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Results of Invitation to Participate: Low Power Modes and Power Factor

Phase II: Appliance Efficiency Pre-Rulemaking

Appliances & Outreach & Education Office

Efficiency Division

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California Energy Commission: Rosenfeld Hearing Room

July 21, 2017

Agenda

- Purpose
- Low Power Modes
- Responses
- Power Factor
- Responses
- General Comments
- Next Steps

Purpose

- The Energy Commission is gathering proposals for Phase 2 products for appliance efficiency regulations.
- In the Invitation to Participate (ITP) workshop, which was held on May 11, 2017, stakeholders were asked to provide relevant information and data that will help the Energy Commission to shape energy efficiency policy for Phase 2 appliances.
- Staff will present the results of the comments received.

Purpose

- The ITP requested information and data on the following topics:
  - Commercial and Industrial Fans & Blowers
  - General Service Lamps
  - Spray Sprinkler Bodies
  - Tub Spout Diverters
  - Irrigation Controllers
  - Set-Top Boxes
  - **Low Power Modes & Power Factor**
  - Solar Inverters

Low Power Modes

Respondents to Invitation to Participate

- California Investor-Owned Utilities (IOU)
- Information Technology Industry Council (ITI)
- Natural Resources Defense Council (NRDC)
- TechNet
- Consumer Technology Association (CTA)
- The Internet and Television Association (NCTA)
- California Cable and Telecommunications Association (CCTA)
- ARRIS Group Inc
- Philips Lighting

Information Requested

- Product Definition & Scope
- Framework
- Existing Standards & Standards under Development
- Existing Test Procedures and Test Procedures under Development
- Sources of Test Data
- Product Lifetime
- Product Development Trends
- Impacts to Small Businesses & Market Competition
- Duty Cycles & Operations
- Baseline Energy Consumption
- Energy-consuming Features
- Energy-saving Features & Technologies
- Control Features
- Trade-offs & Solutions
- Cost Analysis
- Product Specifications & Modes of Operation

Framework

Commenter	Framework	Details/Examples
IOUs and NRDC	Horizontal/vertical approach & auto power down (APD)	• For example 4 clusters: network equipment, electronic edge devices, non-electronic edge devices, and non-networked products. • Auto power down based on timers, sensors, or smart logic that learns the occupants' usage pattern
ITI, TechNet, Philips	Horizontal/vertical approach & power management	Identify product category specific requirements that may include separate limits, performance / capability adjustments (allowances) etc.
Philips	Horizontal & vertical approach (wholistic, not component level)	Horizontal: Base function as lumination Vertical: networking (space utilization & public safety) (Zigbee®, Bluetooth®, Wi-Fi), sensing (PIR, temperature, humidity, radiation, chemical, audio), imaging
CTA, CCTA, NCTA	-	Small network equipment to be in conjunction with set-top boxes

Discussion:
What should each cluster of products include?

Product Definition and Scope

Commenter	In Scope	Out of Scope
IOUs	Broad scope, including consumer electronics	Federally or California state regulated products
NRDC	Broad scope	Federally regulated products
ITI	Products with the greatest potential for improved energy efficiency. Example: Internet connected edge devices	• Products that are regulated (federally or internationally) including products that are subject to the EU Lot 26 regulation • Mobility products that operate primarily on battery power • Devices such as networking equipment and network infrastructure equipment
Philips	IOT: Connected indoor & outdoor lighting	
CTA, CCTA, NCTA, ARRIS	-	Small network equipment

Product Definition and Scope

Commenter	Term	Definition
Philips	Function	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.
Philips	Modes of operation	State of a function or combination of functions
Philips	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
Philips	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

Product Definition and Scope

Commenter	Term	Definition
Philips	Active mode	State of device (function) when connected to a power source, (not off, not standby) delivering its primary function
Philips	Standby power	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

Discussion:
Definitions for other products in the scope?
Separate levels/definitions for sleep and standby modes for each product cluster?

