

**ENERGY STAR® for SSL: Getting Ready for September 30
June 26, 2008 Webcast
All Questions - Answered**

Will this presentation be available for download? [It is posted on the DOE website
http://www.netl.doe.gov/ssl/](http://www.netl.doe.gov/ssl/)

Could you please repeat the seven categories. [Undercabinet kitchen, undercabinet shelf-mounted task, portable desk lamps, recessed downlights, outdoor porch, outdoor step and outdoor path.](#)

Please explain how the EPA's recently announced Program Requirements for Residential Light Fixtures v4.2 fits in? [Rich answered live. Please refer the presentation slides.](#)

Please repeat the 7 categories for now [Undercabinet kitchen, undercabinet shelf-mounted task, portable desk lamps, recessed downlights, outdoor porch, outdoor step and outdoor path.](#)

With the release of RLF 4.2, PG&E is very concerned about potential marketplace confusion with two different SSL Energy Star specifications in place. In fact, until the current issues over Energy Star for SSL are resolved, PG&E does not plan to include products qualified under the EPA RLF 4.2 specification in our incentive programs. Has DOE been contacted by manufacturers or customers who share this concern and are confused? [Rich explained that DOE has received numerous questions from both manufacturers and end-users, and that they are working diligently to seek a resolution that will address the concerns and end the confusion.](#)

How does DOE resolve the CRI requirement for the RGB (or RAGB) white light? which DOE has already recognized that current CRI matrix is not suitable for measuring RGB (RAGB) white? [DOE understands the problem with CRI especially with RGB white. In fact DOE is currently funding efforts at the National Institute of Standards to develop a new metric called color quality index which will address the issue. However until a new metric is developed and recognized by industry standards organizations, DOE must continue to use CRI.](#)

To what extent will non-Energy star products be tested by govt/state agencies to prevent low quality products from undermining the SSL market acceptance? [This is currently being done by DOE's CALiPER program. DOE anonymously purchases commercially available products for testing, performs tests using industry standard test procedures, makes actual test results available to the public, and compares actual test results to manufacturer performance claims. Learn more about the CALiPER program here:
http://www.netl.doe.gov/ssl/CALiPER-Program.htm](#)

Reliability is a big factor in CFL acceptance. Quality is all over the map. Does the DOE Energy Star mark requirement for CFLs include a reliability test standard requirement?

Today's presentation covered the ENERGY STAR program for solid-state lighting or LED's. However the CFL ENERGY STAR criteria do include reliability testing, including rapid cycle stress testing, lumen maintenance and full rated life testing. Furthermore, there is a quality assurance program that does spot testing on ENERGY STAR qualified CFLs.

What about luminaire types other than those that fall into the 7 applications listed in Category A? Can these be submitted for Energy Star compliance? An example would be Track-mounted Spotlights. DOE will steadily add additional Category A products as the technology advances. DOE will soon be releasing draft criteria for additional products for review and comment.

Is there an update on the EPA Energy Star requirements vs. DOE Energy Star requirements? Rich answered verbally. Please see Rich's slides in the presentation.

What are the near term adds of categories again for Cat A? Undercabinet kitchen, undercabinet shelf-mounted task, portable desk lamps, recessed downlights, outdoor porch, outdoor step and outdoor path.

What is the impact on the E.S. name as the efficacy declines year by year as the LEDs age? Should the driver have internal compensation to boost light output over time or shut off the light, e.g. "burned out," at some defined point of efficacy reduction? All light source technologies, SSL and conventional, show lumen degradation over time. The rates of decay vary according to basic technology and manufacturer/model. The industry has defined useful life as the point at which 70% of initial light output is reached. DOE uses this definition of life in the ENERGY STAR SSL program requirements. We have discussed such things as you suggest with the lighting industry and others, but there isn't a consensus for how to address these issues. As SSL technology advances, DOE expects lumen maintenance will also improve.

