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Mr. Andrew McAllister  
Commissioner  
California Energy Commission  
1516 Ninth Street  
Sacramento, California 95814

**NEMA Comments on Staff Workshop on Proposed Lighting Efficiency Measures for Residential and Nonresidential Buildings**

Dear Commissioner McAllister,

The National Electrical Manufacturers Association (NEMA) appreciates the opportunity to provide the attached comments on the California Energy Commission's Staff Workshop on Proposed Lighting Efficiency Measures for Residential and Nonresidential Buildings. These comments are submitted on behalf of NEMA Lighting Systems Division companies.

As you may know, NEMA is the association of electrical equipment and medical imaging manufacturers, founded in 1926 and headquartered in Arlington, Virginia. Its 400-plus member companies manufacture a diverse set of products including power transmission and distribution equipment, lighting systems, factory automation and control systems, and medical diagnostic imaging systems. The U.S. electroindustry accounts for more than 7,000 manufacturing facilities, nearly 400,000 workers, and over \$100 billion in total U.S. shipments.

Please find our detailed comments below. We look forward to working with you further on this important project. If you have any questions on these comments, please contact Alex Boesenberg of NEMA at 703-841-3268 or [alex.boesenberg@nema.org](mailto:alex.boesenberg@nema.org).

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## **NEMA Comments on Staff Workshop on Proposed Lighting Efficiency Measures for Residential and Nonresidential Buildings**

NEMA and its members would like to thank the Commission staff and Title 24 consultants for the opportunity to review CASE proposals for the 2016 Title 24 building standard. We look forward to continued dialog with industry regarding this important energy standard.

### **General Comments:**

NEMA and its members are concerned that some of the proposed requirements and the intention behind them are becoming overly prescriptive. NEMA supports energy efficiency programs and products, as is evidenced by the myriad product offerings of components, systems, and management tools our members innovate, create and sell, which save energy while providing lighting solutions that meet a variety of consumer needs, safety requirements, recommended illuminance levels and, just as important, consumer satisfaction. It is tempting, following an energy efficiency study and having tested and demonstrated some specific system, to mistakenly believe that a single solution should be made mandatory for all conditions and locations. Rather, the commission should look to the lessons learned from each study to verify that energy savings is possible, and with the assistance of experts outline a path for solutions that allows consumers and specifiers to design and implement energy efficiency in a way that best meets the needs of the application and available products. In other words, the Commission must make all effort to avoid overly prescriptive requirements in the Building Efficiency Regulations. Some of the proposals from the June 24<sup>th</sup> CEC workshop fall in to this category. In our following comments we will identify these occurrences and suggest alternatives which will yield more flexibility and choice, while still steering buildings towards energy efficiency.

In our comments, changes to proposed language are shown as deleted text in ~~strikeout~~, and suggested new text in underline.

### **RESIDENTIAL**

1. Consumers like choice and quality means different things to different people. The proposal includes a variety of “quality” criteria, but there are tradeoffs between most of these. We appreciate the interest and share the concern to promote the adoption of quality LED products, but the proposal appears to be requiring the best of class or high quality in every attribute. The McKinsey study mentioned in the June 24<sup>th</sup> CEC workshop indicated that cost and quality both have essentially equal weight in preference. A homeowner or multifamily property owner may select a lower cost over high color or other quality features as long as they understand the tradeoffs. Luminaires installed in a garage, basement or closet may not need the highest level of color rendering. Luminaires in a bathroom would likely demand very high color quality, at the expense of energy use or brightness. LED products carry the Lighting Facts label, which describes the energy use, color, brightness – allowing consumers or specifiers to make the decision. We recommend that the Commission consider a focus that allows the owner to select from a range of compliant options to select the quality attributes most important to their application(s) and needs, rather than requiring the highest quality attributes in all categories, which ultimately drives up price and delays consumer adoption.

2. The only limitation to the energy used in a residential building is the nature of the energy use and savings potential in the building’s equipment. A potential path forward to regulating energy use would be to develop a simple alternate path for compliance based on whole building energy use that could be introduced in the 2016 code and expanded for future standards. This

could be an optional compliance path and could provide valuable insight to actually reduce energy use in residential buildings.

3. As to the proposal that screw based lamps can qualify as high-efficacy if they meet the performance requirements in Appendix JA8, we request the CEC consider having more discussion on this point. Based on the June workshop discussions and subsequent exchanges, it appears that some groups favor a position that all screw base products in all applications be entitled to this opportunity to classify more products as high-efficacy, while others would continue existing restrictions against screw base products in some applications (i.e. residential downlights). Rather than CEC attempt to compromise between such disparate positions based on written comments, we suggest this be the subject of a public discussion so that it can be addressed more effectively.