Existing Standards & Standards under Development

Existing standards:

- European Commission (2014)
- Natural Resources Canada
- U.S. states (California, Connecticut, Oregon)
- Korean e-Standby Program
- ENERGY STAR ®
- G20 CDA Voluntary Agreement
- Communication and power management protocols

Existing Test Procedures and Test Procedures Under Development

Commenter	Test Technique Details	Test Procedure
IOUs	Set-up instructions for the product under test, including LPM functions, such as network connections and sensors	No harmonized test procedure exists; CASE team working to develop one
	Instructions for measuring power	IEC 62301:2011
	Auto power down (APD)	CASE team working to develop one
CTA, CCTA, NCTA	Test procedures for SNE	ANSI/CTA-2043 and ANSI/CTA-2049

Existing Test Procedures and Test Procedures Under Development

Commenter	Test Technique Details	Test Procedure
ITI		• ETSI/ATIS/ITU-T for routers and switches • CENELEC/ETSI for lot 26 • IEC 62301 Ed 2 • IEC 62623 • DOE BCS test procedures
Phillips	Development of standards for power measurement of lighting equipment in low-power modes (off, standby, and network mode) are underway	• ANSI and IEC

Baseline energy consumption

Commenter	Data	Sources
CTA, CCTA, NCTA	Small Network Equipment: • 9.38 Watts in idle mode (non-efficient models sold in 2015) • Max idle power allowance (VA): 7.92 Watts	D+R International, 2015 annual report at 11
Staff	Average idle power: 8.8 Watts	http://www.energy-efficiency.us/library/pdf/SNE-AnnualReport-2015.pdf

Discussion:

Are there estimates for baseline energy consumption for all devices in the scope?

What duty cycle assumptions should the Commission make?

Market Analysis

Commenter	Data
ITI	There are 50 billion internet connected devices by 2020

Small Network Equipment:

Category	Reported Units
Broadband Modem	2,607,044
Integrated Access Device	20,683,903
Local Network Equipment	5,649,062
Total	28,940,009

Source: 2015 Annual Report Voluntary Agreement for Ongoing Improvement to the Energy Efficiency of Small Network Equipment

Discussion:

Is data available on aggregated stock and shipments for products in scope?

Other Data

- Modes of operation
- Duty cycles
- Product lifetime
- Energy-consuming features;
- Energy-saving features
- Trade-offs and solutions
- Cost analysis
- Impact to small businesses

Power Factor

Respondents to Invitation to Participate

- California Investor-Owned Utilities (IOU)
- Information Technology Industry Council (ITI)
- Natural Resources Defense Council (NRDC)
- ARRIS Group Inc.
- Armin Hauer

Information Requested

- Product Definition & Scope
- Framework
- Existing Standards & Standards under Development
- Existing Test Procedures and Test Procedures under Development
- Sources of Test Data
- Product Lifetime
- Product Development Trends
- Impacts to Small Businesses & Market Competition
- Duty Cycles & Operations
- Baseline Energy Consumption
- Energy-consuming Features
- Energy-saving Features & Technologies
- Control Features
- Trade-offs & Solutions
- Cost Analysis
- Product Specifications & Modes of Operation

Framework

- NRDC and IOUs support horizontal approach

Discussion:
Should products be divided based on displacement power factor and harmonic distortion or product types (similar to LPM)?

Scope and Definitions

- IOUs and NRDC support consideration of PF and LPM together, or if sufficient data and analyses are available, consider decoupling them into two roadmaps.
- ITI suggested including products that have the highest potential for energy efficiency and excluding products that are federally or internationally regulated.
- ARRIS suggested excluding small network equipment from the scope.

Energy-consuming Features

- ARRIS suggested that most consumer electronic devices are capacitive type, they balance inductive type products such as refrigerators.
- NRDC commented that poor power factor causes energy losses in the building wiring and on the grid, wasting energy unnecessarily.
- IOUs suggest evaluating opportunities to improve both displacement power factor and harmonic distortion, and consider the range of technological pathways appropriate to each situation.

Benefits and Cost Analysis

- ARRIS commented that PF correction results in retail cost increase of about $3.
- NRDC commented that poor power factor causes energy losses in the building wiring and on the grid, wasting energy unnecessarily.
- IOUs suggest to consider the full scope of energy and non-energy benefits, such as reduced risk of overheating in buildings' neutral wires and longer lifetimes for distribution transformers

Discussion:
Should PF correction be coupled with LPM to improve the cost efficiency?