How do you meet the lumen maintenance standard for Energy Star? Even though it's implemented sept 30th the LM80 is not finalized yet and it takes about a year to finish testing for the results. DOE anticipates LM-80 will be final prior to September 30, 2008. Major device manufacturers have been collecting the necessary test data on LED packages according to the draft LM-80 procedure. Once LM-80 is final, they expect to be able to generate reports (based on the tests they have been performing) for their products soon afterward. Should LM-80 not be final by Sept. 2008, DOE will delay the effective date for the program until LM-80 is final.

What's a cct? CCT stands for correlated color temperature and is what the industry uses to describe the various shades of white light.

Why are you so stuck on Lumens? Lumens can be isotropic, or lambertian, and therefore do not represent how much useable light gets to the target. Why not use Lux, especially for LED's? All the international standards such as ISO 8995 ratings are all in Lux. Lumens are really irrelevant requiring an integrating sphere for real measurement, not

real world conditions. thanks, Please recognize that in order to use lux (a measure of illuminance) we would have to define all the possible applications, geometries, reflectances, etc. that the luminaire would be installed in. We considered this initially when developing the program requirements, but it quickly became apparent that it would add significant complexity and expense to product testing.

Why only 3 year warranty requirement since LED lasts 50K hours? Not all LEDs last 50,000 hours. DOE selected a 3 year warranty period to balance costs to manufacturers for supporting long-term warranties with the public need for longer warranties that reflect longer product lives. Three years is longer than the current ENERGY STAR requirements for CFLs and fluorescent fixtures.

As a start-up company with a solar powered street light with LED luminaire- we plan to send the fixture to ITL for photometric testing but want to know is there an approved 3rd party validation testing house approved by DOE for the whole lighting system including the Solar aspect? We applied for funding for our product but was told by the DOE they didn't believe we had a viable product based on how we applied the PV panel to the pole. The engineering proto-types we have installed have shown great promise and is currently functioning as expected but we want third party validation and not sure where to go to get it. At this time, off-grid luminaires are outside the scope of the ENERGY STAR for SSL. We are unaware of any standardized test procedures for PV powered SSL luminaires.

So magnetic power supplies could qualify? Yes. We currently do not address the power supply/driver efficiency as we want to give manufacturers flexibility in designing their luminaires. By establishing luminaire efficacy thresholds manufacturers are able to trade-off components (LED lamps, drives, optics, etc) to meet desired performance levels.

What does "Portable Task" entail? Portable desk lamps (not hard-wired to a branch circuit). Basic Energy Star requirements are a minimum of 200 lumens, 85% of light output in the 0-60° zone, luminaire efficacy at least 29 lm/W, and up to 5000K CCT.

If the luminaire is managed by a remote controller (e.g., a computer system), is it required that there be a photocontrol at the luminaire? Or does this mean that some type of control which is responsive to ambient light must ultimately influence the luminaire? Only wall-mounted outdoor residential luminaires greater than 13W are required to have integral photocontrol.

Why were ccts limited to 3500K for under cabinet kitchen? One of the key lessons learned from early CFL promotion efforts is that consumers reacted negatively to CFLs with high color temperature, preferring "warm white" light that is closer to incandescent sources. To help avoid similar problems with LED products, DOE limited the allowable CCTs for residential kitchen undercabinet lights and residential recessed downlights to the warmer shades of white, 2700K, 3000K, and 3500K.

Why are CCTs limited to certain range dependent on application? End-users, particularly consumers, have come to expect certain colors for applications. Limiting CCT ensures end-user satisfaction with the technology.

What kind of accelerated testing is used for lifetime testing? Device manufacturers use various methods to stress their products such as extremes for temperature, current, voltage, corrosion, etc. If your question is life as defined as lumen maintenance then I direct your attention to IESNA LM-80 which is currently “in committee” and is expected soon.

How does it pass again? I assume you are referring to the in-situ temperature test. The luminaire is placed in the appropriate UL1598 environment. The hottest LED (temperature measurement point {TMP}) and the power supply case temperature are measured at thermal equilibrium. The LED TMP temperature is compared to the LM-80 lumen maintenance test report. When the temperature is plotted on the LM-80 test report of the same or higher drive current and yields $\geq 25,000$ for indoor or $\geq 35,000$ for commercial and outdoor, then the luminaire passes. In addition, the power supply case temperature must be below the manufacturer’s warranted temperature. DOE will be releasing a document soon that will describe how manufacturers will be able to verify compliance with requirements via thermal testing in a 1598 environment

When you talk about CRI or CCRI are you using R1 to R14 and then calculating Ra? DOE is using the current metric for CRI which is R1- R8 to calculate Ra. DOE is currently funding efforts at the National Institute of Standards to development of a new metric called color quality index which will address the issue. However until a new metric is developed by industry DOE believes it cannot remain silent on CRI.

