Setting Standards for Excellence

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Submitted via email: docket@energy.ca.gov

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

NEMA Comments to Appliance Regulations Code Cycle Invitation to Participate

The National Electrical Manufacturers Association (NEMA) appreciates the opportunity to provide the attached information for the Rulemaking for Appliance Efficiency Regulations (Title 20).

As you may know, NEMA is the trade association of choice for the electrical manufacturing industry. Founded in 1926 and headquartered near Washington, D.C., its approximately 450 member companies manufacture products used in the generation, transmission and distribution, control and end-use of electricity. These comments are submitted on behalf of NEMA Lighting Systems Division member companies.

Thank you for your consideration of this information and proposal. If you have any questions on these comments, please contact Alex Boesenberg of NEMA at 703-841-3268 or alex.boesenberg@nema.org.

Sincerely,

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NEMA Comments to Appliance Regulations Code Cycle Invitation to Participate

Lighting Products Data Requests

Please provide information and data for the following:

- All Lighting Product Categories
- Fluorescent Dimming Ballasts Category
- Light-Emitting Diode (LED) Lamps Category
- Small Diameter Directional (MR) Lamps Category

NEMA is unable to provide the requested data at this time, and refers the CEC to individual companies for any data they might have to share.

For all lighting product categories (fluorescent dimming ballasts, LED lamps, and MR lamps), please provide data and discussion regarding:

1. Category definition and scope: Fluorescent dimming ballasts are typically made in one of five different performance types; 1) phase dimming, 2) step dimming, 3) analog (0-10V) dimming, 4) DALI and 5) power line carrier controlled dimming. That is not to say there are no other types, but we find these are the most common. For information on LED and OLED driver types, the CEC might investigate the database managed by the U.S. Department of Energy's LED Lighting Facts Label program.
2. Standards (existing or under development): Some suggested reading and education standards include the following. For dimming; ANSI C82.11, NEMA LL9, ANSI C78.81, ANSI C78.901, ANSI C82.77, UL 935. For LED; UL8750, - IEC60081, IEC62031, IEC61347, IEC 61347-2-13, ANSI C136.67, C78.377, IES LM-79, IES LM-80, IES TM-15
3. Test procedures (existing or under development): Some suggested reading and education standards include the following. For dimming; ANSI C82.11, ANSI C78.375, ANSI C82.3, IES LM-9, IES LM-78, ANSI C82.77. There are also various company-proprietary internal testing standards for dimming compatibility and lifetime. For LED; ANSI C78.377, IES LM-79, IES LM-80 and, again, proprietary internal testing
4. Sources of test data (confidential or public): The CEC is invited to review the public information on the U.S. DOE's reporting website for regulated products (CCMS: https://www.regulations.doe.gov/ccms/). NEMA cautions against strict literal interpretation of all performance data, as we have noted potential discrepancies in interpretation of reporting guidance (for instance reporting individual product test data versus aggregated median test data over a larger sample). NEMA is addressing these variations with DOE as they are discovered, so reporting to the database can be harmonized and refined.
5. Energy use metrics (e.g., lumens vs. beam lumens per watt): the most common metrics are Lumens Per Watt (LPW), Ballast Luminous Efficiency (BLE) and Ballast Efficacy Factor (BEF). LED products today are mostly measured in terms of Lumens per Watt.
6. Relevant performance indicators (The below list is not all-inclusive)
    - For Dimming:
        - Watts - input power ranges from 10 to 150 watts typically
        - BLE (Ballast Luminous Efficiency) (but not while in the dimmed state)
        - BF (Ballast Factor) – typically ranges from 0.03 to 1.18
        - BEF (Ballast Efficacy Factor) – typically ranges from 0.7 to 1.5
        - PF(Power Factor) – typically ranges from 0.8 to 0.99
        - THD (Total Harmonic Distortion) – typically ranges from 2% to 20%
    - For LED:
        - Watts – ranging anywhere from 5W to 150W
        - Lumens – typically ranging from 100 to 10,000
        - CCT – typically ranging from 2700 to 6500
        - CRI – often specified at >60, >70, >80, or >90
        - Standard Deviation of Color Matching (SDCM) - (2,3,6)