4. There was a confusing point in the June workshop where slide 18 of the Residential Proposal brief indicated that JA8 will become technology neutral, however the materials presented and ensuing discussion focused only on LED products. The data on slide 21 illustrates the low volume of products meeting individual quality requirements. Representatives of the building industry in the stakeholder meeting indicated that an even lower volume of products meet all the quality criteria. This could very well result in restrictions in supply or selection of styles of qualified products. There is a continued need to allow other choices in lighting besides 100% high-efficacy, to afford lighting options which are still efficient but can't necessarily meet the stringent, technology specific, requirements of Appendix JA8.

The permitted percentage of non-high efficacy lighting could be controlled with a vacancy sensor, partial-on occupant sensor, or dimmer. Note: we suggest further public discussions about what percentage, but some leeway is needed.

5. The proposed multiple quality attributes will drive up the cost of the products due to high cost of components, financial implications with warranties and administration, additional labeling and additional testing. The cost projections on slides 10, 28, 29 and 30 were not based on the consideration of the proposed code revisions. Therefore the cost projections in the CASE proposal are not accurate since they don't represent products that meet all the overlapping quality attributes. There were comments at the June workshop suggesting that builders should be required to provide the lighting facts info (brightness, watts, color) and cost to the homeowner allowing them to understand the tradeoffs and make a decision about their preferences.

6. In response to the excessive proposed requirements in JA8, we propose these alternatives:

- Color rendering R9 value (red) at least 50 (however outdoor lighting should continue to be exempt from color rendering requirements)
- ~~Color Consistency: Within 4-step ANSI quadrangle~~
- Dimmable to 10% without noise or flicker, ~~“Reduced flicker operation” between 100% and 25% input power~~
- ~~< 30% percent flicker at frequencies less than 200 Hz~~
- Power Factor > 0.90
- Start time < 0.5 seconds

- Elevated Temperature: Same as ENERGY STAR light output ratio, ~~but for all lamps~~
- Early Failure: No failures in 1,000 hr test
- ~~Minimum rated lifetime: 15,000 hrs~~
- ~~5 year manufacturer warranty (based on 1,200 h/yr)~~
- Compatibility:
  - LED Lamps and dimmers must meet NEMA SSL7A as Type 1 or Type 2 products.
- Certification and Labeling:
  - Labeled on the product or in the catalog or packaging as meeting JA-8 high quality specification along with other specific lamp markings
  - Certified in CA appliance efficiency database
  - Labeled with manufacture date or a discernable date code

Our reasons and rationale for these changes are:

- R9: based on our experience, 50 is sufficient.
- Color Consistency: while color consistency is a matter of annoyance to some, in practice few consumers look directly at the light source. It does not affect performance. It does not affect energy efficiency. We acknowledge and appreciate that the CEC removed the proposed requirement of set CCT ranges, which means the Commission recognizes that color appearance is a consumer preference. The Commission should treat this issue consistently and remove this color consistency requirement.
- Dimmability: the SSL-7A requirement addresses dimmability, so additional requirements are redundant.
- Flicker: The test procedures for flicker cited by the IOUs is a draft procedure being evaluated by volunteer participants in the ENERGY STAR Lamps program. It is self-test and self-report, and there are multiple reasons for this. The most important reason is the test procedure has not been used long enough to be certain it provides adequate/accurate assessment, and it has not been verified as repeatable. Internal enforcement challenges and outside litigation would be at risk if a test procedure that is not fully vetted were implemented. We share stakeholder and regulator concerns regarding flicker and the industry is working to address the issue via standards. Until such time as national/international standards exist, flicker cannot reasonably be made a hard and fast requirement. The Commission should allow the ENERGY STAR program to complete its work and industry to respond with standards before making flicker a requirement.
- Power Factor: There is no firm basis for this proposed requirement. As was noted in the public meeting, the combination of lead and lag power factors in the field makes a high-power factor requirement inarguable. This is a utilities-based argument for which utilities have never gathered or publicized substantive data of justification. Strike this requirement. Moreover, power factor is already addressed in the ENERGY STAR program, which is a precursor for most IOU rebate programs. To be consistent with ENERGY STAR and not place additional burden on manufacturers we recommend CEC echo the EPA's requirement of  $\geq 0.7$  power factor.
- Start Time: Remove this requirement. It is not substantiated as a problem, and only adds testing cost and raises final product cost.
- Elevated Temperature: This requirement is only justified for products which are expected to be installed in elevated temperature conditions, i.e. recessed fixtures. Products designed for these applications are marked and marketed accordingly. Products not intended for recessed/high-temp applications are so marked. It is a violation of the manufacturer's guidance to continue. To require elevated temperature capabilities and verification for other products imposes unfair cost and burden on manufacturers and responsible consumers.
- Early Failure: No comment