Is there an official definition of the terms "Cool White" and “Warm White”? ANSI C78.377-2008 defines white light for SSL. At the present time there is no official definition for “warm” and “cool” white although the fluorescent lamp industry generally characterizes 2700-3000K as warm white and 4100K as cool white.

Will luminaires need to be retested periodically to keep up with the ratcheting program? Jeff answered live. In response to comments received at the May 15 stakeholder meeting, DOE is reviewing how to proceed with the ratchet schedule. We should be able to give you an answer to your question before long.

Category A, residential power factor: why so low? Given the impact on the grid, wouldn't it be better to have a relatively low maximum wattage limit to have a low power factor? Jeff answered live. The current power factor for the ENERGY STAR CFL and RLF programs is 0.5 so 0.7 is a significant increase from the existing technologies. 0.9 is required for commercial.

Any Energy star criteria planned for large area lighting, e.g. 4' T8 fixture replacement? Jeff answered this live. CALiPER round 5 reports show absolute photometry comparisons of T12, T8 and several LED replacement lamps in 2x4 troffers, both

prismatic and parabolic. Based on the results the technology needs to improve further before DOE will consider linear replacement lamps. See the CALiPER reports at: http://www.netl.doe.gov/ssl/comm_testing.htm

Where can we get a copy of the efficacy table with timeline please. DOE will be sharing the ratchet schedule shortly and well in advance of when the ratchet increase takes effect. DOE will be engaging the industry for further discussion on this.

Have you estimated the approximate cost added per fixture to test, qualify and maintain Energy Star rating for a typical fixture that is technically qualified? (I.E. cost outside of any re-engineering or re-design to achieve the required levels of efficacy, life, etc.) Jeff answered live. DOE estimated the cost of testing to range from \$500-\$1500 per fixture. You should also be aware that DOE recognized the burden to manufacturers and has included a "Product/SKU Family" option allowing one product to represent multiple products within a product family.

How does LED efficacy trend with light output? In general, as drive current (light output) is increased efficacy is reduced and lumen depreciation is increased.

Why is system efficacy not measured for LED systems? Are fixture losses inherently lower than CFL/Fluor? Jeff answered live. Several reasons. First, there is not an industry standard test procedure to test system efficacy, Second, LED performance is greatly impacted by the thermal and electrical design of the luminaire. Third, at the current stage of LED technology development, most LED luminaires must be designed to take advantage of LED directionality to realize an energy efficiency advantage compared to fluorescent technology.

How will you validate photometric files? Jeff answered live. Testing must be conducted by DOE-approved third-party labs according to IESNA standards and test procedures.

Does off-grid (solar, wind, hydro, etc.) SSL lighting have different qualification processes? DOE is not considering off-grid applications at the present time.

What about fluorescent drop-in replacement tube testing for Energy Star? I didn't hear anything about them. Jeff answered this live. CALiPER round 5 reports show absolute photometry comparisons of T12, T8 and several LED replacement lamps in 2x4 troffers, both prismatic and parabolic. Based on the results the technology needs to improve further before DOE will consider linear replacement lamps. See the CALiPER reports at: http://www.netl.doe.gov/ssl/comm_testing.htm

Why is energy savings a secondary message?? - The energy savings and cost of ownership should be a primary message. Marci answered live. While SSL is expected to be twice as energy efficient as fluorescent and ten times more so than standard incandescent lighting, current products are still in the early stages and eligible product under the first group that will qualify for ENERGY STAR may only be as efficient as compact fluorescent lighting. While efficiency and long life are important considerations, the

primary messages will be based on the unique attributes that make LEDs the right choice for certain applications. These include directional qualities, form factor, controllability, cold temperature operations, to name a few.

