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NRDC Comments on Low Power Mode Test Procedure Discussion Document

Additional submitted attachment is included below.

NRDC
NATURAL RESOURCES DEFENSE COUNCIL

NRDC Comments on CEC's
Low Power Mode Test Procedure Discussion Document, released June 20, 2018

Phase 2 Appliance Efficiency Roadmaps
Docket Number 17-AAER-12

September 14, 2018

Submitted by:
Pierre Delforge, Natural Resources Defense Council

On behalf of our more than 95,000 California members who have an interest in receiving affordable energy services while reducing the environmental impact of California's energy consumption, we respectfully submit these comments on the California Energy Commission's (CEC) Low Power Mode Test Procedure Discussion Document, released June 20, 2018. Our comments built on the comments we submitted un June 2017 in response to CEC's Invitation to Participate to the Phase 2 Pre-Rulemaking on Low-Power Modes and Power Factor.[1]

We strongly support CEC's initiative to develop an energy savings roadmap for non-federally preempted electrically-powered products when they are not delivering their primary service to the user (like a TV that has been "turned off" but is still drawing significant levels of power even though no one is watching it). In 2015, NRDC released a report which analyzed smart meter data from 70,000 Northern California homes and found that "always-on" electricity use by inactive devices represented nearly 23 percent of northern California household electricity consumption.[2] And this idle load is likely to increase as more products include sensors, network connectivity, and displays.

This "idle load" was caused by a large number of unregulated devices that individually draw a modest amount of power (and in some cases, a few devices drawing a significant amount of power like continuous hot water recirculation pumps that can draw up to 100 watts continuously). In aggregate, these devices account for the largest use of electricity in California homes. Much of the electricity use can be reduced through modern product design practices that scale power down when a product isn't providing its primary function, like those used on smart phones to make them run longer on a battery charge.

[1] https://efiling.energy.ca.gov/GetDocument.aspx?tn=219215
[2] "Home Idle Load: Devices Wasting Huge Amounts of Electricity When Not in Active Use", June 2015, https://www.nrdc.org/resources/home-idle-load-devices-wasting-huge-amounts-electricity-when-not-active-use

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Capturing this energy savings potential is the next frontier of electrical energy efficiency and is critical for California and for the world to achieve the carbon and toxic air pollution reduction targets that are necessary to mitigate climate disruption and reduce pollution-induced public health impacts.

A broad cross-cutting (or "horizontal") approach is essential to achieving significant savings with low-power mode. This is because, as demonstrated in NRDC's 2015 report, no single product or even sub-category of products accounts for a large share of the energy savings potential. Capturing a significant share of the savings potential will require addressing most products in the same way as battery charger standards covered most battery chargers.

Why an energy savings roadmap?
NRDC strongly supports CEC's energy savings roadmap initiative. This is a new and innovative policy approach for some product categories where it may provide a more cost-effective and faster pathway than a conventional regulatory approach. The objective is to reduce regulatory burden, provide an opportunity for voluntary action by industry, with targets set by CEC to ensure that the level of ambition aligns with the state's climate and clean energy goals. If industry fails to respond to this voluntary approach, CEC can transition from roadmap to regulatory standard.

California has set cross-cutting standards before with battery chargers, and the European Union has done it with standby power including for networked products. This roadmap would similarly address idle power across a wide range of products but using a voluntary roadmap approach instead of a mandatory standards approach.

Key objectives of a "low-power mode" roadmap
The primary objectives of a low-power mode (LPM) roadmap are the following:

1) Products are designed to scale power down when not providing their primary function, or when primary function isn't necessary to deliver intended service to customer and the product could power down to a lower-power mode; and

2) LPM power draw is function-appropriate, i.e. draws no more power than necessary to provide secondary functions that are active in LPM.

To achieve these objectives, it is necessary to characterize both power draw and functions when the product is delivering primary service to users and when it is not. For example, a garage door opener needs to wait for a remote-control signal while in idle mode, a security console needs to monitor sensors but doesn't need the display on, a Wi-Fi router needs to be ready to transmit traffic but doesn't need to operate at full power when it is not receiving or delivering data.

Why a data collection protocol?
NRDC supports CEC's approach to start the roadmap development process by collecting data on a wide range of products, to characterize power draw and function in idle (aka standby, sleep, or low power) mode for a wide variety of products using a common test procedure.

