Appliance Standards Awareness Project
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Subject: Docket Number EERE-2015-BT-STD-0006/(RIN) 1904-AB51
Standards Framework for Fluorescent Lamp Ballasts

We are pleased to have the opportunity to comment to the U.S. Department of Energy (DOE) on the Framework Document for the Fluorescent Lamp Ballast Rulemaking. In general, the signatories to these comments support the approach DOE has outlined and are glad to see DOE initiate this rulemaking.

These comments address several issues raised by DOE in the Framework Document and/or at the public hearing. For those comments that pertain to specific issues identified by DOE with an "Item" number, we have noted the number.

With the rapid evolution of lamp and ballast technology and lighting controls, fluorescent lighting has expanded into market niches formerly dominated by other lighting technologies by offering high quality light and greater energy efficiency, e.g. T5 replacing metal halide in high bay applications. Solid state lighting is now beginning to claim market share from all other lighting technologies, but fluorescent lighting is well established and continues to be relatively inexpensive. We believe that it could take twenty years for lighting markets to shift entirely to solid state technologies, and for the hundreds of millions of fluorescent luminaires currently in service to be replaced. As a result, the market for fluorescent lamps and ballasts will persist well into the future.

A fluorescent ballast may be replaced several times during the lifetime of a luminaire, and a fluorescent lamp may be replaced several times during the lifetime of a ballast. We expect the current and future energy efficiency of fluorescent ballasts to continue to play a significant role in determining the energy consumption of commercial lighting for years to come. The replacement of electromagnetic with solid state electronic ballasts has significantly increased the technical efficiency of fluorescent ballasts. It appears that there are limited opportunities for increasing the energy efficiency of covered commercial lighting by tightening ballast luminous efficacy (BLE) requirements. However, significant opportunities remain to augment the impact of the fluorescent ballast standard by expanding the scope of products covered, and by increasing BLE requirements for residential fluorescent ballast products.

1. **The signatories request that DOE consider expanding the scope of coverage of the current standard to include fluorescent ballasts capable of dimming below 50% of full output, and to include digitally addressable or networkable ballasts. DOE should also consider the standby losses associated with such products. The associated test procedure and metrics should also be amended to measure BLE at partial output, and to accurately assess standby energy consumption.**

Item 3-1: Inclusion of additional dimming ballasts
As noted in the comments submitted by the California Investor Owned Utilities, and acknowledged in the Framework Document, new California Title 24 building codes are expected to dramatically alter the market for fluorescent ballasts in that state, resulting in greatly increased sales of ballasts capable of dimming below 50% of full light output. Such ballasts are not currently covered by federal minimum efficiency standards, meaning the majority of ballasts purchased for use in new construction projects in California will be not be regulated by DOE with respect to energy efficiency. We expect that this change in the California market will spill over into other lighting markets across the country as well, as these new dimming ballasts become more widely available.

In addition, we expect that the dimming function will tend to be packaged with fluorescent ballasts that are digitally addressable, such as "DALI" ballasts, and as part of luminaire level lighting controls. Luminaire level lighting control refers to a control strategy where each luminaire in a space can be controlled independently from every other and can therefore maximize incremental control within very small areas. Each LLLC is not only addressable, it also includes an integrated sensor that is network connected and can be programmed, overseen and modified through a computer user interface.[1]

These dimmable, addressable and controllable fluorescent ballasts may continue to consume power when they are switched "off" and not emitting light. Of course such ballasts may also reduce active power consumption through this enhanced functionality. Therefore, we believe considering both standby losses and the benefits of increased controllability should be part of DOE's consideration of coverage for additional dimming ballasts.

Item 2-1: Test Procedure
The signatories support the CA IOUs comments calling for testing BLE at 80% and 50% of full output, in addition to 100%. Research performed by the CA IOUs shows that the energy efficiency of dimmable ballasts can change when operated at partial output and

[1] New Building Institute website

that two ballasts with similar BLE values at full output may have different BLEs when operating at 50% of full output.

Item 2-2: Standby Mode
The signatories support CA IOUs comments calling for testing of fluorescent ballasts for energy consumption in standby mode that is similar to that implemented by the California Energy Commission, including the recommendation for better definition of “network standby.”

Item 2-3: Energy Efficiency Metrics
The signatories concur with the CA IOU comments that it is crucial for the energy efficiency metric for dimmable fluorescent ballasts to capture part load operating efficiency. To address this issue, we strongly recommend that DOE initiate a test method rulemaking for fluorescent ballasts.

2. **The signatories request that DOE consider expanding the scope of coverage of the current standard to include other fluorescent ballasts and thereby avoid the risk of one or more of the currently excluded ballast categories creating a loophole that weakens the effectiveness of the standard.**

The signatories believe that the current exclusion of several categories of fluorescent ballasts from coverage under the standard no longer serves a purpose and creates a real danger of creating significant loopholes in the standard’s effectiveness in the dynamic market for fluorescent lighting products.

Item 3-2: Inclusion of T8 MBP PS fluorescent lamp ballasts with an output less than 140 mA per lamp.
The signatories concur with the CA IOUs that “It is unclear that there is a unique utility served by the currently exempted very low ballast factor, low current ballasts.” There are multiple lamp-ballast combinations available on the market that are capable of providing comparable light output with better energy efficiency. DOE should amend the current standard to include this ballast type.