How are you working with energy providers so that they recognize ssl and offer rebates? DOE is working with utilities and program sponsors who are interested in offering programs that promote ENERGY STAR qualified LEDs after the program is launched on September 30. We make sure they are aware of the approach that DOE is talking to ensure that ENERGY STAR addresses product quality. Specifically, they need to know and base their program plans on the phasing of product eligibility and that there will initially be a limited group of products under the ENERGY STAR program (Category A). We also want them to know about the CALiPER product testing program that DOE manages and that the information on the many products being tested under that program is available to them at no cost. They also have an opportunity to participate on an advisory committee to identify product for testing and review the testing parameters and results.

Inability to dim using current phase control wall dimmers is also a big limiter to wide adaption of CFLs in residential aps. Dimmable CFLs are just now becoming available on a limited basis. Does dimabilty figure into energy star ssl strategy? Jeff answered live. Dimming is a major concern not only for LEDs buy also existing technologies like fluorescent. DOE is beginning a standardization effort with relevant industry standards organizations to address dimming.

As consumer interest is growing concerning toxic components in lighting products, disposal and embodied energy, what info will be provided? Jeff answered live. DOE has commissioned a study to look at environmental waste streams associated with LED production and use. A summary of the plan for this study will be presented at DOE's forthcoming workshop in Portland. See the DOE website for details on the workshop.

Messaging is essential. Thank you for addressing this. Why is cost savings not the number one message but rather positioned as secondary. Marci answered live. While SSL is expected to be twice as energy efficient as fluorescent and ten times more so than standard incandescent lighting, current products are still in the early stages and eligible product under the first group that will qualify for ENERGY STAR may only be as efficient as compact fluorescent lighting. While efficiency and long life are important considerations, the primary messages will be based on the unique attributes that make LEDs the right choice for certain applications. These include directional qualities, form factor, controllability, cold temperature operations, to name a few.

Will someone comment on pricing of LEDs within each category of phase 1? Jeff answered live. Prices vary greatly among the application categories according to a range of factors. In general, there is a significant cost premium for SSL products, but costs per unit of light output continue to fall rapidly. The very high level of price variation among products, and rapidly changing prices make generalized cost analysis difficult at this

time. Buyers are strongly encouraged to estimate cost effectiveness before making significant investments in SSL products.

How do we get a copy of the DOE's V1.0? It is on the DOE website:

http://www.netl.doe.gov/ssl/energy_star-criteria.html and on the ENERGY STAR website at

http://www.energystar.gov/ia/partners/prod_development/new_specs/downloads/SSL_FinalCriteria.pdf.

Do you still need a safety test report/coverage statement from an OSHA NRTL lab if the product is already UL listed or can you just submit the UL listing number? Jeff answered live. Manufacturers must do in-situ temperature measurement testing in the UL1598 environment and thus will need additional testing.

Will Energy Star be addressing monitors, controls and ballasts associated with LED and their efficacy? First, ENERGY STAR for SSL is for general illumination. We do not address the power supply/driver efficiency as we want to give manufacturers flexibility in designing their luminaires. By establishing luminaire efficacy thresholds manufacturers are able to trade-off components (LED lamps, drives, optics, etc) to meet desired performance levels.

Is DOE considering a Category A application category covering LED Lamps (ie the LED Light Engine?) Jeff answered a similar question live. As the technology advances, as there are good performing products in the market, as there are industry developed standards and test procedures (e.g. IESNA, ANSI, etc.), DOE plans to consider a wide variety of replacement lamps and light engines. In fact this is part of the underlying thinking for Category B.

How will the thermal performance of each product be verified. Thanks Via in-situ temperature measurement of the hottest LED and the power supply/driver when the luminaire is installed in the appropriate UL1598 environment.