This test procedure need not necessarily be the final test procedure that will be used for the roadmap, its initial purpose is to collect data to inform roadmap scoping and development. As such it may be more

appropriately called "**data collection protocol**" and it may or may not require updates to define a future test procedure adopted by the CEC in the roadmap it eventually publishes.

The data collection protocol should capture not just power draw, but also which functions are active when the product is not delivering its primary service, to help inform the scope and development of the future roadmap and test procedure. Roadmap power draw targets in "low-power mode" will need to consider what functions are active and need to remain active when the product is not delivering its primary service, such as sensors, LED indicators, network connectivity, etc.

How to deal with products which must provide their primary function 24/7 and legitimately don't have a "low-power mode"

Some products need to provide their primary service 24/7 and don't have a low-power mode. For example, a security camera needs to record and transmit data 24/7.

The term "low-power mode" may not be appropriate for such products, but it is still important to characterize functions that are active in such products and power draw after an extended period of user inactivity, to inform the scope of the roadmap. This data will help CEC determine how to define the criteria that will determine which products should be in scope of the roadmap.

In addition to implying that every product should reduce power from active mode levels even if not appropriate for intended use or should reduce power in a similar amount of time, the term "low power mode" is problematic for another reason: it implies that there is a "low power" operational mode that is common across products. This isn't necessarily the case, as products have very different usage cycles which call for different low-power modes and in some cases no low-power mode. A low-power roadmap doesn't need a common low-power mode, it may address different low-power states depending on product categories. The first step is to characterize the behavior of a large sample of products after a period of inactivity, to inform the scoping of the roadmap and potentially groupings of products by applicable low-power states.

We recommend using a different term than "low-power mode", such as "standby", "long inactive" (inspired from "long idle" for computers), or "Long-no input" to better represent that the data being collected is not restricted to products that have a low-power mode and doesn't imply that every product should have one.

NRDC Comments on Appendix A questions

1. Provisioning the Product
1.1. Should the product be allowed to run for a specific amount of time, for example 24 hours, to allow the product to update and provision software before taking the LPM measurements? If so, what is the appropriate amount of time?

Reproducibility

One of the key requirements of a test procedure is reproducibility, meaning that test results must be reproducible over time, from when a product was initially certified, to months or years later when customers use it or when enforcement authorities need to verify manufacturer reported data. Allowing a product's software (operating system, firmware, and key applications) to be updated before testing can radically alter the product's energy use: software drives the use of resources (e.g. processor and graphics), and it can power down unused hardware components. If a software update disables internal power management, then energy use of a product could be several times higher than with power management.

To ensure reproducibility, it may be necessary to test products with original factory software configuration, without any software updates.

Representativeness
On the other hand, allowing the product to update may be more representative of energy use in the field, as products in the field get regularly updated.

A possible approach would be to test twice: once without any updates, once with full updates, and taking the average of the two measurements.

We also suggest waiting sufficient time before starting measurements to ensure a product has run through the full set of available updates. Based on testing of computers, this can take several hours. We recommend CEC collects this data as part of the data collection phase and sets the update time delay accordingly.

Energy mode settings
Some products offer the choice of energy efficiency mode at initial setup. For example, Microsoft Xbox One game console (at least in its early versions) offered users the choice to use an "Instant On" mode for "faster startup time" or an "Energy-saving" mode. Some products offer the rapid start or energy-saving mode by default, and the user interface may encourage users to pick one or the other. In addition, energy saving modes don't always stick: a 2016 NRDC report[3] showed that certain TVs disabled the energy savings mode when changing largely unrelated settings such as screen brightness.

To ensure these factors around energy mode settings, including default mode, what the interface encourage the user to do, and the energy saving mode sticks over time, we suggest testing once in the default mode, and once in the highest-power mode if different.

2. **Testing State**

2.1. Is the approach outlined in section 2 of the test procedure an effective way to define the testing state for a broad range of products? If not, explain why.

[3] "The Secret Costs of Manufacturers Exploiting Loopholes in the Government's TV Energy Test: $1.2 Billion for Consumers & Millions of Tons of Pollution", https://www.nrdc.org/resources/secret-costs-manufacturers-exploiting-loopholes-governments-tv-energy-test

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As discussed in our general introductory comments, we support CEC's general approach.