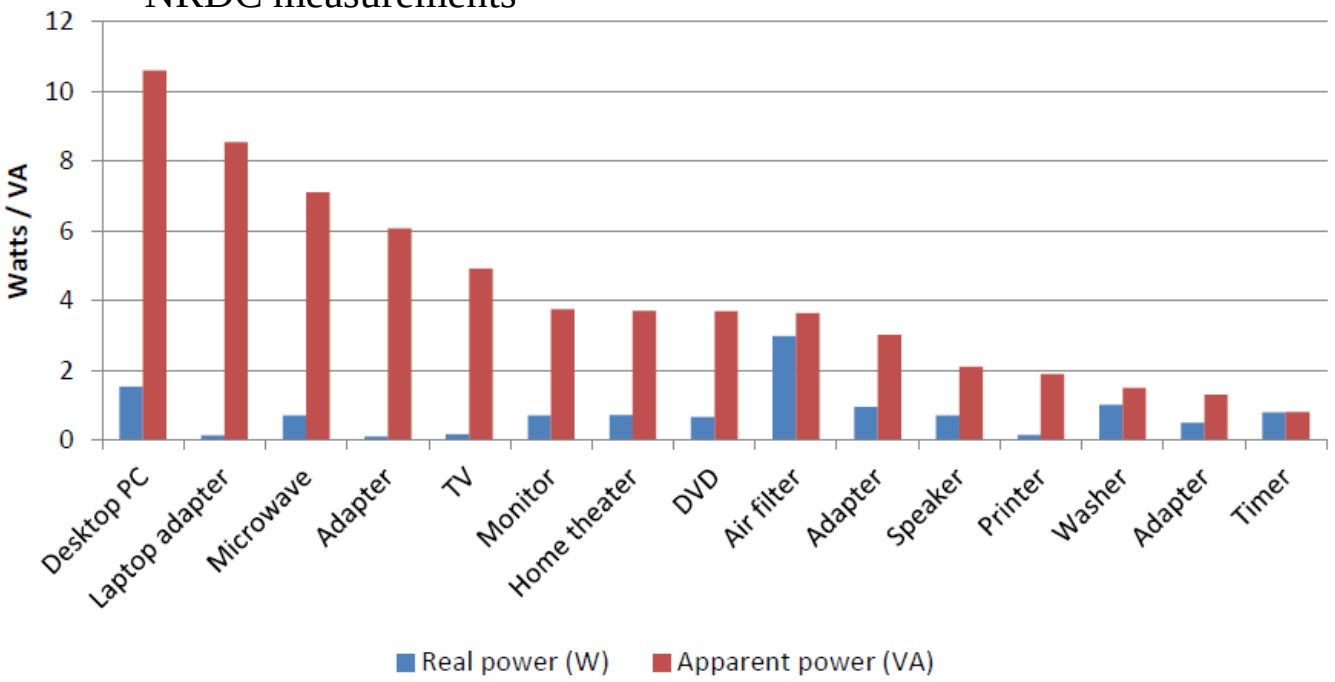
Existing Test Procedures and Test Procedures Under Development

- IOUs commented that no single test method can be applied to all electrical loads to measure power factor.
- Some product-specific test procedures require reporting of power factor, usually under active mode conditions. Example: polyphase and single-phase induction motors.
- IOUs suggested that depending on the ultimate scope and framework for the power factor roadmap, the Energy Commission would need to provide additional testing guidance for in-scope products, potentially piecing testing requirements together from several test procedures.

Sources of Test Data

Commenter	Test Data	Results
NRDC	Electric Power Research Institute, Public Interest Energy Research Program. January 2015. Report number: CEC-500-2016-034	Improved power factor (for loads over 50 watts) could save California ratepayers at least 240 GWh per year

Figure 1 – Apparent Power of Sample Devices in Standby Mode*
* NRDC measurements



Other Data

- Modes of operation
- Duty cycles
- Product lifetime
- Market analysis
- Energy-saving features (PF correction techniques)
- Trade-offs and solutions
- Impact to small businesses
- Baseline energy consumption

