DOCKETED

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Description:	Phase 2 Pre-Rulemaking Invitation to Participate Presentation 05-11-2017
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Invitation to Participate
Phase 2 Pre-Rulemaking

2017 Appliance Efficiency Pre-Rulemaking

California Energy Commission

May 11, 2017

Project Manager: Ryan Nelson, P.E.

Appliances & Outreach & Education Office

Efficiency Division

Appliances & Outreach & Education Office

Manager: Kristen Driskell

Appliances Unit Supervisor: Leah Mohney

Contributing Staff: Alejandro Galdamez, Jessica Lopez, Ryan Nelson, Soheila Pasha, Patrick Saxton, Sean Steffensen

Agenda

10:00 AM	**to**	**10:45 AM**	**Introduction**
11:00 AM	**to**	**11:15 AM**	**Commercial and Industrial Fans and Blowers**
11:15 AM	**to**	**11:30 AM**	**Tub Spout Diverters**
11:30 AM	**to**	**11:45 AM**	**Spray Sprinkler Bodies**
11:45 AM	**to**	**12:45 PM**	**Lunch**
12:45 PM	**to**	**1:00 PM**	**Afternoon Introduction**
1:00 PM	**To**	**1:15 PM**	**Irrigation Controllers**
1:15 PM	**To**	**1:45 PM**	**Low-Power Modes & Power Factor (Roadmap)**
1:45 PM	**To**	**2:00 PM**	**Set-Top Boxes (Roadmap)**
2:00 PM	**To**	**2:15 PM**	**Solar Inverters (Roadmap)**
2:15 PM	**To**	**2:30 PM**	**General Service Lamps (Expanded Scope)**
2:30 PM	**To**	**3:30 PM**	**Questions & Conclusion**

California Energy Commission

- The state's primary energy policy and planning agency created by the Legislature in 1974
- Responsibilities include promoting energy efficiency and conservation by setting minimum appliance and building efficiency standards, and other cost-effective measures

Appliance Efficiency – A Statutory Mandate

Warren-Alquist State Energy Resources Conservation and Development Act

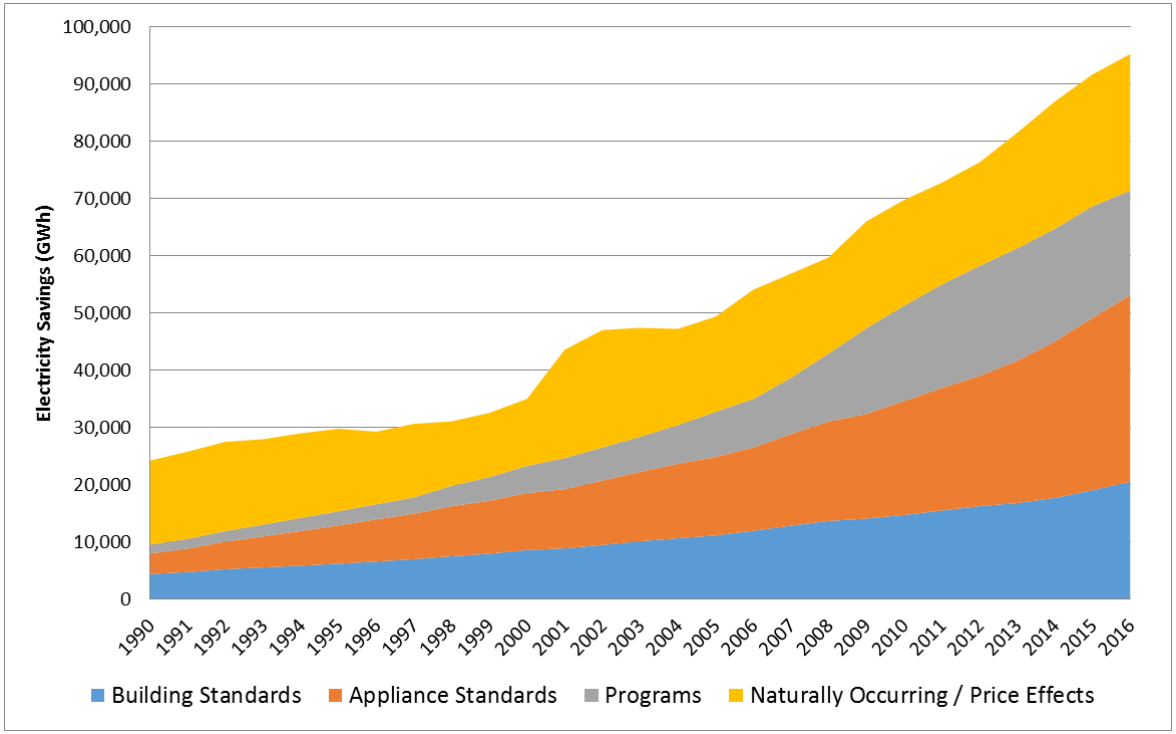
Public Resources Code Section 25402(c)

