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AccurIC Ltd response to proposed regulations

Additional submitted attachment is included below.

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AccurIC Ltd written response to California Energy Commission Express 45 Day Language for 'Proposed Regulations for Small Diameter Directional Lamps and General Service LED Lamps'

Docket Number 15-AAER-06

13th November, 2015

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Comments on 45 Day Language:

AccurIC Ltd both welcomes the opportunity to offer comment on the proposed wording of the Title 20 regulations relating to small diameter and general service LED lamps and commends the Commission for including flicker-related performance metrics within the proposed regulations. The importance of flicker suppression, as well as dimmability, in terms of the public acceptance of LED lighting technology can hardly be overstated. If LED lighting is to achieve the rollout required to make its full impact on energy and Carbon reduction, it is in our view essential that these two performance metrics improve.

Our comments relate to Section 1604 'Test Methods for Specific Appliances' and in particular, to the fact that certain performance criteria, such as those relating to Flicker, are labelled as 'Optional'. This labelling is designed to indicate that the criteria are conditional upon manufacturers' claims, as described in Section 1607(d)(12). The wording of Section 1607(d)(12) implies that the 'reduced flicker operation' performance criteria, as stated in Title 24, part 6, Joint Appendix 10 (2015) needs to be met if and only if the lamp in question is marked as 'dimmable'. Requiring flicker testing only for dimming lamps is based on the erroneous assumption that flicker at frequencies less than 200Hz arises solely or mainly as a result of dimming. This is not the case.

The main component of photometric flicker arising in LED lighting at frequencies below 200Hz is primarily generated by full-wave rectification of the AC mains, and which occurs at the second harmonic of the mains frequency (in the case of the US, 120 Hz). Whilst it is the case that this flicker component can, in the case of many LED lighting products, be exacerbated by dimming, it is not caused by dimming.

We therefore strongly suggest that the flicker criterion given in Title 24, part 6, JA-10 (2015) **should apply to all LED lamps covered by Title 20 regulations**, with the sole and somewhat obvious limitation that in the case of LED lamps that do not claim to be dimmable, the criterion should only apply at full brightness.

An aspect of the Title 24 regulations which seems to have been omitted from the present draft of the proposed Title 20 regulations is the requirement that manufacturers record flicker percentages at both 100% and 20% output. In the current draft, they are asked merely to declare whether their products meet the current flicker criterion at these two dimming levels. It is perhaps worth recalling why the recording and reporting of specific flicker levels is

required under Title 24. This is to enable the Commission to establish a database, recording flicker percentages of available products, on the basis of which it can decide how and when to update the regulations, such that they come into line with practices recommended by IEEE, on the basis of peer-reviewed research and ballots. Again, there is no rational reason why this database should not also include the performance of products covered by Title 20 regulations. We therefore request that the Commission introduce the requirement for flicker performance to be recorded at both full brightness and 20% dimmed, in the case of dimmable lamps and at full brightness for non-dimmable lamps.

The regulations seek, inter alia, to raise product quality and increase adoption of technologies that use less power – such as LEDs. Flicker is one of the key quality criteria on which many LED lamps are materially inferior to incandescent bulbs. The consumer is unable to differentiate between lamps with dramatically different flicker characteristics because there is no disclosure or no meaningful disclosure of flicker measures on consumer packaging or product labelling. Lack of information about the relative quality of lighting products along dimensions such as flicker and power factor in undimmed and dimmed states encourages competition purely on the basis of relative price which in turn may encourage manufacturers to sell lower quality bulbs with shorter operating lives. The lack of consumer information about flicker is a barrier to improving the flicker qualities of lamps and increasing the rate of adoption of LED lamps.

We believe that consumers should be empowered to make informed choices when buying replacement light bulbs. Disclosure of relevant flicker quality information beside other lamp specifications such as power, lumens, and colour temperature would allow the consumer better to judge relative product quality. If all packaging disclosed the flicker characteristics of lighting products by reference to the levels of flicker in GLS incandescent bulbs and to the recommended levels in IEEE1789 consumers would be able to make informed decisions. The key measures set out in IEEE1789, namely light modulation or % flicker and frequency should be disclosed for all lighting products.

The technology to make suitable power drivers to eliminate or materially reduce flicker exists today. Regulators have the power to require better consumer information and to incentivise or require industry to supply better quality product. Setting medium term targets for relevant quality criteria assists consumers and manufacturers progressively raise standards. Requiring disclosure of flicker information and setting out targets for acceptable levels of flicker in relevant products will progressively raise standards. IEEE1789, published in August, 2015, sets out the appropriate measures and provides recommendations towards which the lighting industry and society can work. Power drivers which meet the recommendations of IEEE1789 are expected to be available at competitive prices in 2017.

In line with our previous submissions we, along with respected researchers and academics, continue to encourage the Commission to align, at the first possible opportunity, the flicker criteria given in Title 24, part 6, JA-10 (2015) with the recommendations of IEEE Standard 1789. We do so in particular, in view of the fact that the recommendations have passed IEEE ballot twice and are based on peer-reviewed research. Currently, the flicker percentage cited as acceptable by JA-10 – namely, 30% - for flicker frequencies below 200Hz, is more than three

times the level regarded as acceptable by IEEE Standard 1789 at 120Hz and more than seven times the level regarded by IEEE as representing No Risk of flicker-related physiological effect at the same frequency.

Background:

AccurIC Ltd is a privately funded technology innovator in the area of LED lighting drivers and ballasts. It has given written input to both Title 24 and Title 20 proposed regulations in relation to LED lighting quality metrics, having participated in the writing of IEEE Standard 1789, relating to flicker performance. Against that background, AccurIC Ltd continues to support the Commission's efforts in establishing minimum quality standards, aimed at ensuring public acceptability of a technology, the successful adoption of which will contribute significantly to the reduction in CO_2 emissions required to meet climate change targets. It is with the aim of encouraging such public acceptance that AccurIC Ltd continues to develop LED driver and ballast technologies, in the form of Application Specific Integrated Circuits (ASICs) and associated reference designs that will allow lighting manufacturers to produce LED lights, tubes, troffers etc, that are capable of not only reducing, but eliminating flicker, as well as providing dimming down to 0.1% brightness and maintaining high efficiency throughout the dimming range.

We feel it is vital that the Commission keeps sight of its assertion, made in the context of the drafting and adoption of its Title 24 regulations, that insisting upon 'high quality' in LED products will reduce the likelihood of residents reverting to lower efficiency lighting solutions. We believe strongly that there is no reason why quality standards relating to lighting in existing build (covered by Title 20) should, other than for reasons of practicality, differ from those established in Title 24, covering new-build.