General Comments

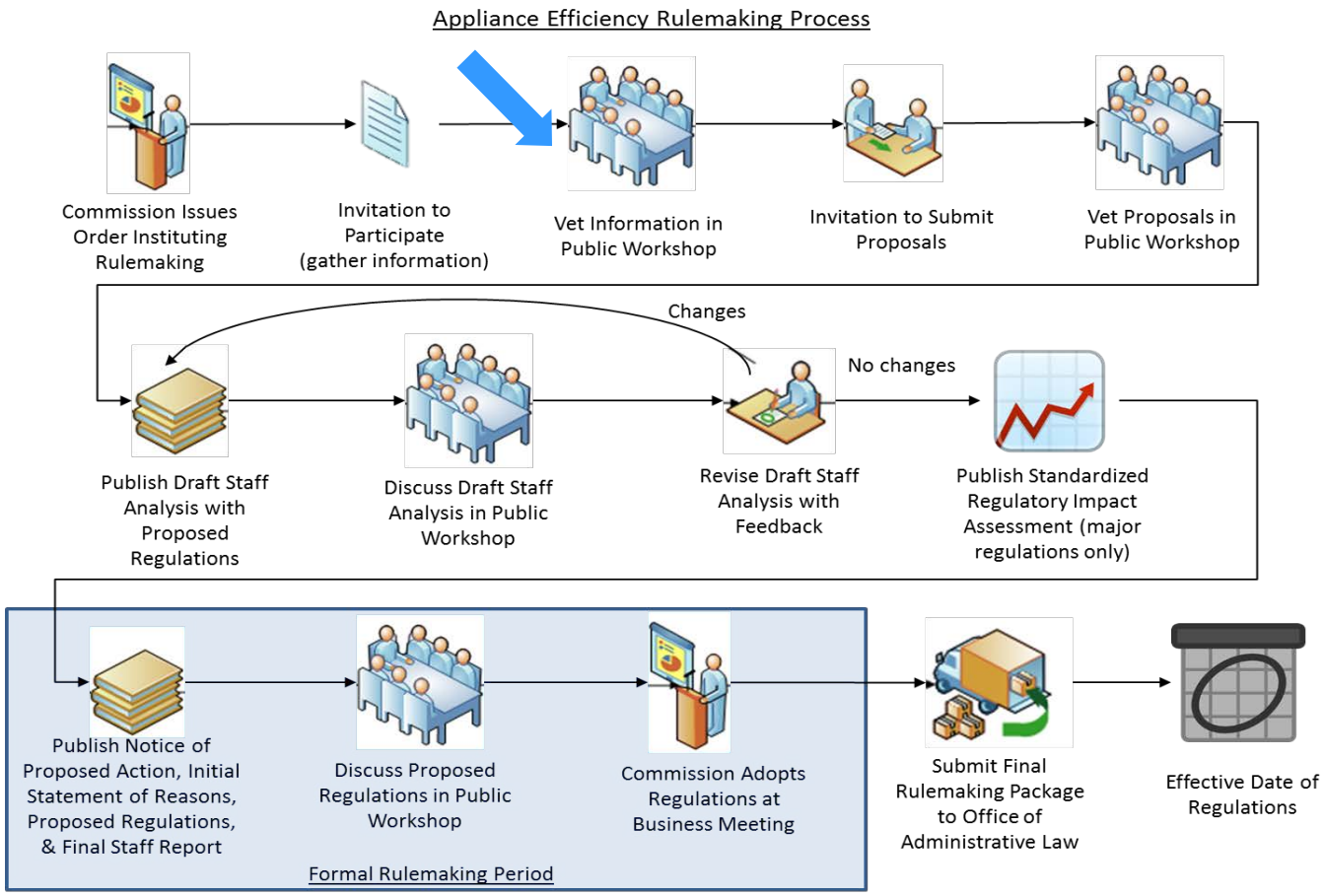
- Are there any other topics stakeholders wish to discuss?

Next Steps

- Following the ITP workshops, the Energy Commission will request proposals for efficiency standards or measures.
- Proposals may be submitted between July 18, 2017, and September 1, 2017.
- Proposal template and guidance is available online.
- Commission staff are available to discuss questions and concerns at any time during the proceeding.

Public Participation

1/27/17



Discussion & Comments

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Backup Slides

Existing Standards & Standards under Development

Commenter	Regulation(s)	Policy
IOUs	European Commission 2014	• Off & standby modes: 0.5 watt or less • Products with information display: 1 watt or less • Network equipment: 8 watts or less • Other connected devices: 3 watts or less (after 1/1/2017), 2 watts or less (after 2019, in progress) • Auto Power Down to (network) Standby within 20 min
	Natural Resources Canada	• Television, compact audio, and video products • off: 0.5 W • standby (products without display): 0.5 W • standby (products with display): 1 W
	California, Connecticut, Oregon	Standby power limits for compact audio, DVD players, televisions
	California	Standby power limits for computer monitors
	Korean e-Standby Program	Low power mode limits, and auto power down for 22 products
	Energy Star	Network standby, standby, sleep, or off mode power limits and auto power down for audio/video, televisions, and computers

Existing Standards & Standards under Development

Commenter	Regulation(s)	Policy
ITI	G20 Connected Device Alliance (CDA) voluntary agreement	Power limits for small network equipment's
	• Ethernet 802,3az • Ethernet WoL • HDMI CEC • Docsis 1x1 mode	Communication protocols
	• IETF EMAN • ETSI GAL	Power management protocols
	• BB CoC • Lot 26 • ENERGY STAR • CEC MEPs	Standards which set targets/ energy requirements policy instruments

