing of downlights using any light source, not just SSL.

Mark McClear said that proposal #5 is the baseline and that EPA will make the final decision. Alex Baker responded that industry will make the final decision after a draft specification is released in order to maintain transparency. Russ Leslie said that through the formal feedback process, other luminaire types can be added to proposal #5.

Jianzhong Jiao asked if there can be double labeling. Russ Leslie asked the group if there can be an ENERGY STAR luminaire with an ENERGY STAR lamp inside. The general response from the group was "yes." Joseph Howley said that in most cases an ENERGY STAR lamp would go into a non-ENERGY STAR luminaire because the luminaire would have a medium screw-based socket. Jianzhong Jiao asked about the reverse situation in which an ENERGY STAR luminaire has a replaceable lamp; do we rule that the lamp has to be replaced with an ENERGY STAR lamp? David Shiller said that we can't require that. Keith Cook added that all you can do is label what lamp was used to qualify it. Joseph Howley said that the labeling should suggest the lamp be replaced with a lamp that allowed the fixture to qualify as an ENERGY STAR fixture, but this would take place 10 years down the road.

Alex Baker asked for clarification on if track luminaires should be decorative. Pamela Horner recommended not testing track lighting as a luminaire because it is purchased based on its unlighted appearance and it can swivel.

Russ Leslie asked everyone in the room to provide their thoughts on proposal #5.

Jianzhong Jiao asked for clarification on if track luminaires should be included in proposal #5. Pamela Horner responded that track lighting is not included in proposal #5.

Keith Cook expressed support for proposal #5.

Joe Marella expressed support for proposal #5 because it's best to "start simple."

Tom Stimac expressed support for proposal #5.

Stephen Blackman expressed concern that fluorescent luminaires would now be subjected to more testing only because SSL luminaires require more testing to assure product quality, not because anyone thought that fluorescent luminaires needed more testing. Mark McClear said that testing had resulted in bad data for fluorescent luminaires too. Russ Leslie asked if anyone had complained about just testing the light source under the RLF specification. Alex Baker responded that the CALiPER program noted missed opportunities for downlights.

David Shiller expressed support for proposal #5. He agrees that downlights should be tested because they represent half of the market share. He agreed with Stephen Blackman that new requirements for testing fluorescent luminaires for the sake of technology neutrality would be a step backwards.

Clark Linstone expressed support for proposal #5. He didn't think that testing requirements for fluorescent luminaires would be much of a burden.

Tom Early said that he doesn't recall ever having seen photometrics used for residential outdoor luminaires. Photometrics should be required for luminaires only when there's a reason and consumers would use the results. Therefore, Tom suggests taking off cove and under-cabinet luminaires from proposal #5.

Terry McGowan expressed support for proposal #5.

Eileen Eaton said that proposal #5 is a "good starting point." She is supportive of technology neutrality, so the testing requirements should be the same for all light sources. She will discuss proposal #5 with CEE and can't comment on it right now.

Dick Upton expressed support for proposal #5.

Chris Primous said he liked the simplified approach of proposal #5. He said that technology neutrality is not practical for all aspects, and fluorescent luminaires should not be tested. He supported removing minimum light output requirements.

Gabe Arnold expressed support for proposal #5. He recognized the tradeoffs between efficiency and costs to manufacturers. He supported testing of downlights. He supported testing fluorescent luminaires because rebates should not be given on low efficiency (e.g. 35% efficient) luminaires.

Hesham Elghoroury said that ENERGY STAR should reflect efficient and good design. He noted that Cooper Lighting designed a track head with the light source integrated into the luminaire. Russ Leslie said that if the track head is one piece, it would be tested as a light source.

Cheryl English expressed support for proposal #5. It preserves decorative choices, and assuring efficient light sources is the best approach for decorative luminaires. Testing is required for some luminaires, not just for technology neutrality, but because downlights can range from 20% to 78% efficient. Outdoor pole mounted luminaires may be an opportunity, and this bridges the gap to commercial products.

Pamela Horner supported proposal #5. Downlights of all technologies, including fluorescent, should be tested because of thermal effects that reduces light output. Cove luminaire testing is

critical because of heat issues. Under-cabinet luminaire testing is not as important. Testing of outdoor pole-mounted luminaires is “interesting.”

Craig Wright suggests being careful about requiring testing of fluorescent luminaires. Manufacturers are almost never asked for photometric results for non-commercial buildings. Generally, 18W luminaires should be used instead of 26W luminaires.

Alex Baker said he’s pleased with the discussion so far. He’d be interested in discussing dark sky requirements if time permits.

Ralph Tuttle recommended that Alex Baker and Peter Banwell talk to DOE and find out why they listed the requirements in the categories they did. He suspects there was input from dark sky groups on pole-mounted and other outdoor lights. He also suggested that if the specification is to be technology neutral, then fluorescent luminaires be tested too.

Joe Marella asked if recessed downlights and wall washers are defined well enough. The group generally responded yes, these categories are well defined.

Cameron Miller said that he couldn’t comment on behalf of the government. Personally, feels that quality is important.

Craig Wright offered that NEMA is willing to meet with EPA to discuss quality assurance testing.

Mark McClear said that a CRI of at least 80 should be required.

Narendran said that 6,000 hour testing won’t give comfort to end users and warranty programs should be used instead.

Alex Boesenberg and Peter Banwell declined to comment.

## **Next Steps**

Pamela Horner suggested that CRI and lifetime should be discussed further.

Alex Baker said that the next step is to issue a first draft of the luminaire specification in March. EPA will discuss issues such as color with stakeholders over the phone. Issuing the first draft will be followed by a comment period. A second draft will be issued in time for LightFair, followed by a comment period over the summer. Then a third draft will be issued in the fall. A final specification will be issued in the fall with an effective date in 2011. It has not yet been determined when RLF and SSL will be sunsetted in favor of this new specification.

Mark McClear asked about the “SSL Roadway.” Peter Banwell responded that this has yet to be determined. When industry comes up with test procedures, EPA will come up with performance specifications.

Dick Upton suggested that the third draft be released by September 21, in time for the ALA annual meeting. He invited EPA to make a presentation about it.

Jianzhong Jiao asked how proposal #5 qualification fits with lamps. Alex Baker responded that right now EPA is focusing on the luminaire specification now and will work on the lamp specification later. Currently, ENERGY STAR doesn't allow medium screwbase unless outdoors with motion sensor; ENERGY STAR may extend this in the future. The ENERGY STAR luminaire program may continue with the platform approval system, and the luminaire would get the certification mark rather than a light engine or LED array. Russ Leslie added that under proposal #5, the luminaire can’t have a socket and be ENERGY STAR qualified.

Pamela Horner asked about the outdoor SSL specification. Peter Banwell said that it is moving forward and may or may not be incorporated into the luminaire document. EPA is waiting for consensus on testing and performance standards. Keith Cook said that the lighting division task

force is working with PNNL to finalize the proposal. Then DOE will send it out for vetting. Jianzhong Jiao said it is hard to predict the timing of this.

Russ Leslie adjourned the meeting.