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Philips Lighting Comments on Low-power mode 17-AAER-12

Additional submitted attachment is included below.

June 16, 2017

Submitted electronically

Andrew McAllister, PhD
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Docket No.: 17-AAER-12

Comments on 2017 Appliance Efficiency Phase 2 Pre-Rulemaking – Low-Power Mode

Dear Commissioner McAllister,

Philips Lighting appreciates the opportunity to provide the attached comments on Low-Power Mode for the 2017 Appliance Efficiency Phase 2 Pre-Rulemaking.

Philips Lighting is a global leader in lighting products, systems and services. Our understanding of how lighting positively affects people coupled with our deep technological know-how enable us to deliver digital lighting innovations that unlock new business value, deliver rich user experiences and help to improve lives. Serving professional and consumer markets, we sell more energy efficient LED lighting than any other company. We lead the industry in connected lighting systems and services, leveraging the Internet of Things to take light beyond illumination and transform homes, buildings and urban spaces.

Please contact me if you have any questions about these comments.

Sincerely,

Dr. David Woodward
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PHILIPS

2017 Appliance Efficiency Phase 2 Pre-Rulemaking

Low-Power Mode, Docket 17-AAER-12

June 16, 2017

Philips Lighting applauds the Energy Commission for moving forward in this area and developing an updated perspective on Low-Power Mode. We support the roadmap approach and believe it is more collaborative than the traditional standards development process and is a more appropriate regulatory framework as we move towards the Internet of Things (IoT) and connected lighting systems.

We think that work on low-power mode is particularly timely, as connected, smart systems and the IoT are experiencing exponential growth. The IoT offers great promise for the future. Adaptive, connected systems will become pervasive. Big data and associated analytics will drive new insights and increased awareness about our environment and we expect that many new and innovative data-driven services will emerge. Connected indoor and outdoor lighting-based systems will simultaneously enable multiple benefits to owners and end users with features that facilitate the management of Assets, Scenes, Space Utilization, Parking etc., and perform services like Incident Detection, Pedestrian and Vehicular Traffic Control, Environmental Monitoring, Navigation and Lighting Energy Optimization to mention but a few.

These innovative connected IoT systems are expected to cover a range of applications and will be composed of products, devices, sensors and infrastructures. The benefits, features and functionality of the systems are increasingly enabled by incorporating additional (secondary) functions like energy storage, sensing, imaging and high network availability functions. Obviously that these additional functions will consume some additional energy and cannot be switched off completely without being disconnected from the power source. Consequently "stand-by" or "low-power mode" power consumption of these devices has emerged as an important regulatory concern that, if not addressed and managed carefully, threatens to retard the implementation of networking-based intelligence and the growth of the entire Internet of Things with all its associated benefits.

Quite often, the carrier for these new smart systems is the existing lighting infrastructure which is everywhere and is rapidly becoming connected. This approach is better, faster and more cost effective than developing a new platform or backbone infrastructure for the smart systems. However, it raises the question of when does a lighting system stop becoming a 'lighting' system and become an 'air quality sensor' or a 'space utilization device'? As an example, there are connected LED lamps on the market now which combine the lighting function with a built-in security camera triggered by a motion sensor. Is this a lamp or is it part of a security system? In low power mode, the device will wait for motion or another control input. It is also listening to the network for a command. What power allowance should be provided in each case? Any low power mode regulatory scheme needs to address this issue. A similar dilemma occurs when considering connected street lighting luminaires with built-in gunshot detection and pollution monitoring capabilities. How do we reasonably allocate low-power mode allowances to each of the non-lighting functions?

Our comments use connected lighting as an example to illustrate our thoughts related to low-power mode. At its present rate of growth, connected lighting systems soon will become ubiquitous across residential, commercial and public spaces. The infrastructure associated with the lighting system is being used ever more frequently as a host for sensor-enabled, data-driven applications. These applications can range from system-oriented energy savings to the safety and security of public spaces.

As we further define and develop the Low-Power Mode concept, there is a clear need to develop a way to recognize the open-ended nature of the lighting infrastructure as a 'platform', for example, to host new innovative non-lighting applications. In most cases, these applications (and enabling devices) will be embedded in lighting fixtures. We will therefore need a way to recognize and treat the low-power modes of these non-lighting functions separately from the lighting function.

In the remainder of the document, we address specific topics cited in the May 11th webinar.

Horizontal and Vertical Policy

We strongly support the proposed horizontal and vertical policy with respect to low-power mode. It reflects the new reality that connected luminaires are increasingly likely to have embedded within them devices to support non-lighting applications. To this end, we recognize that illumination is the 'base function' in this case, and that sensors and networking are important additional functions that may support applications such as space utilization and public safety. We support the way the Energy Commission has characterized sensors and networking as 'adders' to the base function. Our collective challenge will be to establish the proper adder (allowance) for each of these functions. We note that this will require a fundamental change from the current 'component' based regulatory approach to one that looks at the system as a whole. If implemented properly, these policies can drive energy efficiency and simultaneously enable innovation. We look forward to working with you in this regard.