- Minimum Rated Lifetime: Manufacturers list the lifetime on the product carton and/or specification sheets. The life of a lamp is covered under the manufacturer warranty and is not appropriate in an energy standard.
- Warranty: The issue of warranties carries significant financial and administrative responsibility associated with a product. Regulatory agencies have not required specific warranties in the past because of the financial implications on the manufacturer. It is not appropriate for the Commission to mandate financial policies, such as product warranties. While ENERGY STAR includes a warranty requirement, it is a voluntary program and manufacturers can choose to list a product or not.
- Compatibility: NEMA SSL-7A only applies to certain specific LED/SSL products; it cannot fairly be required of all high-efficacy products. This proposed requirement must be adjusted, or removed, to allow the technology-neutrality proposed by the IOU CASE team.
- Certification: No comments
- Labeling: due to the small size of some products, it should be allowed that the JA-8 compliance be documented in a manner easily accessible to builders, designers or homeowners. The standard should not specifically require this information on the product. We sympathize with the desire to make an inspector's job easier, but the small size or recessed installation of some products may not be feasible and may not assist in compliance inspections.

7. Light Pollution: During the public meeting in June, a participant suggested that outdoor products should include requirements for light pollution. This is not an appropriate consideration for the residential energy standard. Light pollution issues are defined and enforced based on municipal ordinances. If a light pollution attribute is required for individual luminaires, it would not take into account the installation and whether a porch or other architectural or landscape elements block the light. While we believe controlling light pollution is an important issue, the Title 24 residential standard is not an appropriate method to regulate this.

8. 150.0(k)1B Blank Electrical Boxes. The total number of boxes should not be limited to number of bedrooms but rather the number of total rooms so that homeowners can install a ceiling fan or luminaire in these boxes for each room if desired. Proposed change: "The number of electrical boxes that are more than 5 feet above the finish floor and do not contain a luminaire or other device shall be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, ~~or~~ vacancy sensor, or fan speed control."

9. 150.0(k)2J and 150.0(k)2K. The 2016 Title 24 should require all luminaires in these non-living spaces to be on an energy-saving control, not just one luminaire in those spaces. If anything, it should be written the other way around so that only one luminaire can be uncontrolled. Also, a partial-ON occupant sensor should be allowed as they have been shown to save even more energy than vacancy sensors because occupants are usually satisfied with 50% of the lighting on and they don't need 100% of the lighting on<sup>1</sup>. This is a step backward from the current standard. Proposed changes:

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<sup>1</sup> <http://lightingcontrolsassociation.org/cltc-study-demonstrates-major-energy-savings-for-bilevel-occupancy-sensors/>

150.0(k)2 J. In Bathrooms, attached and detached Garages, Laundry Rooms, and Utility Rooms, ~~at least one~~ all luminaires in each of these spaces shall be controlled by a, vacancy sensor or partial-on occupant sensor (with the exception of nightlights or security lights).

150.0(k)2 K. All screw based fixtures shall be controlled by a dimmer, ~~or~~ vacancy sensor, or partial-on occupant sensor.

EXCEPTION 1 to Section 150.0(k)2K: Luminaires in closets less than 70 square feet.

10. 150.0(k)9 Residential Outdoor Lighting. Landscape lighting is still not addressed. All exterior lighting should be controlled, not just the exterior lighting that is attached to a building. Proposed changes:

150(k)9A. For single-family residential buildings, landscape lighting and outdoor lighting permanently mounted to a residential building or other buildings on the same lot meet all of the following requirements in item (i) and the requirements in either item (ii) or item (iii):

11. Appendix JA-8. We are concerned that there may not be enough qualifying high efficacy light sources. For instance, there do not appear to be any qualifying high efficacy light sources that would replace the halogen MR-16. Homeowners would lose current options to light up artwork or decorations. It is not clear if there is a qualifiable high efficacy equivalent for low voltage track lighting, or for chandeliers.