Item 3-3: Inclusion of ballasts that operate at input voltages other than 120V or 277V.
As noted above, fluorescent technology has been replacing HID lighting in high bay applications which are often found in the industrial settings where 480V lighting circuits are most common. DOE should examine this particular retrofit market to determine whether or not the implementation of these products is likely to continue to increase in the future. The signatories request that DOE change the range of operating voltages covered for fluorescent ballasts from 120V and 277V to 120V to 480V.

Item 3-5: Not amend the current exclusion from standards for low frequency T8 fluorescent lamp ballasts for EMI-sensitive locations.
In section 3.3 of the framework document DOE states that it does not plan to consider standards for linear fluorescent ballast applications in which EMI is expected to be an

issue. The signatories are concerned that the current standard's definition of this class of products: "designed, labeled, and marketed for use in EMI-sensitive environments only" creates a significant opportunity for low EMI, low-price, and energy inefficient ballasts to gain significant market share. DOE should collect sales data on fluorescent ballasts specified as low-EMI and intended for commercial use and consider eliminating or tightening the current exclusion in the event DOE finds that it represents a significant loophole.

We concur with the CA IOUs that DOE should examine the full range of existing low EMI, energy efficient fluorescent ballast technology options currently available. Given that residential ballasts are currently covered by a less stringent energy efficiency standard - in part because the FCC subjects these products to more stringent EMI requirements - DOE should at least subject low EMI ballasts to the current residential ballast energy efficiency requirements.

3. **The signatories recommend that DOE re-analyze the current market for residential ballasts, focusing on whether a more appropriate standard level can be set for these products to capture additional energy savings.**

As mentioned above, residential ballasts are subject to stricter FCC requirements for EMI than commercial ballasts, which requires manufacturers to include additional filter circuitry in their products, which in turn negatively impacts the energy efficiency of ballasts intended for residential applications. We concur with the comments submitted by the CA IOUs that it is possible for ballasts which achieve the FCC's residential EMI requirements to also achieve efficiency levels comparable to commercial ballasts.

Residential ballasts are also subject to a lower power factor requirement than commercial ballasts, which allows residential ballasts to avoid the additional circuitry needed for power factor correction, and the associated negative impact on energy efficiency.

The signatories recommend that DOE model achievable efficiency for residential ballasts using the same set of technology options available to commercial ballasts and not rely only on residential ballast products currently offered for sale in their analysis. DOE should analyze exactly how EMI and power factor requirements impact achievable efficiency through additional testing and/or modeling, as necessary. The result of this analysis should be an adjustment factor that can be applied to the current BLE efficiency standard for commercial ballasts to define an appropriate standard level for residential ballasts. We recommend that DOE revisit its analysis of residential ballasts to also account for changes in the market, such as cost of higher quality components, trends in ballast efficiency, or other factors that may have changed since the 2011 standard took effect last year.

Finally, as LED technology becomes more affordable and consumers gain confidence in this new technology, consumers have more cost-effective choices for energy efficient lighting. EISA will also progressively limit the availability of less energy efficient options. As a result, the risk of potential residential fluorescent lighting users "backsliding" to less efficient lighting technologies due to the possibly higher cost of energy efficient residential fluorescent ballasts has been significantly reduced.

4. **Final comment regarding the transformation of the market from fluorescent to solid state lighting.**

Item 7.2: prevalence of tubular LEDs operating on fluorescent lamp ballasts
DOE's CALiPER research has found that tubular LED lamps operating in luminaires designed for fluorescent lamps (with modified or unmodified fluorescent ballasts), are significantly less energy efficient than dedicated LED luminaires. As noted in our introductory comments, a fluorescent ballast may be replaced several times during the lifetime of a luminaire, and a fluorescent lamp may be replaced several times during the lifetime of a ballast. The typical operating life of a T8 fluorescent lamp is 20,000 hours. The typical advertised average rated lifespan of a LED T8 replacement lamp can range from 50,000 up to over 80,000 hours.

If tubular LED replacements for fluorescent lamps (TLEDs) have lifetimes equal to or longer than the lifetimes of the fluorescent ballasts that operate them, TLEDs could disrupt the normal fluorescent luminaire maintenance and replacement cycle. Currently, ballast failure (or scheduled replacement) in a dedicated fluorescent luminaire can present a cost-effective opportunity for luminaire replacement and conversion to a dedicated LED luminaire. However, if a fluorescent luminaire's fluorescent tubes have been replaced with TLEDs during a prior lamp change-out, ballast failure may no longer present a cost-effective opportunity for conversion to a dedicated LED luminaire due to the prior investment in the TLEDs (which may cost three to five times more than the fluorescent lamps they replace). This is particularly true for "Direct Fit" or "Instant Fit" tubular LED lamps which are designed to be driven by a fluorescent ballast.

The widespread installation of TLEDs could delay the eventual transformation of the commercial lighting market from dedicated fluorescent luminaires to dedicated solid state luminaires, creating an extended "hybrid" phase where a LED light source is driven by a ballast designed for a fluorescent light source. If this were to happen, it would also delay energy savings associated with dedicated LED luminaires, as identified in the CALiPER report. We recommend that DOE analyze the market for tubular LED replacement lamps to evaluate their effect on overall energy savings over time. DOE should also expand the types of linear fluorescent ballasts covered by the standard to include all ballasts that could be used with a TLED.

Thank you for considering these comments.

Sincerely,

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