Requires the Commission to adopt minimum levels of operating efficiency, and other cost-effective measures, to promote the use of energy and water efficient appliances whose use requires a significant amount of energy or water on a statewide basis.

The Benefits of Standards

- Since 1975, energy efficiency standards have saved California approximately $75 billion in electricity costs.

Figure 1: Appliance Standards Have Achieved the Most Energy Savings



Source: California Energy Commission, Demand Analysis Office, 2015

The Benefits of Standards

- Battery Charger standards (Adopted 2012) are projected to:
  - Save California ratepayers $306 million annually
  - Eliminate 1.8 million metric tons of carbon dioxide emissions
- Lavatory Faucets and Showerheads (Adopted 2015) are projected to:
  - Save California $ 702 million annually
  - Save California 38.8 billion gallons of water
- Computers and Computer Monitors (Adopted 2016) are projected to:
  - Save California $350 Million per year
  - Save California 2,332 Giga-watt hours per year

Phase 2 Pre-Rulemaking

- On March 14, 2012 the Energy Commission issued an Order Instituting Rulemaking (OIR) on to begin the process of considering standards, test procedures, labeling requirements, and other efficiency measures for a number of appliances.
- The rulemaking was divided into three phases.
- There are five appliances being considered for a standards rulemaking in Phase 2.
- There are three appliances/modes being considered for roadmap development in Phase 2.

Phase 2 Invitation to Participate Topics

Standards Rulemaking

- ❑ Commercial and Industrial Fans & Blowers
- ❑ General Service Lamps
- ❑ Spray Sprinkler Bodies
- ❑ Tub Spout Diverters
- ❑ Irrigation Controllers

Roadmap Development

- ❑ Set-Top Boxes
- ❑ Low Power Modes & Power Factor
- ❑ Solar Inverters

Standards & Roadmaps

Standards Development

- Minimum mandatory efficiency measures
- Cost-effective
- Based on feasible and attainable efficiencies
- Certify to MAEDBS
- Administrative enforcement

Roadmap Approach

- Negotiated with stakeholders
- Results in white paper (not regulations)
- Establish milestones for product efficiency over time
- Regular reporting on meeting milestones
- Data collection through MAEDBS
- May convert to mandatory standards if milestones not met or to prevent backsliding

How to Submit Data & Information

- **Public Comment**

  Written comments. Written comments should be submitted to the Dockets Unit **by 5:00 p.m. on June 16, 2017**. Written comments will be also accepted at the webinar; however, the Energy Commission may not have time to review them before the conclusion of the meeting.

  Please note that your written and oral comments, attachments, and associated contact information (e.g. your address, phone, email, etc.) become part of the viewable public record. This information may become available via Google, Yahoo, and any other search engines.

How to Submit Data & Information

(Continued)

- **Public Comment Continued…**

  The Energy Commission encourages use of its electronic commenting system.

  Visit the website at:

  https://efiling.energy.ca.gov/EComment/ECommentSelectProceeding.aspx

  Or to go directly to this rulemaking:

  http://www.energy.ca.gov/appliances/rulemaking.html

  Please enter your contact information, any organization name, and a comment title describing the subject of your comments. You may include comments in the box titled "Comment Text" or attach a file in a downloadable, **searchable format** in Microsoft® Word (.doc, .docx) or Adobe® Acrobat® (.pdf). Maximum file size is 10 MB.