Given that the connected lighting infrastructure, including the luminaire itself, is now a platform for other functions, we need to account for the open-ended potential of new, innovative devices being embedded into the luminaire in the future. To this end, it will not be possible to predict, characterize and regulate all additional (non-lighting) functionality at any set time. Said a different way, the Low-Power Mode framework will have to accommodate new 'adders' for specific functions as they are developed. A new function may be added long after the connected lighting system is installed and commissioned in the field.

We note that the 'adder' for the networking function will need to be treated differently than 'adders' for other functions. Networking is the foundation of the infrastructure described above, and in fact, the entire Internet of Things. Networking is fundamental to connected lighting behaving as a system and enables the advanced functionality (including additional energy savings), applications and value delivery.

The performance, and therefore power consumption, of the networking function is driven by the specific applications that are embedded in the system. For example, an incident detection sensor (such as gunshot detection for public safety) may have a low sampling rate in 'normal' mode, but switch to a high sampling rate if an incident is detected. Similarly, a commercial space utilization sensor could switch from a low sampling rate to a high sampling rate depending on building occupancy and activity.

More generally, the power consumption of non-lighting devices that enable non-lighting applications will be driven by application behavior. This will need to be considered when determining the scope of the broader low-power mode initiative.

Information Requested – Product Development Trends

New devices and applications that will be hosted by the connected lighting infrastructure, and hence the fixtures, is exciting, innovation-driven and open ended. Devices are becoming smaller, more power efficient, more capable. In addition, completely new devices are being invented who's power consumption may be anywhere from low to high—perhaps corresponding to the value they enable and the benefits that can be delivered to society.

Information Requested – Market Characteristics

The connected lighting market, and the IoT market that the connected lighting infrastructure enables, is exploding. Although the transition from conventional to LED-based lighting is well underway, the transition from non-connected lighting to connected-lighting systems is in its infancy. Not even industry, much less the Commission, can foresee its potential. Many market research firms (e.g. Navigant Research) have heavily analyzed and quantified this market space.

Framework for Low-Power Mode

In the base category are devices that directly deliver the base function, in our example, illumination. Adders are functions that could be embedded in the device or added later, such as sensing, imaging, and networking to name a few. The adders may also have to take into account that there are a number of different types of sensors (e.g. PIR, temperature, humidity, radiation, chemical, audio, etc.) and networking protocols (ZigBee, Bluetooth, Wi-Fi, etc.).

Definitions

Using connected lighting systems as an example, we see that there are multiple functions and multiple modes of operation. The following definitions apply:

> <u>Function</u> – Predetermined operation carried out by a luminaire or other connected device
> - A device may have more than one function
> - A device may be controlled by an interaction with the user, other systems, the system itself, from environmental inputs and/or time.
>
> <u>Mode of Operation</u> – State of a function or combination of functions.
> - Off mode – May have more than one function/state of device (function) connected to a power source and not in standby mode or active mode. Indicator showing off mode allowed.
> - Standby mode – State of device (function) when connected to a power source, (not off, not active) providing a persistent ability to activate other modes via a network signal, internal sensor or timer.
> - Active mode – State of device (function) when connected to a power source, (not off, not standby) delivering its primary function.

Regarding the standby power of the lighting function, the following definition applies:

> <u>Standby Power</u> – Electrical power consumed by the luminaire under normal operating conditions, with the light source(s) switched off via a control signal*, excluding any emergency lighting charging power and non-lighting functions.*

Standards Activities

International standards development organizations including ANSI and IEC are aware of the Low-Power mode issue. They are currently working on the preparation and publication of standards for power measurement of lighting equipment in Low-Power modes which will include the terms, definitions and procedures to measure the energy consumption in the off mode, standby mode and network mode for each principal function or a combination of principal functions in a system. We recommend that the CEC closely monitor these standardization activities, reference any new IEC and ANSI standards as they are developed and apply pragmatic subsets of modes and (combinations of) principal functions and associated limits in the regulatory roadmap framework.

Summary

- Philips Lighting supports the Energy Commission's initiative with respect to low-power mode.
- We support the roadmap approach.
- We agree with the concept of 'adders' and stress that this concept must be flexible enough to accommodate future functionality and innovation.
- Smart/connected systems will ride on the already ubiquitous lighting infrastructure in homes, businesses and public spaces
- New services and functions, some of which have not been imagined, will create a fundamental paradigm shift on how these systems should be designed, evaluated and regulated.

END COMMENTS