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NRDC Comments on CEC Staff Analysis of Dimming Fluorescent Ballasts

2015 Appliance Efficiency Pre-Rulemaking Docket Number 15-AAER-1

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Submitted by:
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On behalf of the Natural Resources Defense Council and our more than 250,000 members and online activists in California, we respectfully submit these comments on CEC's Staff Analysis of Dimming Fluorescent Ballasts.

NRDC generally strongly support CEC's proposed standards for fluorescent dimming ballasts, however we urge the commission to reconsider its proposal on two points: 1) CEC should set the standby power limit to 0.5 watt instead of 1 watt. This would **increase savings by 20 percent**; 2) CEC should set power factor requirements at 50 and 80 percent of arc power, not just at 100 percent.

Dimming ballasts are a rapidly growing market and energy use in California – The market for dimming ballasts in the Golden State is expected to greatly expand in the coming years due to the 2013 California building code (Title 24) that became effective on July 1, 2014. The 2013 code requires multilevel lighting and, therefore, the use of dimming ballasts, including deep-dimming ballasts, in commercial lighting applications. The energy consumption in dimmable fluorescent ballasts and their attached lamps is expected to increase 15-fold to nearly 3,600 GWh/y by 2020 by displacing fixed output ballasts, based on DOE market projections adapted to California and accounting for the effect of Title 24. Of that energy, 20 percent on average is wasted in the ballast itself before ever reaching the fluorescent lamp. Furthermore, California Investor-owned utilities (IOUs) test data shows differences in efficiency of 5 to 10 percent between dimming ballasts of equivalent function. This makes the efficiency of dimming ballasts an important opportunity for energy efficiency standards.

NRDC generally supports CEC's proposed standards – CEC's proposed weighted ballast luminous efficiency (BLE) metric standard will yield the largest savings of all proposed options, and yet has the highest compliance rate in the IOU test of 34 existing ballasts in 2013. This proposal is technologically feasible as demonstrated by IOU testing, and very cost-effective with a cost-benefit ration of between 1:11 and 1:31.

The proposed standard is performance-based in that it leaves industry the flexibility to meet the performance requirements in any way it chooses, whether by using known technology pathways such as upgrading magnetic components, diodes, capacitors and transistors, to cutting out cathode heating and scaling it when dimming, or by innovating and finding new, more cost-effective ways to meet the standards.

CEC should require standby power not to exceed 0.5 watt instead of 1 watt – The IOU test data showed existing dimming ballast models with standby power lower than 0.5 watt in all three technologies (Digital, LVDC and Phase), demonstrating feasibility. The chip and transceiver used in digital ballasts to communicate with controllers and other products requires a little more standby power than LVDC and Phase ballasts, and only one of 14 digital models tested met this threshold.

However, this is not due to technological feasibility but to the lack of incentive to design dimming ballasts with low standby power. To demonstrate this, NRDC worked with Power Integration to measure standby power for two connected lamps.

While lamps are different products from ballasts, both lamp drivers and ballasts provide similar functionality in the lighting system by managing the power used by the light source, and by responding to a control signal that directs the ballast/driver to turn the light source on/off/dim.

Therefore they should have similar power requirements, and lamps demonstrate the technological feasibility of achieving sub-0.2 W power levels in digital dimming ballasts.

