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Additional submitted attachment is included below.

LUTRON ELECTRONICS CO., INC.

11 October 2021

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Lutron Comments to CEC on Low Power Mode Data Collection Procedure (LPM DCP)

Docket ID No. 17-AAER-12

Dear Dr. Pasha:

Lutron thanks you for the opportunity to provide the attached comments on the Low Power Mode Data Collection Procedure.

As you may know, Lutron was founded in 1961 and is headquartered in Coopersburg, Pennsylvania. From dimmers for the home, to lighting management systems for entire buildings, the company offers more than 17,000 energy-saving products, sold in more than 100 countries around the world. In the U.S. alone, Lutron products save an estimated 10 billion kWh of electricity, or approximately $1 billion in utility costs per year. The company's early inventions - including the first solid-state dimmer invented by Lutron's founder Joel Spira - are now at the Smithsonian's National Museum of American History in Washington, DC.

Please find our detailed comments below. We look forward to working with you further on this important project. Please contact me at (610) 282-6468 or at sirving@lutron.com if you have questions or would like more information on these comments. Thanks again for your consideration.

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CEC has embarked on an ambitious goal to consider low-power mode (LPM) states for most products with a single test method. The obvious benefit to this approach is that it can be applied to many products to quickly identify trends and relative LPM power consumption. The con to this approach is that is may not adequately address some products, potentially reporting inconsistent or exaggerated LPM power consumption values.

Additionally, the general shift away from individual products towards integrated products and systems of products makes this goal even more challenging.

LPM is a nuanced study and collaboration among test labs and manufacturers is key to achieving accurate and representative LPM measurements. Throughout this process, CEC and the CASE team have encouraged collaboration with all stakeholders. We are presenting these comments in that same spirit, and plan additional comments as CEC begins to consider target setting.

1. Definitions of *primary function* and *secondary function* are too ambiguous, resulting in inconsistent/inaccurate measurements of LPM power and other unintended consequences.

The draft DCP defines *primary function* as "an intended purpose or main service that the UUT provides a user" and *secondary function* as: "other functions which may enhance the primary function(s) or can assist with the use and operation". These definitions make sense for a simple, stand-alone product that has a well-understood primary function and limited secondary function(s).

Consider an electric can opener. Arguably its primary function is to open cans, and therefore its DCP inactive state is when it is connected to mains power and not opening a can. Now consider a child's plug-in nightlight. Its primary function is to provide light when it is dark, and arguably its DCP inactive state is when the nightlight is not illuminated while any supporting control circuitry remain active (such as daylight sensing).

Now let's combine those two simple products together and create a new product – a undercabinet can opener with a built-in nightlight. What is the primary function of this product? Is the primary function still just that of a can opener (in which case the nightlight should be illuminated in the DCP inactive state) or does it have two primary functions (in which case the nightlight should not be illuminated). Should the interpretation change if the same product is marketed as a Kitchen Safety Light with built-in electric can opener?

It's quite possible that different test labs would choose differently among these two interpretations, resulting in significantly different measurements. Even worse, in practice different test labs evaluate products from different manufacturers. Comparatively, the results could artificially make one product appear to perform far worse than the other, when they may actually have the same LPM power consumption.

The above thought experiment is intended to be a simple one to illustrate the concern. Now let us consider a real example – a smart streetlamp like those piloted in the City of Los

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Angeles. Smart streetlamps have a plethora of new capabilities in addition to lighting, including public Wi-Fi, 4G/5G networking capability, USB charging ports, people and vehicle counting, electric vehicle charging, cameras, and environmental sensors. We believe that all of these functions should be considered primary, as previously they would have been separate products; however, using the proposed definitions it is possible that only the lighting function would be considered primary. To further complicate this example, the product that was installed in Los Angeles is called a "Smart Node". Now perhaps the networking features have become primary while lighting and others have become secondary. Even the lighting portion of a smart streetlamp cannot be assured to be considered a primary function!

Typically, when multiple products are integrated into a single product, the overall LPM energy consumption is lower than that of the two separate products. If this definitions issue is not sufficiently resolved, it will likely have unintended consequences. Manufacturers would be encouraged to offer separate products, resulting in greater real-world energy usage and higher consumer prices – all while appearing to perform better in the LPM evaluation.

Ultimately, this issue stems from the broad nature of the LPM road-mapping scope. We believe these definitions require refinement before proceeding into the data collection phase of this project. If better definitions cannot be derived, there are other options for the CEC to consider, such as limiting the scope to simple products or specifying a narrow set of secondary functions to leave on during the test.

No matter which course CEC decides to take, the best solution will include some form of communication between the test lab and the manufacturers to agree upon on the characterization of all functions, detailed equipment setup, and reported LPM values. Only then can CEC be confident that the reported data represents real-world LPM power consumption. The data reporting tool should be updated to include a required field for manufacturer consensus.