How to Submit Data & Information

(Continued)

- **Public Comment Continued…**

  Written comments may also be submitted by emailing them (include the docket number and appliance type in the subject line) to the Docket Unit at:

  docket@energy.ca.gov

  If you prefer, you may send a paper copy of your comments to:

  California Energy Commission
  Docket Unit, MS-4
  Re: Docket No. [see below]
  1516 Ninth Street
  Sacramento, CA 95814-5512

How to Submit Data & Information

(Continued)

- **Public Comment Continued…**

  The docket numbers for this proceeding are:

  17-AAER-06 – Commercial and Industrial Fans & Blowers
  17-AAER-07 – General Service Lamps (Expanded Scope)
  17-AAER-08 – Sprinkler Spray Bodies
  17-AAER-09 – Tub Spout Diverters
  17-AAER-10 – Irrigation Controllers
  17-AAER-11 – Set-Top Boxes
  17-AAER-12 – Low-Power Mode & Power Factor
  17-AAER-13 – Solar Inverters

How to Submit Data & Information

(Continued)

- If the file size is more than 10 MB, if the information includes an application for confidential designation, or if you prefer, paper copies of responses with electronic information provided on a CD or DVD may be sent to:

California Energy Commission
Dockets Office, MS-4
Re: Docket No. [*Insert Appropriate Docket Number*]
1516 Ninth Street
Sacramento, CA 95814-5512

How to Submit Data & Information

(Continued)

Confidential Information:

If interested parties wish to maintain the confidentiality of specific data or information, they should contact Jared Babula in the Commission's Chief Counsel's Office *before* submitting a response to this Invitation. Otherwise, all responses received will become publicly available.

Jared Babula, California Energy Commission, Office of the Chief Counsel

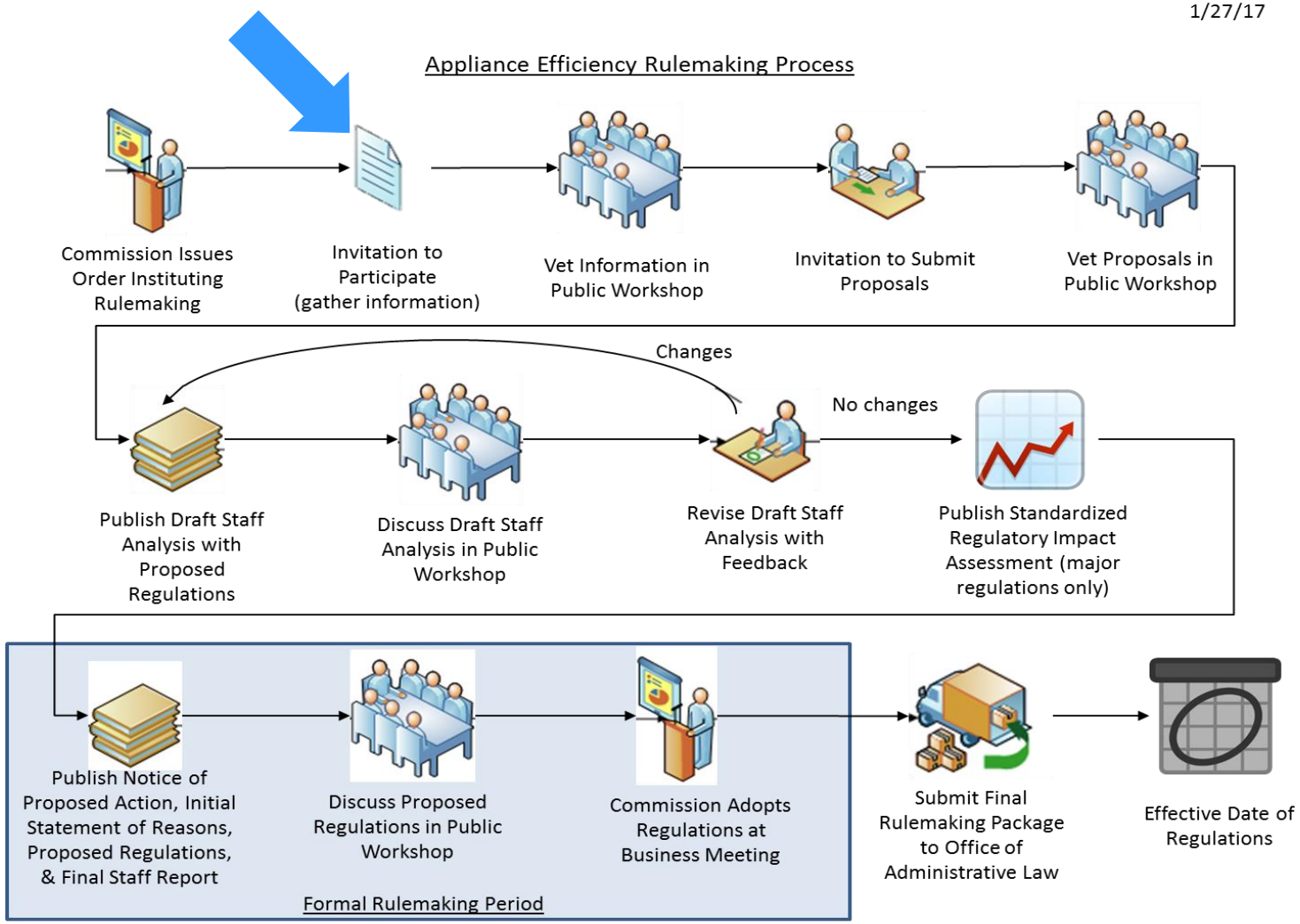
1516 Ninth Street, MS 14, Sacramento, CA 95814-5512