How ready are the third party labs for providing independent testing? As an example the LRC @ RPI is extensively backlogged. Jeff answered live. DOE recognizes the need to increase the number of third-party testing labs and is actively soliciting labs under the CALiPER program. More information can be found here: http://www.netl.doe.gov/ssl/comm_testing-labs.htm

Min Output Operating frequency of 120Hz is only twice that of magnetically ballasted fluorescent lamps - how was this value determined and how well will it eliminate perceived flicker? Flicker is a complicated issue as that goes beyond just what the human eye perceives as continuous stimuli. Studies have also shown flicker to have physiological impact on humans. The human critical fusion frequency (CFF) is in the 75-85 Hz range but this of course assumes direct viewing of the source and there are many other factors that affect this, e.g., peripheral vision, contrast, etc. If one looks at the center of a magnetically ballasted linear fluorescent lamp you cannot see flicker (its

actually 120 Hz at that point) but in your peripheral vision the cathodes are out of phase with each other and thus you can see the 60 Hz cycle. 120 Hz is an initial starting point and DOE intends to revisit this in a future revision, once additional information on the topic becomes available.

How will Energy Star address products categorized under UL1993? UL1993 addresses self-ballasted lamps. DOE is considering replacement lamps as a future application.

What DOE guidance will be offered for LED MR16 to achieve Energy Star rating? Thank you. MR16/PAR based LEDs are not presently included in the current Category A applications. They are being discussed as a future application.

What about LCD TV backlight criteria. DOE's focus and criteria cover white lighting for general illumination. Backlighting applications are outside the scope of the ENERGY STAR SSL criteria.

It's clear that these are better at low voltage DC environment, will there be guidelines set when using DC vs AC? At this time DOE is only allows grid connected luminaires to qualify because off grid luminaires form a very small part of the lighting market, and don't necessarily lead to energy savings.

The test for frequency (which addresses dimmability) is a selftest. Will the test for frequency become formalized as a part of the official spec? The output frequency in the criteria addresses visual flicker. DOE is concerned that perceptible flicker may be a problem and wants manufacturers to consider it in their designs.

Will Wall Grazers fall under the Wall Wash category? Possibly, we will be releasing the additional Category A criteria shortly and encourage you to provide review and comment.

Could we have a list of all attendees? No, DOE policy is not to release the names of voluntary participants in public forums.

What is the difference between LM-79 photometric testing and the photometric testing that is normally done to produce IES files? The IESNA publishes separate test procedures for different light sources and luminaires. For example, LM-41 for indoor fluorescent luminaires, LM-9 for fluorescent lamps, LM-31 for roadway luminaires using incandescent and HID lamps, etc. The key difference in the testing of LED luminaires is that LM-79 uses absolute (directly measuring light output from the entire luminaire) vs. relative photometry (measuring the lamp separately and determining fixture efficiency based on a reference lamp). Therefore, for LED luminaires measured using LM-79, fixture efficiency is not calculated as you do not measure the lamp flux separate from the luminaire. The IESNA file format used for photometric reports is standardized according to LM-63-02. LM-79 is no different in the "fields" (tab delimited) it uses. Any fields with "lamp parameters" are left empty. This has no impact on using the files in modeling software as these fields are informational only.

Will ratcheting automatically suspend E-Star ratings until re-submittal? Once a qualified luminaire (or SKU family of luminaires) is eclipsed by the ratchet, the manufacturer will be able to continue to market the product for at least one-year. DOE is reviewing how to proceed with the ratchet schedule and should be able to give you more information before long.

Will utility organizations play a role in product selection for CALiPER? On May 13, DOE sent out a solicitation to form a CALiPER advisory committee.

How about CIE colour uniformity "u" and "v" and "x" and "y" variation allowance? ANSI C78.377-2008 defines chromaticity for white light LEDs and further defines the allowable tolerance for each nominal CCT. The tolerance is defined for each CCT within the CIE 1976 u'v' diagram.

Will the CALiPER Program test all Energy Star product applications without charge? The CALiPER program independently tests and provides unbiased information on the performance of commercially-available SSL products. The test results guide DOE planning for ENERGY STAR and technology procurement activities, provide objective product performance information to the public, and inform the development and refinement of standards and test procedures for SSL products. CALiPER does not test products for ENERGY STAR compliance. It does however work with and approve independent laboratories that may be contracted to conduct ENERGY STAR testing.