We suggest renaming this state to better reflect the intent of the data collection to characterize product power draw and functions in the prolonged absence of input, whether user or other external inputs (network, sensors, etc).

2.3. How long should X (the time between discontinuation of user interaction and the beginning of the measurement) be?

For data collection purposes and at this early stage of the roadmap development process, we suggest the data capture starts right from the end of external input, to a long enough time (e.g. 6 hours), that it gives a full picture of how long it takes a product to transition, what is the longest time it takes some products to transition to LPM, and the various power levels over that transition period. The full histogram of power draws over that period should be captured, not just the average power draw.

For the roadmap final test procedure, the time will need to be adjusted so that it leaves reasonable time for the product to transition to LPM state. A balance needs to be found between encouraging a rapid transition and not impacting user experience which might lead some users to disable power management. ENERGY STAR recommends 30 minutes before entering standby for computers, NRDC supports 1 hour for game consoles, to ensure gamers can pause games for a short time and return to the console without incurring a long resume time. There are a lot more energy savings from ensuring that a product does transition to an appropriate low-power mode than to make it transition a few minutes earlier and risk users disabling power management altogether.

The duration of the test should be long enough that it captures intermittent activities. For example, the Nintendo Wii has a best practice implementation of LPM where the console is in a sub-1-watt LPM, and "wakes up" every hour to ping the server for any requests, then goes back to LPM. The test should be able to capture this type of intermittent activity in LPM.

We suggest that the exact time and duration of the test be defined after data collection, and perhaps set by product categories depending on the type of user interaction each product provides.

4. Sensors

4.3. What is the appropriate instruction to ensure that sensors do not cause the product to exit LPM during the test and also represent real life situations? No environmental input or no specific trigger?

No environmental input is an easier condition to reproduce. While it may not be as representative as some life-like environmental input, it is a good and relatively simple starting point to measure power draw in low-power mode.

5. Charging, wired

5.1. Is the methodology described in section 5 of the test procedure a reasonable approach to evaluate the wired charging function to minimize its power impact when it is not being used?

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NRDC strongly supports the need to test LPM for products with charging peripherals attached and CEC's proposed test procedure.

When testing game consoles by in 2014, we found that charging peripherals could interfere with LPM. Given the proliferation of rechargeable devices, it is important to ensure that charging is implemented in a smart manner that supports good LPM practices.

6. Charging, wireless

6.1. Is the methodology described in section 6 of the test procedure a reasonable approach to evaluate wireless charging function to minimize its power impact when it is not being used?

NRDC strongly supports this approach as well. NRDC commissioned an analysis of wireless charging in 2017 (Foster-Porter S., ACEEE 2018). The analysis found that wireless-powered devices are rapidly gaining market share, particularly smart phones. It is therefore important to ensure that wireless-power technology is developed with power management in mind.

Note: No comment on DC Powering. Could just support if this is potentially controversial, or skip otherwise

7. DC Powering

7.1. What is the appropriate input voltage to supply during testing, particularly for products that specify a range of acceptable DC input voltages?

7.2. How should the measurement be made? Are the instructions in the ENERGY STAR display test procedure appropriate? Explain how the procedure should be modified, if the ENERGY STAR instructions are not adequate.

Note: No opinion on Systems, either option look fine…

8. Systems

8.1. Would the approach described in section 8 of the test procedure for systems that are powered separately from their system hub adequately represent system's power draw? If not, explain how to capture the actual power of products that need to connect to other products, wired or wirelessly, in order to transfer data.

8.2. Does the test procedure described in section 8 for systems that are powered from their system hub apply to all products? Explain if and how this approach should be modified to be applicable for new technologies.

8.3. Are the test procedures described in section 8 reasonable approaches?
Provide reasons and explain what needs to change.

9. Off Mode

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9.1. Is the definition in section 9 an appropriate definition for the off mode? If not, what is an appropriate definition?

9.2. Are any other instructions beside those in section 9 needed to collect the off mode power measurement?

9.3. How might products that do not have hard or soft switches be turned off?

9.4. What proportion of products do not have an off mode?

NRDC supports the inclusion of Off mode in the data collection. Off mode is a low-power mode, data collection will enable CEC to assess potential savings opportunities from including off mode in the LPM roadmap, and the incremental test burden is negligible.

We appreciate the opportunity to provide this input to the CEC and thank CEC for its careful consideration of our comments.

Respectfully submitted,

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