Telephone: (916) 651-1462

Email: jared.babula@energy.ca.gov

Public Participation

1/27/17

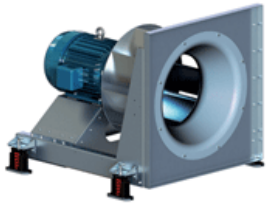


Fans & Blowers

Alejandro Galdamez, P.E.

Mechanical Engineer

Fans & Blowers



Centrifugal fan
Unhoused

Mixed Flow fan
housed

Axial housed

Centrifugal fan housed
with motor

Axial Unhoused

Centrifugal fan
housed

Axial housed with
motor

Axial housed

Axial housed with
motor

Centrifugal fan housed
with motor

Fans & Blowers

Current Status of Regulations

- **Federal: Department of Energy (DOE)**
  - 3rd Notice of Data Availability (NODA) for Industrial Fans and Blowers
  - Scope:
    - Axial, centrifugal, inline and mixed flow, radial, power roof ventilator fans.
    - Exempt safety fans, cross flow fans, circulating fans, induced fans, air curtains, and fans above 150 hp on input shaft
- **California:**
  - Starting regulatory process
    - Scope, Metrics, Data Gathering, Energy Savings, Cost Effectiveness, and Technical Feasibility

Fans & Blowers

Information Requested

- ❑Product Definition & Scope
- ❑Existing Test Procedures and Test Procedures Under Development
- ❑Sources of Test Data
- ❑Existing Standards & Standards under Development
- ❑Product Lifetime
- ❑Product Development Trends
- ❑Operations
- ❑Energy-consuming Features
- ❑Energy-saving Features & Technologies
- ❑Control Features
- ❑Market Characteristics
- ❑Installed Base Characteristics
- ❑Market Competition

Fans & Blowers

Product Definitions and Scope

- **US DOE:**
  - Proposed definition
  - Excludes the following from scope of NODA:
    - Safety Fans, Cross Flow Fans, Circulating Fans, Induced Fans, Air Curtains, and
    - Fans above 150 hp on input shaft.
- **Scope and Definition**
  - Should scope be broadened by CEC?
  - Clarify the definition of a Fan and Blower
  - Include residential Fans and Blowers in scope

Fans & Blowers

Existing Test Procedures and Test Procedure under Development

- **US DOE proposed:**
  - Air Movement and Control Association (AMCA) 210
  - AMCA 207
- **Fan Energy Index (FEI) vs. Fan Energy Rating (FER) metrics**
  - Benefits of FEI
  - Benefit of FER
  - Comparison between FER and FEI

Fans & Blowers

Source of Test Data

- Test lab reports
- Explanation of findings
- Reasoning on proposed test procedure
  - Advantages and disadvantages
- Accuracy of data

Fans & Blowers

Existing Standards & Standards under Development

- Air Movement and Control Association (AMCA)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- American Nation Standards Institute (ANSI)
- International Standards Organization (ISO)
- European Union (EU) No. 327/2011

Fans & Blowers

Product Lifetime

- How long will fan last?
- How long will fan last if installed using efficiency as the basis?
- How long will fan last at maximum volumetric flow rate?

Fans & Blowers

Product Development Trends

- New technology innovations
- How often does manufacturer develop new fan designs?
- How long does it take to implement new design by manufacturers?
- Does development follow new technology or is it due to competition?