7. Range of typical performance for each indicator (given above)
   Note: for fluorescent dimming ballasts a set formula is used to determine any given ballast's actual efficiency and the range of performance across a ballast type will change with the number of lamps that are driven by the ballast. Therefore, ballast efficiency is not a single discrete number; it is systems and installation dependent. The system efficiency is in turn dependent on which controls are used and how they are programmed. The system, not the individual components, typically determines the energy savings that are achieved.
8. Incremental costs of energy efficiency features: NEMA is unable to comment. The CEC may be able to find out more detail by conducting confidential manufacturer interviews.
9. Product development trends: We note and suggest the CEC strongly consider the fact that most development today is focused on LED control. Fluorescent ballast control, while it is still being examined in terms of load shed and demand-side power management aspects, is not growing at the same scale as LED-related efforts.
10. Market barriers to energy efficiency: The most typical barriers include, initial cost, concerns of asbestos in ceilings, maintenance (and operating correctly post-installation), inertia, and lack of education/awareness.
11. Number of California small businesses associated with manufacture, sale, distribution, or installation. The following NEMA member lighting company manufacturing and/or R&D facilities are located in California: Peerless Lighting, Architectural Area Lighting, Deco Lighting, Feit Electric Company, eldoLED, ELB Electronics, KIM Lighting, OSRAM Opto Semiconductors, Philips Lumileds, Soraa, Sunpark Electronics, SWITCH Lighting, USHIO America, and WattStopper/Legrand. In addition, many NEMA member companies have branch offices in California.
12. Commercial vs. residential vs. governmental sector sales: NEMA does not gather market data divided into these categories, and is therefore unable to comment.
13. How do consumers identify efficient products on the market? For fluorescent dimming most consumers look strictly at payback, how much savings is generated to offset the cost of the new lighting. This is primary; consumers match the technology with their payback requirements and code needs. Secondary are any recommendations from specifiers or lighting designers.
    Another typical reference is individual product specification sheets widely available online and in catalogs.
    Another tool for identifying high-performance fluorescent ballasts is the NEMA Premium Ballast Program. NEMA Premium is a widely recognized trademark, and the NEMA Premium program is advertised to and well-known by building managers, specifiers, lighting designers and many utilities. Many partners in the program list qualified dimming ballasts.
    http://www.nema.org/Products/Pages/NEMA-Premium-Lighting-Programs.aspx
    Another well-known program is ENERGY STAR, which includes categories for LED lamps and LED Luminaires.
14. Any other information relevant to this proceeding
    Dimming ballast and controls compatibility: in T20 it implied, as an almost fundamental requirement, that compatibility between products in a lighting system is a driving concern for products and product classes regulated in Title 20. We note that dimming compatibility standards are still in development for LED products especially, so hasty regulation might harm consumer acceptance. For fluorescent products, NEMA suggest the CEC investigate NEMA Document LSD-34, *Recommended Practices For T8 Rapid Start Fluorescent Lamp Dimming* *http://www.nema.org/Standards/Pages/Recommended-Practices-for-T8-Rapid-Start-Fluorescent-Lamp-Dimming.aspx* and NEMA Standard LL-9, *Dimming of T8 Fluorescent Lighting Systems* http://www.nema.org/Standards/Pages/Dimming-of-T8-Fluorescent-Lighting-Systems.aspx

    The CEC should investigate the potential for Federal preemption of this product class. We note for the CEC and those considering pursuing regulations for dimming ballasts in California: The U.S.

Department of Energy included fluorescent dimming ballasts within the scope of the Final Rule of October 28, 2011[1].
§430.32
Quote "(10) Each fluorescent lamp ballast—
(i) Manufactured on or after November 14, 2014;
(ii) Designed—
(A) To operate at nominal input voltages of 120 or 277 volts;
(B) To operate with an input current frequency of 60 Hertz; and
(C) For use in connection with fluorescent lamps (as defined in § 430.2);
(D) For dimming to 50 percent or less of the maximum output of the ballast".

Furthermore, these products are already energy-saving by their very nature. The CEC should do no more than encourage their use, and in fact already does. The endorsement of the CEC of the position that dimming ballasts are beneficial is readily apparent given their status as widespread requirements in Title 24 and Title 20, as well as other International and State codes.

Lastly, widely recognized test procedures for evaluating the efficiency of a fluorescent ballast at any level other than full output do not exist, and if/when required should be developed by a proficient standards development organization with due regard to North American and International product considerations.

In view of the above, the CEC should abandon Title 20 requirements development for fluorescent dimming ballasts.

[1]§430.32 http://www.gpo.gov/fdsys/pkg/CFR-2012-title10-vol3/pdf/CFR-2012-title10-vol3-sec430-32.pdf

Data Requests: Fluorescent Dimming Ballasts

1. Logical product categorization for analysis. Market Share: NEMA is unable to publish market share figures for these products.

2. Features that impact efficiency across the dimming range and in standby mode, and options to improve efficiency: this varies by design and by company.

3. Cost vs. ballast luminous efficiency (BLE): NEMA is unable to provide cost information, and refers the CEC to individual manufacturers.

4. BLE and lamp arc power across the dimming range: Many dimming ballasts are not tested for BLE or arc power across the dimming range because today the DOE does not require it.

5. Typical range of color shift / flicker at dimmed levels: As we state in item 4, there is no industry standard for measuring/gauging dimming performance yet. Anecdotally, we note there is little shift in CCT for fluorescent products during dimming.

6. Controller impact on energy consumption: Power consumption requirements of the controls in a dimming ballast system are not yet standardized or routinely tested. It will vary greatly (though it is a small number overall) from one control device to another and one dimming system installation to another. Wireless and Digital ballast systems do use some standby power; up to 1.5W is within normal variance and system needs.