2. Environment conditions during LPM testing must seek to allow the UUT to remain in LPM throughout the test. This requires collaboration with the manufacturer.

The CASE team has correctly identified the need to control environmental variables during LPM testing. While we agree that the identified variables are each important, they are incomplete.

Manufacturers employ different strategies to reduce LPM power consumption, and it is important to ensure that environmental factors do not inadvertently change the UUT's mode. For example, there are products that are designed to operate on a unique RF channel that enter an LPM mode while waiting for communication on that specific channel. As test labs evaluate many products at the same time, it is possible that other products in the lab will operate on that same channel, causing the UUT to "wake up" during testing. This will cause higher reported DCP inactive state power but may not be otherwise observable to the test technician.

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The spirit of the CEC road-mapping process is to inspire manufacturers to seek out innovative means to reduce LPM energy consumption. It is, therefore, impossible to identify all the different methods that will be employed. Again, this requires consensus between the test labs and the product manufacturer to ensure that all appropriate environmental conditions are controlled during the test.

3. Devices should be tested separately to the greatest extent possible

As individual products are replaced by systems of products, determining what constitutes an UUT can be challenging. Should a device be connected to all its peripherals when undergoing LPM testing? Manufacturers bundle products together in ways they believe their customers desire. It is often true that a consumer can buy a single device or that same device bundled with other devices. Sometimes these bundles include multiple products in one box and sometimes they are provided in separate boxes. Separate boxes can be delivered to the customer in one or more shipments.

The CASE team proposal requires testing all peripherals that "ship with the UUT" and "any additional equipment the UUT requires (but does not ship with) in order to provide the primary function(s)". The DCP should not differentiate between devices shipping directly with a product and those that ship separately. We recommend treating all peripherals the same way – by connecting only those devices which are required for the UUT to perform their primary function(s). Untested peripherals could then be tested as separate UUTs to characterize their LPM energy consumption.

Additionally, multiple pieces of the same product (or similar) can be sold together. For example, Lutron sells some of our dimmers in "bulk packs" where multiple pieces of the same product are included in a single box. This represent a win-win-win scenario: it can be offered at a lower cost to the consumer, it improves shipping efficiency, and it reduces packaging waste.

However, this proposed DCP does not address how to test these bulk packs. Should they be tested together? In a three-pack of our dimmers, each dimmer would measure the same LPM power consumption, resulting in 3x the single product measurement. At best, this seems like uninteresting results and wasted testing burden. At worst, the data could be interpreted that this particular SKU has 3x the LPM power consumption of a typical dimmer. Consistent with the recommendation above, as a single dimmer provides the primary function, it should be tested separately without the other dimmers in the circuit.

4. CEC targets for LPM consumption must consider power conversion losses – whether included in the measurement or not

The draft DCP evaluates products based upon their supplied power source:

1. Main-voltage products are powered by 120V mains.
2. DC-powered products supplied with a power supply are tested using their supply

3. DC-powered products not supplied with a power supply are tested using a DC power source.
4. POE-powered products are tested using an external PSE.
5. USB-powered products are tested using an AC-to-USB power adapter

Products with power sources listed in bullets 3-5 are tested on the secondary side of power supply. Products with power sources listed in bullets 1 and 2 at tested at the primary side of the power supply. Therefore, power conversion losses are only measured for products with power sources listed in bullets 1 and 2. As LPM consumption measurements are expected to be small, incontinent application of power conversion losses can result in seemingly material differences among similar/same products. In other words, products with similar functions are not being tested consistently.

In almost all cases, power conversion losses take place. If CEC decides to keep the test method as is (i.e., these losses are included in the reported LPM power consumption for some products but not others), CEC will need to take this into consideration when setting targets. Perhaps products with power sources listed in 1 and 2 can have a higher target, or products with power sources in bullets 3-5 are assessed an additional power consumption appropriate to typical supplies of that category. Stakeholder engagement is needed to resolve this issue.

5. LPM is better suited for the road mapping regime instead of a regulatory one

CEC has set an ambitious goal for LPM by trying to evaluate almost all electrical products. A single test method cannot be expected to represent real-world conditions for all products, and the use of this test method and subsequent data must be responsive to new learnings and flexible when product-specific issues arise.

Earlier in these comments, we have advocated for discussions between the test lab and the manufacturer. These two stakeholders coming to consensus is critical to truly understanding how products perform in LPM. The collaborative nature of this work supports the non-regulatory approach proposed in the road-mapping phase. The regulatory regime cannot allow for flexibility in test procedures and has typically had the effect of reduced collaboration among these different categories of stakeholders.

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