Fans & Blowers

Energy-consuming Features

- Type of Electric motor
  - Single speed
  - Dual speed
  - Variable speed
- Direct drive
- Belt driven
- Gear driven

Fans & Blowers

Energy-saving Features & Technology Under Development

- ❑ Controls
- ❑ Motors
- ❑ Scheduling
- ❑ Sensors
- ❑ Gears
- ❑ Belts

Fans & Blowers

Installed Base Characteristics

- What trends are used to choose a fan?
- Do manufacturers provide installation manuals?
- Do manufacturers provide training on how to pick the correct fan?

Fans & Blowers

Market Competition

- ❑ Specific to California
- ❑ Competition in market
- ❑ Manufacturers in California
- ❑ Probable trends and loopholes on proposed standards from DOE
- ❑ Stock and shipment in California
- ❑ How many small businesses are involved in the manufacturing, sale, or installation of these products?

Fans & Blowers

Costs

- **What are the retail costs per fan (blower)?**
  - Fan type
  - Fan construction
  - Fan performance characteristics (airflow, pressure, power, sound - sones & decibels)
  - Fan certification (listed for Kitchens, lab hoods, product conveyance, explosion resistant etc.)
  - Fan application
  - Speed control (VSD & ECM)
  - Motor type (Induction motors, ECM)

Fans & Blowers

Costs

- **What are the incremental cost differences between fan efficiency levels?**

Fans & Blowers
Thank You

Questions regarding Fans & Blowers

Written comments should be submitted to the Docket:
17-AAER-06 by 5:00 p.m. on June 16, 2017

Alejandro Galdamez

Tub Spout Diverters

Jessica Lopez

Energy Analyst

What are Tub Spout Diverters?

"**Tub Spout Diverter**" means a device designed to stop the flow of water into a bathtub and to divert it so that the water discharges through a showerhead.

Types
Showerhead-tub spout diverter combination
Lift-type tub spout diverter
Turn-type tub spout diverter
Pull-type tub spout diverter
Push-type tub spout diverter







Figures: www.homedepot.com

Tub Spout Diverters

- **Current status of regulations:**
  - **California:** On March 20, 1992, California began regulating tub spout diverters. As of March 1, 2003 tub spout diverter leakage rates shall be no greater than:

Testing Conditions	Maximum Leakage Rate
When new	0.01 gpm
After 15,000 cycles of diverting	0.05 gpm

  - **Other States:** Washington state same standard as CA, effective January 1, 2009 [Title 19, Section 19.260.040 (8)(a)]
  - **Federal:** Not federally regulated.
  - **Other Codes:** ASME A112.18.1-2012/CSA B125.1-12 Plumbing Supply Fittings, IAPMO/ANSI WE-Stand 2017 Draft, WaterSense Notice of Intent for Bath and Shower Diverters

Tub Spout Diverters

Staff is considering reducing the tub spout diverter leakage rate below 0.01 gpm when new and below 0.05 gpm after 15,000 cycles of diverting.

Tub spout diverters would continue to be tested in accordance with ASME A112.18.1-2012/CSA B125.1-12 Section 5.3.6 and Section 5.6.1.5.

Tub Spout Diverters

Information Requested

- ❑ Product Definition & Scope
  - ❑ WaterSense Notice of Intent
- ❑ Existing Standards & Standards Under Development
- ❑ Existing Test Procedures
- ❑ Sources of Test Data
- ❑ Product Lifetime
- ❑ Product Development Trends
- ❑ Maintenance, Operation, and Function
- ❑ Water Savings & Efficiency
- ❑ Costs
- ❑ Market Characteristics
  - ❑ Installed Base Characteristics
  - ❑ Market Share & Sales

Tub Spout Diverters

Product Definition & Scope

- **Improvements to the current California definitions?**
  - Tub spout diverter
  - Lift-, pull-, turn-, push-type
  - Showerhead-tub spout diverter combination
- **WaterSense Proposal:**
  - Product Category: "Bath and shower diverter" means any device used to direct the flow of water either toward a tub spout or toward a secondary outlet intended for showering purposes [e.g., showerhead, body spray].
  - Product Families:
    - "Tub spout diverter" means a diverter mechanism that is embedded in the tub spout itself.
    - "Tub-to-shower diverter" means a diverter mechanism that is embedded as a valve in the plumbing hidden behind the wall.