While the Commission could conduct a study prior to the next workshop to evaluate supply and cost, we believe it is important to recognize the increasing market for MR-16 and not preclude them from use. Nor is it wise to exclude all products that are not high-efficacy per JA8 from use. Per our comment number 4 we recommend the CEC lead further public discussion on some lessening of the 100% high-efficacy requirement.

12. Appendix JA-8. There is a notable error in the Appendix which should be corrected: “(i) Light source shall have start time no less more than 0.3 seconds as tested according to the requirements in Title 20.”

13. Appendix JA-8. As mentioned at the June workshop, NEMA still feels that the requirement for 90 CRI for high-efficacy LED products unfairly limits product options and constrains consumer choice. We ask the CEC to hold an open discussion on this subject in a future workshop. There are many applications where a lower CRI is sufficient, and other color metrics may be appropriate.

NON-RESIDENTIAL

1. CEC Proposal: Add provisions to Section 130.1(c)5 whereby a Partial-On Occupant Sensor would have the automatic on level set between 50-70 percent of full rated power.

NEMA Comment: We disagree with the proposal to set a minimum automatic on level to 50%. This limits the amount of energy savings possible with today’s control technologies. We propose to only set a maximum limit for the partial-on function, or, if a minimum is deemed necessary,

then we propose to change this minimum limit to 10%. (We refer to the September 27, 2013 PG&E report for the Ace Hardware LED High-Bay Lighting and Controls Project, by Mutmanskyy and Berkland, which demonstrates the savings possible with occupancy sensors.)

NEMA Recommendation: Change the language to Read “Partial-On Occupant Sensor would have the automatic-on level set to no more than 70% of full rated power, OR, Partial-On Occupant Sensor would have the automatic-on level set to between 10 and 70%”

2. Tubular LED (TLED) products: NEMA urges the CEC to maintain the current understanding that installation of Type A TLEDs is not considered a Luminaire Modification-in-Place and, as such, are not covered by the lighting requirements of Title 24 2013, and will not be covered by 2016.

Discussion: we have noticed that there is considerable confusion regarding tubular LED products and their applicability to the requirements of Title 24 Part 6, which we believe stems in part from a lack of clarity in the standard regarding the different types of TLED devices, and how they are installed in luminaires. In particular, we are concerned with the treatment of High Frequency TLEDs, defined by UL as a “Type A” TLED, which requires no modification of the luminaire and is a simple swap out of a fluorescent lamp for a TLED. We propose that the CEC adopt the UL TLED terminology and definitions in the Standard, so that a common, industry definition is used and applied. Underwriters Laboratories (UL) has categorized TLEDs into three Types (A, B, and C) in their standard (UL 1993 “Self-Ballasted Lamps and Lamp Adapters”) that covers LED products.

We believe that there needs to be clarification provided in the standard to identify the different types of TLEDs. We suggest that the CEC adopt the existing UL definitions to harmonize with industry, clarify the requirements of Title 24 Part 6 in reference to each of these types, and provide clear language to define what constitutes a retrofit, an alteration, and a Luminaire Modification-in-Place.

We believe the interpretation that installation of Type A TLEDs is a Luminaire Modification-in-Place will eliminate the benefits of low investment for this technology, and will burden California citizens with additional costs for installation of Multi-level controls. It will slow adoption of SSL technology and its associated energy savings, with the most likely end result that cost-sensitive consumers (who make up the largest portion of the market) will choose not to upgrade their fluorescent fixtures to SSL.

3. Add provisions for “intelligent luminaire” functionality in open offices

Proposal: Add an exception in 130.1(a) area control for open office applications when partial-on luminaires are used with controls embedded in each luminaire.

Rationale: These systems provide embedded occupancy and daylight control in each luminaire. Upon occupancy, lights turn on to a background level which is at 20% power, then once occupancy is stable, lights increase to a higher “task” level for providing task illuminance at the desk. The task level for open offices is preset at approximately 90% of full power. These granularly controlled systems save more energy than “auto-on to 50%” systems because they turn lighting on to 10% power, and operate at an individual luminaire level, rather than grouped control. In these cases, a manual-on switch is not needed, nor is manual-off because lights turn off when the area is vacant below the luminaire, and automatically turn on to background level upon occupancy.

NEMA Recommendation: Add a second exception to read as follows:

Proposed EXCEPTION to Section 130.1(a)1: In open offices, luminaires using embedded occupancy and daylight sensors in each luminaire, together with continuous dimming drivers/ballasts, that operate in a manner where each luminaire has:

- 1) Integral occupancy sensors that automatically turn on to no more than 30% power upon initial occupancy, turn to a higher level when fully occupied, and automatically turn off when unoccupied, and
- 2) Integral daylight sensors that automatically calibrate at each activation, and need not be controlled using manual-on and off lighting controls.