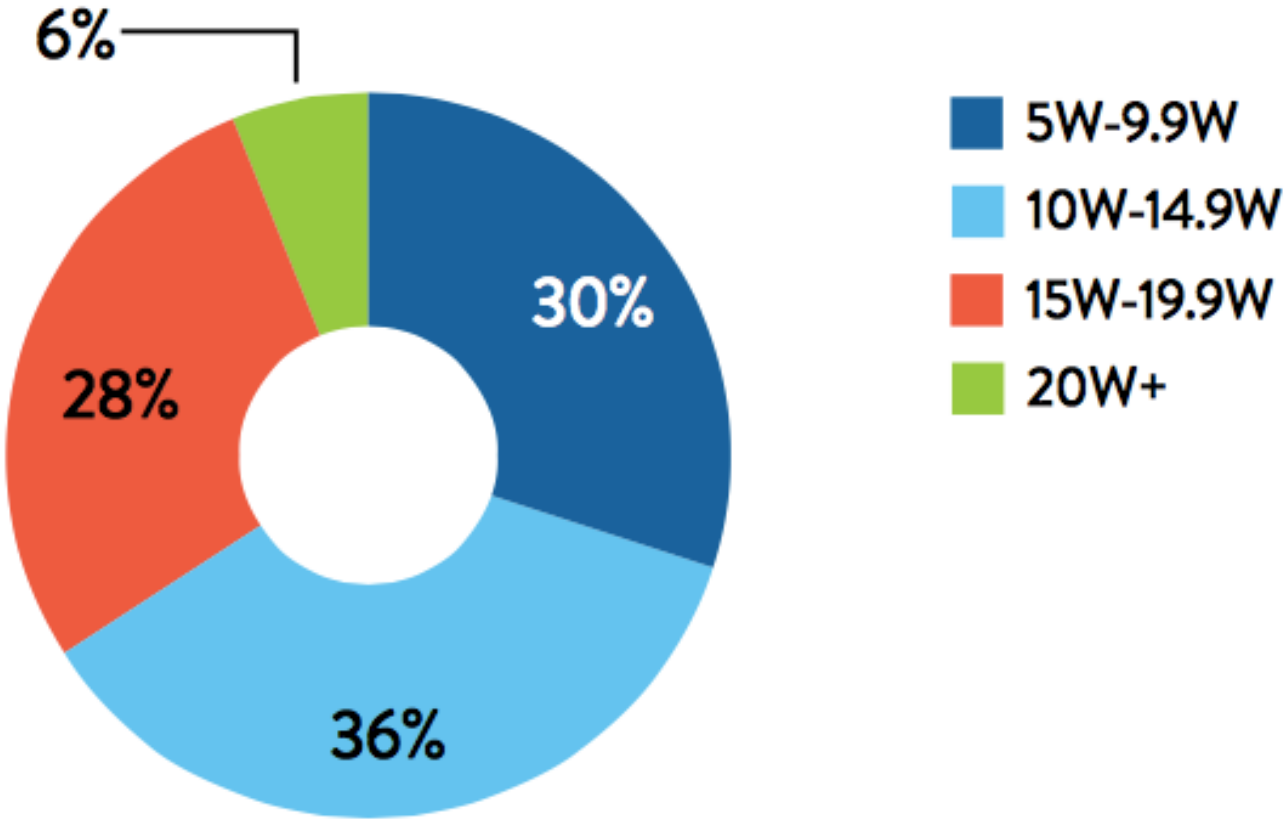
Sources of Test Data

Commenter	Test Data	Results
IOUs	Harrington, L., B. Nordman. 2010. Standby Power and Low Energy Networks – Issues and Directions.	Framework for applying a horizontal approach to LPM
	Harrington, L., B. Nordman. 2014. Beyond Network Standby: A Policy Framework and Action Plan for Low Energy Networks.	Four clusters: network equipment, electronic edge devices, non-electronic edge devices, and non-networked products.
	NRDC. 2015. Home Idle Load: Devices Wasting Huge Amounts of Electricity When Not in Active Use.	23 percent of residential electricity use in (Northern) California are from Idle loads
CTA, CCTA, NCTA	Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas & Electric (SDG&E), Analysis of Standards Proposal for Small Network Equipment (July 29, 2013)	LPM power allowances for small network equipment

Product Development Trends

Commenter	Development Trends
Phillips	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.

Discussion:
What are the most energy efficient features/trends for the products in the scope?



Distribution of Reported Idle Power of Integrated Access Device Models