Tub Spout Diverters

Product Definition & Scope - Continued

- **Other accepted terminology**
- **Does California/WaterSense cover all products and configurations? Examples:**
  - Roman tub faucets with showerheads
  - Claw foot tub faucets with showerheads
  - Other showerhead system combinations
- **Other products and configurations**
  - Companion products/fittings (i.e. twin ell adaptors)
  - Replacement Kits/Valves

Tub Spout Diverters

Existing Standards & Standards Under Development

- **Are there features or designs that prevent tub spout diverters from meeting a maximum leakage rate that is below the current standard?**
- **Should the performance standard include a tolerance level?**
  - Structure of tolerance level
  - Residual Water
  - Automatic reset diverters
- **Structure of performance standard**
  - Rate [V/T] vs. Volume

Tub Spout Diverters

Existing Test Procedures

- **Are there any limitations or improvements that can be made to the test procedure?**
  - Setup/procedure
  - Measuring data
  - Accuracy of equipment
- **Operating Requirements**
- **Recording/Reporting data**

Tub Spout Diverters

Sources of Test Data

- Test lab reports (including pictures of device, test setup, etc.)
- Field studies discussing age of tub spout diverters

Tub Spout Diverters

Product Lifetime

❑ **Product design life for:**

Class	Category	Types	
▪ Residential ▪ Commercial	▪ Tub spout diverters ▪ Showerhead-tub spout combinations	Lift	Push
		Pull	Turn

Tub Spout Diverters

Product Development Trends

- **Are there any new upcoming diverter developments?**
  - Types
  - Styles
  - Diverter mechanisms

Tub Spout Diverters

Maintenance, Operation, and Function

- **Shower and bath durations**
- **Are there factors (water hardness, water pH, water temperature, pressure) that can cause diverters to leak or cause parts to deteriorate?**
- **Do the diverter mechanism parts vary by diverter type?**
  - Description of parts (coating, material, etc.)
- **Installation**
  - Manuals, best practices, manufacturer recommendations
  - Specification sheets (functional diagrams, part assembly diagrams/ exploded view)
- **Which parts are more often replaced? And how often?**
- **Are there any health and safety concerns if the leakage rate is reduced below current standards?**

Tub Spout Diverters

Water Savings & Efficiency

- ❑Is there data or input on how to calculate and apply a water savings factor (when a diverter leak is fixed, some of the water is diverted to the showerhead and used in the shower event)?*
- ❑Field surveys and studies showing water savings

*U.S. Environmental Protection Agency. (2016). WaterSense Notice of Intent to Develop a Draft Specification for Bath and Shower Diverters. Washington, D.C.: U.S. EPA WaterSense

Tub Spout Diverters

Costs

- **What are the costs per unit?**
  - Breakdown of costs by parts
  - Manufacturer Suggested Retail Price (MSRP)
  - Retail price difference between:
    - products with water-saving features and without a water-saving feature
    - WaterSense labeled and non-WaterSense labeled devices
- **What are the incremental costs of efficiency improvements?**
  - Retail device costs: design, features, parts
  - Manufacturer costs: test procedure equipment/setup, engineering design
- **What are the costs of replacement versus repair of tub spout diverters?**
- **What are the water delivery associated costs?**

Tub Spout Diverters

Market Characteristics

- **Installed base characteristics**
  - Surveys/census/data collection of tub spout diverters installed
- **What are the annual historic sales for the past 10 years or since the current standard went into effect in March 2003 (in CA and nationwide)?**
- **What are the projected sales (in CA and nationwide)?**
  - Estimated annual sales growth
- **Market share breakdown by product type for:**
  - Single-family, Multi-family, Hotels
- **How many small businesses are involved in the manufacturing, sale, or installation of these products?**
- **How will small businesses be affected by the standard?**

Tub Spout Diverters
Thank You

Questions regarding Tub Spout Diverters

Written comments should be submitted to the Docket:

17-AAER-09 by 5:00 p.m. on June 16, 2017

Jessica Lopez

SPRAY SPRINKLER BODY

Sean Steffensen

Mechanical Engineer

Spray Sprinkler Body

- Spray Sprinkler Body means the exterior case or shell of a sprinkler incorporating a means of connection to the piping system, designed to convey water to a nozzle or orifice[1].