As a driver MFR, we can meet the 2012 requirements now. Since the driver efficiency has a major impact on overall efficacy, can E.S. consider an E.S. component recognition? No. DOE has made a decision to label integrated luminaires, not components of that luminaire system.

Are there guidelines for accelerated Life Time testing for LEDs? Device manufacturers use various methods to stress their products such as extremes for temperature, current, voltage, corrosion, etc. If your question is life as defined as lumen maintenance then I direct your attention to IESNA LM-80 which is currently "in committee" and is expected soon.

If category A is expanded to include additional products, when does the spec take effect for those additional products? DOE wants to provide time for public review and comment and does not want to add confusion by setting the effective date to coincide with the current Category A products. With that said the additional Category A applications will simply expand the products that can be ENERGY STAR labeled. All major provisions in the criteria remain unchanged. DOE will announce a schedule for comment and finalization once the draft criteria are made publicly available.

Can you please advise on MR16 LED bulbs. I did not see anything about this. MR16/PAR based LEDs are not presently included in the current Category A applications. They are being discussed as a future application.

Will all contact info for people referenced in presentation be available on the website?
Yes.

Why is the embodied energy question getting a private answer, is no one else interested? DOE has commissioned a study to look at environmental waste streams associated with LED production and use. A summary of the plan for this study will be presented at DOE's forthcoming workshop in Portland. See the DOE website for details on the workshop.

Do all products need to go through caliper for utility rebate programs? No. Utilities will independently decide what kind of testing is required to qualify for their programs. If they require ENERGY STAR qualification, tests according to ENERGY STAR requirements will need to be performed.

In terms of energy savings, do grid-tied systems such as a grid-tied solar SSL lighting product qualify here? Not at the present time.

How should manufacturers get around binning issues when our supply chain will not allow us to purchase a particular Kelvin value but it is an unknown?? We're unfamiliar with the particulars of your supply chain. We encourage you to investigate other options that will sell you complying products.

Are there going to be standards for LED lamps like replacement MR16s, LED PARs, etc? MR16/PAR based LEDs are not presently included in the current Category A applications. They are being discussed as a future application.

I can't find LM-79 at www.iesna.org. Are you certain that is available? It is available as both a download and hardcopy at the following location: http://www.techstreet.com/cgi-bin/detail?product_id=1566105

How many third party laboratories are approved in Europe and are any in the UK. I am currently not aware of any. DOE initially has been focused on US laboratories but as the program evolves and standards are developed this will change. Here is the link to the CALiPER program: http://www.netl.doe.gov/ssl/comm_testing-labs.htm

Are we concern at all with EN60825 testing?? EN60825 is safety for laser products. Generally speaking LEDs would be in the lower Classes (1, 1M, 2, 2M, 3R), and perhaps Class 3B. As the technology evolves there is the possibility that the radiant power may increase to a point where eye safety becomes a concern. Keep in mind that most of today's LEDs are phosphor converted white light and thus the power is distributed across a wider spectrum.

How many energy companies are expected to offer rebates? We know that there are utilities interested in promoting ENERGY STAR LEDs but we don't know how many as yet will be offering rebates. Once DOE launches the program, there will be a rebate

locator function on the ENERGY STAR website (www.energystar.gov) that will include information about which utilities are offering rebates on ENERGY STAR qualified products.

At LightFair there are 2 Energy Star Ratings, one is on the package (means the manufacturer gets a rating). The other rating is on the part itself (means the product gets the rating); My question is does Department of Energy (DOE) plan to have these 2 types of Energy Star rating for SSL products say for MR16? **This information is incorrect.** DOE only plans to offer ENERGY STAR qualification to integrated luminaires in September, 2008, not components of those luminaires. As for MR-16 based LEDs, DOE does not presently include them in the current Category A applications. However, DOE is considering future ENERGY STAR qualification for replacement lamps. Draft specifications are under development.

Let me correct my previous question about LM-79. It is available in hard copy format but not yet in PDF format. Do you have a date when LM-79 will be available as a PDF? **It is available as both a download and hardcopy at the following location:**
http://www.techstreet.com/cgi-bin/detail?product_id=1566105