#### 4. Clarify Demand Response Requirements

Proposal: Rewrite the Demand Response section for lighting.

Rationale: Current language is confusing and provides little guidance for compliance methodologies. Compliance manual latest revision changed the intent of the code from 15% reduction from “total installed power” to 15% reduction from “current power level.” In other words, originally, the code implied that the reduction was from the total maximum load, but was modified to require the reduction from wherever the power is at the time of the demand response event. Furthermore, the code requires that a DR controlled power calculation be made, and excludes counting areas with LPDs <0.5 W/SF in that calculation. This essentially lowers the total load required to be controlled using DR. However, the DR measurement is typically taken at the main distribution panel, which is measuring the total building electrical load.

5. Lighting Alterations and Retrofits – Renovation of existing lighting in California represents a significant opportunity. There are a variety of new lighting solutions that offer superior lighting quality, simple installation and significant energy savings. We request that the Commission review the requirements related to “Luminaire Modifications-in-Place” with NEMA members to identify opportunities to improve the adoption of energy efficient lighting retrofits. In addition, we request that the Commission clarify language describing the difference between “alterations” and “Luminaire Modifications-in-Place”.

#### OUTDOOR LPA

1. LPA baseline based on LED technology – In general, NEMA supports a baseline for the models utilizing LED technology. However, the models used to determine the LPA will need to be reviewed to validate the assumptions and equipment used in the analysis. We recognize there are a significant number of models and encourage this information to be made publically available as soon as possible.

2. Table 140.7A – The percent changes in LPA are not consistent and are much more restrictive for higher zones. In the June workshop, homebuilders referenced the inherent inefficiencies with 250 watt Metal Halide systems; however the changes seem to be overly aggressive for higher zones. We appreciate the projections that LED systems will be 30% more efficient by 2017, but the energy standards must be based on an analysis of commonly available existing technologies today. This variation in reduction to LPA by zone should be



specifically addressed for the next workshop and the models should be made available for public review.

3. Tunnels – We understand that the proposed requirements for tunnels would not cover roadway lighting or facilities under the authority of CALTRANS, however we would like for the Commission to confirm this.

4. Adding Lighting Zone 0 – While it was not in the home builder’s proposals, there was discussion in the June workshop that Title 24 should add LZ0 to be consistent with IES definitions. Title 24 has not been consistent with the IES zone definitions since it was added to the 2005 standard. The California zones are based on population density. In order to add LZ0 at this time, the entire scope of zones would need to be revised and the associated models would need to be changed. We suggest that the Title 24 requirements for LZ1 are very restrictive and sufficiently address the energy concerns associated with lighting zone 0.

5. Spectral considerations – While it was not in the home builder’s proposals, there was discussion in the June workshop that the non-residential outdoor standards should include spectral considerations, such a blue spectral content. There was a reference to “Light at Night”, which is a term commonly used to describe conditions associated with exposure to higher levels of interior lighting at nighttime. It is not synonymous with “Outdoor Lighting”. There are efficacy tradeoffs when considering spectral content that will impact the proposed LPA values. Research regarding health implications of light exposure at night typically references light levels in excess of typical illuminance at the retina in an outdoor installation and the research remains inconclusive for outdoor lighting. There may also be unintended consequences related to the impact for security cameras. We suggest that this is NOT an energy issue and should NOT be considered by the commission at this time.

#### OUTDOOR LIGHTING CONTROLS

1. Outdoor Retail and Canopies: NEMA members provide a variety of outdoor control solutions. The expanded requirement for occupant sensing outdoor lighting to include retail areas and canopies is reliable and will achieve additional energy savings. NEMA members will help to assist the contractors in identifying existing installations that are effectively utilizing occupant sensing solutions for these applications.

2. Dimming Range: We appreciate that CEC extended the range to 90%. However, Title 24 is an application standard not a product standard. The decision about appropriate light levels during unoccupied times should be based on the entire site evaluation by the designer and owner. We recognize there has been a concern that occupants may become frustrated with occupant sensing controls if all the lights are off, thinking that they are not functioning properly. This seems to be anecdotal and significant energy savings can be obtained by allowing some lights to be turned off completely while maintaining safety and security with other lights installed on the site.

NEMA Recommendation: Consider allowing a reasonable percentage of products on the site to turn completely off.