Email received on October 29, 2010 from Craige Thompson.

Dear Mr. Baker,

ONCE Innovations, Inc. appreciates the opportunity to comment on Draft 2 of the ENERGY STAR Luminaires V1.0 specification. We support the work of Energy Star. Our comments are directed specifically to the modulation depth specification at page 32 of the draft.

In the strongest terms, we urge the removal of the newly introduced modulation depth specification (< 50%) for solid state sources for at least three reasons.

1) Absence of Scientific Support: the requirement is not supported by any known scientific research or studies. Our review of the technical literature does not indicate any basis to require modulation depth to be less than 50%. Neither the EPA, DOE, nor Energy Star has suggested any scientific evidence compels or even suggests this modulation depth requirement.

2) Controlled Studies Required on LEDs: Before flicker should be allowed as the basis for a modulation depth requirement, further controlled studies would be essential. Based on our review of the existing research literature on biological effects of flicker, no studies have yet considered and controlled for other potential sources of the measured biological effects. For example, it is not known whether measured brain activity thought to be caused by light modulation may have actually been caused by either electromagnetic signals (EMI) from ballasts or inaudible noise, for example. In new LEDs drivers, such as AC LEDs, the EMI and noise may be substantially reduced relative to lighting systems used in existing studies.

3) Inadequate Specifications: Taken alone, minimum frequency and modulation depth are insufficient parameters to address potential flicker concerns because they do not account for temporal aspects of new and complex waveforms. For example, a low duty cycle waveform with less than 50% modulation may present a greater hazard than a high duty cycle with modulation depth greater than 50%. Moreover, new SSL drivers have been developed with novel current waveforms. The frequency components of the current have, to our knowledge, not been evaluated as they relate to possible flicker issues. We suggest that Fourier analysis could be a useful tool for researching biological effects of flicker for SSL and for developing appropriate SSL requirements specifications.

In summary, we are aware of no research that seems to support a specification based on the minimum frequency and maximum modulation depth as set forth in this draft. Accordingly, the modulation depth limit of 50% appears to be merely arbitrary and the specification appears to be based on mere speculation rather than science. The economic implications on at least two major classes of LED driver circuitry are severe, so it is inappropriate to set arbitrary specifications that would eliminate at least two important classes of SSL drivers from consideration for the Energy Star label.

We urge the removal of the modulation depth specification pending development of

suitable research and a scientifically effective specification. Thank you for your consideration.

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Best Regards,
Craige Thompson, PE
Once Innovations, Inc.