	Standby power at 115V	
Philips Hue (300 lumens)	134 mW	
Connected by TCP	175 mW	

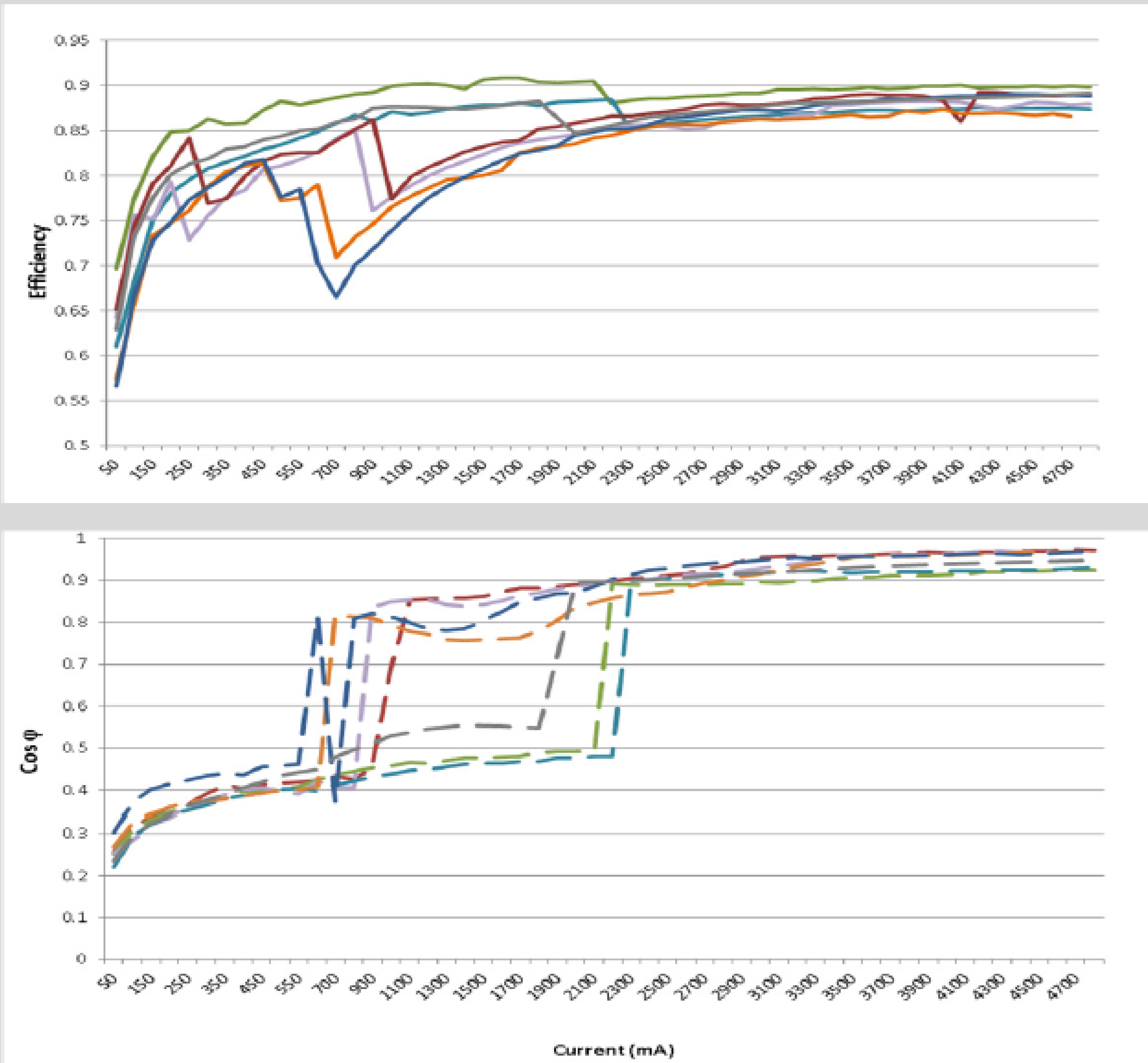
While a 0.5 watt difference between 1 and 0.5 watt may not seem like much, ballasts spend an average of 15 hours per day in this state per CEC's proposed mode weightings, which represents roughly 3 kWh/y per ballast. When multiplied by dozens or hundreds of ballasts in a building, this can amount to hundreds of kilowatt-hours annually. Using CEC's stock estimate of 51 million ballasts in California by 2030, assuming that half of those will be using digital technology, **a 0.5 W standby limit would increase savings by 72 GWh/y, or nearly an additional 20 percent**.

CEC should set power factor requirements at 50 and 80 percent of arc power, not just at 100 percent – Not setting power factor requirements at output levels lower than 100 percent opens the door for a potential loophole in the standards, where manufacturers could turn off power factor correction in order to more easily achieve efficiency requirements at lower output levels, offsetting some of the efficiency savings. This is not just a theoretical possibility, as this behavior was actually observed in external power supplies and documented in a 2012 GeSI-ITU study.[1] Figure 39 illustrates how switching off power factor correction at lower output levels affects efficiency. Allowing dimming ballast manufacturers to do this would offset some of the gain from efficiency standards, particularly in office buildings where the length of wiring causes power factor losses to be significant.[2]

[1] GeSI-ITU 2012: An Energy-Aware Survey on ICT Device Power Supplies http://www.itu.int/dms_pub/itu-t/oth/4B/01/T4B010000070001PDFE.pdf
[2] Power Factor Correction: An Energy Efficiency Perspective, http://standby.iea-4e.org/files/otherfiles/0000/0041/AGO_G3A_PowerFactorCorrection_FINAL_2011_0617-M.pdf

The IOU test data demonstrates that CEC's proposed efficiency requirements can be met cost-effectively while maintaining a power factor of 0.9. CEC should specify a 0.9 power factor requirement at all three arc power test points in order to ensure that expected energy savings from the standards are effectively realized.

Figure 39: Energy efficiency and correlation with Cos ϕ curves for a set of adapters with some anomalous behaviors (not reported in the previous graphs).



Thank you for your consideration of NRDC's input.

Respectfully submitted,

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