DOE Quadrennial Energy Review
Comments by Cree, Inc.
"Electricity Distribution and End-Use: How Do We Manage Challenges and Opportunities?"
Atlanta, Ga. May 24, 2016

Cree, Inc. respectfully submits the following comments as part of the U. S. Department of Energy's (DOE) Quadrennial Energy Review.

Cree, Inc. is a leading developer and supplier of LED technology, LEDs and LED lighting products and systems. Over the past decade, LED lighting has evolved from a technology with the potential to replace traditional lighting to the accepted standard for energy efficient lighting. The widespread deployment of LED lighting has the potential to reduce electricity usage for lighting by over 50**%** while delivering improved lighting experiences and value-added services to end-users.

Cree started the LED Revolution in the U.S. with the availability of the first economical LED lighting products. At the outset and through the first phase of LED lighting, the objective was to deliver LED lighting products that mimicked the lighting they were replacing in appearance and lighting experience while using much less energy and providing much longer lifetimes. This first phase of LED lighting is nearing its end, as LED lighting is generally expected to replace almost all traditional lighting products over the next several years.

We are now embarking on the second phase of LED lighting which is characterized by the opportunity to deliver lighting products and systems that deliver better light experiences than were possible with traditional technology. LED technology provides the capability to go well beyond what was possible with previous lighting products. What opportunities does this create for building owner/operators and end-users?

LED Lighting products are essentially high-power digital appliances, and when equipped with sensors, intelligence and communications connectivity, provide a platform to both sense and affect the environments in which they are deployed. In the context of the Internet of Things (IoT), LED lights enable the widespread deployment of IoT within buildings – cost-effectively deploying intelligent, connected devices roughly every eight feet in each space people occupy.

Deploying intelligent, connected LED lighting gives building managers the valuable opportunity to collect continuous data about lighting usage, building occupancy, ambient light levels, and depending upon what sensors are deployed, room temperature, CO levels, and other environmental characteristics. At the same time, the lighting can respond to changes in the environment, either via intelligent response to sensor data, or through programmed or scheduled behavior. Examples include:

- sensing room occupancy to turn lights on or off
- reacting to ambient light levels to dim lights to achieve desired light levels,

- changing lighting color to accommodate user preferences
- dimming to satisfy demand response requests
- using lighting to provide way finding in response to emergency situations
- scheduled color changes to accommodate circadian protocols

The intelligence and data gathering capabilities of these systems can be used to identify and effect building energy management in ways not previously possible. Through data analytics, building managers can tune space usage and associated systems (HVAC, security) to maximize energy efficiency while providing an increased level of service to building inhabitants.

One example of these types of systems is Cree's recently announced SmartCast POE lighting system. This system uses standards-based Power over Ethernet cabling and hardware to both power the lights as well as provide networking and secure communications. Through SmartCast POE and SmartCast Manager, building owners can enable intelligent lighting systems that can save up to 70% more when compared to standard LED lighting systems. In addition, by providing a standard Applications Programming Interface (API), we enable connection to external building management systems and other systems. Connecting multiple building management systems delivers a higher level of energy efficiency in a building by coordinating user, event and environmental response and accommodation across multiple systems.

Better light experiences not only improve buildings for users, but also save significantly more energy.

Policy Implications and Recommendations

Dynamic, intelligent lighting systems require a new approach to energy regulation. Lighting load is no longer static suiting a simple device or floorspace metric (lumens per watt or watts per squre foot), but rather now requires a system metric (watts/day per square foot, perhaps). Building codes need to accommodate usage patterns and intelligence, not just static device energy usage.

In addition, by using open, standards-based architectures, lighting systems can now easily integrate with other building systems facilitating building-wide efficiencies. Therefore, effective regulation or standards will address whole-building energy usage, as well. A significant challenge facing adoption of these systems is the use of proprietary, closed systems by many vendors. As demonstrated by the internet, open, standards-based solutions enable the most widespread adoption and economic leverage.

Respectfully submitted,

Greg Merritt
Vice President
Corporate Marketing and Public Affairs
Cree, Inc.
4600 Silicon Drive
Durham, N.C. 27703