Data Requests: Light Emitting Diode (LED) Lamps

1. Logical product categorization for analysis. Market share by category: NEMA is unable to publish market share figures for these products.

2. LM-79 and TM-21 reports: The DOE LED Lighting Facts Label database has some of this information.

3. Types of dimming circuitry & minimum dimming levels: LED lamps have been made to function with one or more of all the common dimming circuits today. Minimum dimming levels vary by manufacturer and by dimmer-lamp combinations at times.

4. Patent or proprietary technology issues: The LED market involves gigantic amounts of intellectual property. We advise the CEC to tread with caution and not rely on 3rd party observations for IP, rather the CEC should investigate IP issues for proposed regulations which dive into product function and performance.

5. Cost of improved color consistency & quality: Higher CRI comes at a price of efficiency (lower lumens per watt) with all common LED designs today. NEMA previously disagreed with the California LED Quality Specification on the point of mandatory high CRI, and we disagree with any suggestions that CRI≥90 be set as a minimum requirement by code. Consumer Reports published an article which noted that most consumers are satisfied with product of CRI 80, and few consumers can distinguish the difference[2]. CRI of 80 is the common industry practice for LED lamps and NEMA proposes it be the minimum CRI for code. Other programs, such as the California LED Quality Specification, push higher CRI, and some commercial applications such as retail and food service favor higher CRI. Commercial customers who desire higher CRI typically know what they are looking for, and do not need a minimum code mandating high-CRI across the board, merely the availability of high-CRI products when they seek them out. Lastly, CFLs have no CRI requirements or standardization. The market drives color quality and consumer satisfaction adequately without CRI regulation for CFLs, so the market is fully capable of driving this consideration for LED lamps.

   Some regulatory programs have suggested recently that CCT be more strictly defined and/or regulated. In case the CEC or proposal developers are considering it, NEMA believes CCT should not be regulated beyond the customary 7-step quadrangle, as defined in ANSI C78.377. This standard was originally formulated with 7-step quadrangles to provide a reasonable color basis while maintaining cost effectiveness for LED manufacturers and is currently the standard in place. The ENERGY STAR program for LED Lamps references this standard, and allows for the 7-step quadrangle. Any tightening of this parameter would result in increased costs and cost remains the biggest stumbling block for more widespread LED lamp adoption.

   For SSL minimum performance requirements, we developed NEMA Standard SSL-4, and we suggest the CEC review this standard as a potential reference[3]. Reference to this standard by CEC will save countless hours of debate and development over the myriad performance parameters of LED lamps, and that is why we developed it.

[2] http://www.consumerreports.org/cro/resources/streaming/PDFs/Consumer+Reports+Lightbulb+Review+Facebook.pdf
[3] http://www.nema.org/Standards/Pages/Retrofit-Lamps-Minimum-Performance-Requirements.aspx

Data Requests: Small Diameter Directional (MR) Lamps

1. Logical product categorization for analysis: The CEC should bear in mind that LED and Halogen MR Lamps currently can exhibit very different performance characteristics (items in #2) and as such they are not fully interchangeable. As a result, they are not eligible for inclusion in a technology-neutral style of regulatory approach. Requirements for these products for now should remain technology-specific. If the CEC chooses to investigate low voltage lamps (i.e. 12V), the CEC should bear in mind that these lamps are powered by an external transformer and power supply, and as such lamp regulations will not affect efficiency greatly, since the power supply is rarely replaced with the lamps. As a result of the influence of the external power supply on low voltage lighting, low voltage lamp regulations are effectively futile in terms of energy savings. NEMA recommends that any low voltage lamp regulations developed bear this in mind. The ENERGY STAR program has removed many testing considerations and reporting requirements in the emerging ENERGY STAR Lamps Specification, to account for the realities and practicalities of low voltage lamps. NEMA can provide additional technical information on request.

2. Test data for halogen, halogen-IR, and LED lamps
    a) Lumen output, beam lumens, center beam candle power (CBCP), beam angle, and lifetime. Because these products are not reported/regulated federally, the CEC could obtain this information through manufacturer interviews. Some LED MR information is available on the DOE LED Lighting Facts Label website.

3. Market share estimates for wattage categories (e.g., 50W, 35W, 20W), voltage (e.g. 12V vs. 120 V), transformer types (e.g., electronic vs. magnetic and associated performance considerations), technology type (e.g., halogen, halogen-IR, LEDs, and others), and use-case (residential vs. commercial): NEMA is unable to publish market share figures for these products.

4. Cost of halogen, halogen-IR, and LED lamps: NEMA is unable to provide cost information, and refers the CEC to individual manufacturers.

5. Comment on energy-use metrics (e.g. efficacy in lumens per watt vs. beam lumens per watt): We suggest the CEC review the approach used by the U.S. DOE in their 2009 Final Rule[4] for Incandescent Reflector Lamps which employs an equation-based approach to efficiency requirements.

[4] http://www1.eere.energy.gov/buildings/appliance_standards/rulemaking.aspx/ruleid/24