Spray Sprinkler Body →

[1]Per ANSI ASABE/ICC 802-2014

Spray Sprinkler Body
Current Status of Regulation

- The sale or offer for sale of spray sprinkler bodies are not regulated by the Energy Commission or the U.S. Department of Energy.
- US EPA WaterSense has released a Draft Specification for Spray Sprinkler Bodies
  - Voluntary specification for WaterSense Labeling
- Assembly Bill 1928 (Ch. 326, Stats. 2016) requires:
  - The Energy Commission to adopt performance standards and labeling requirements for landscape irrigation equipment.
  - Manufacturers would need to test and certify equipment to show compliance with performance standard.
  - Effective date for new performance standards to be January 1, 2019

Spray Sprinkler Body Information Requested

- ❑Product Definition & Scope
- ❑Existing Test Procedures and Test Procedures under Development
- ❑Sources of Test Data
- ❑Existing Standards & Standards under Development
- ❑Product Lifetime
- ❑Product Development Trends
- ❑Operations and Duty Cycle
- ❑Water-saving Features & Technologies
- ❑Market Characteristics
- ❑Installed Base Characteristics

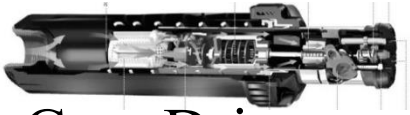
Spray Sprinkler Body
Product Definition & Scope

- Input to define products and set scope of standards

Examples:

- Irrigation Association Smart Water Application Technologies (SWAT)
- ANSI/ASABE/ICCC 802-2014
- US EPA WaterSense Draft Spray Sprinkler Body Specification

Spray Sprinkler



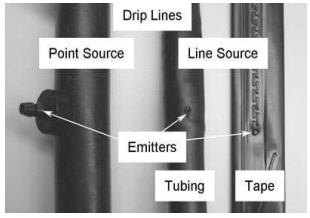
Gear Driven

Impact

Gun

Multi-stream Multi-trajectory

Bubbler



Micro Emission

Hose End

Spray Sprinkler Body

Existing Test Procedures & Test Procedures Under Development

- **Input on available test procedures to measure performance.**
  - Indicate test burden, industry acceptance, accuracy and repeatability, and ability to rank order performance
- **Areas of interest**
  - Pressure regulation
  - Application efficiency
  - Drain check valve

Spray Sprinkler Body

Sources of Test Data

- **Studies showing performance of spray sprinkler bodies**
  - Identify performance differences among different models with various water saving features
  - Identify case studies that demonstrate water savings through implementation of water saving features — before and after

Spray Sprinkler Body

Existing and Developing Standards

- **What standards address water savings of spray sprinkler bodies?**

  Examples:

  - Draft US EPA WaterSense Spray Sprinkler Body Specification
  - ANSI/ASABE 802-2014 Landscape Irrigation Sprinkler and Emitter Standard
  - Irrigation Association Smart Water Application Technologies (SWAT)

Spray Sprinkler Body
Product Lifetime

- What is the range of product lifetimes?
- Are product lifetimes changing?
- How do lifetimes vary by product lines or sprinkler type?
- What data or testing supports product lifetime information?

Spray Sprinkler Body
Product Development Trends

- What new products have been introduced to the market recently?
- What new products provide increased water savings?

Spray Sprinkler Body

Product Operation and Duty Cycle

- **How much water do spray sprinkler bodies use?**
  - How are spray sprinkler bodies used in California?
  - How are spray sprinkler bodies installed?
    - Head to head spacing
    - Design guides
    - Actual practice
- **Under what conditions are spray sprinkler bodies installed? Examples include system pressure or landscape grades**
- **How often is watering performed and what contributes to variations in irrigation time? Examples include landscape needs, user preference**

Spray Sprinkler Body

Product Operation and Duty Cycle Continued

- Does irrigation practice vary by commercial or residential installation?
- What sources of data are available that address irrigation cycle time in California?

Spray Sprinkler Body
Water-Saving Features & Technologies

- **Identify water-saving technologies, components and features**
  - Estimate the savings performance at a device and statewide level
  - Identify the retail cost difference between products with and without the water-saving feature
  - Identify the market share of devices installed with the water-saving feature
  - Identify the market share of devices sold with the water-saving feature

Spray Sprinkler Body
Market Characteristics

- **Identify manufacturers of spray sprinkler bodies**
- **How do offerings differ among manufacturers?**
  - Do some manufacturers provide broad product offerings while others focus on specialty products?
- **Identify aspects of supply chain**
  - Does one manufacturer make all components or are there multiple suppliers involved?
  - What is the length of time between an order and a delivery to retailer?
  - Are there sales seasons or product years to consider when setting regulation effective dates?
- **Identify small businesses involved in spray sprinkler body market**

Spray Sprinkler Body

Market Characteristics Continued

- **California sales of spray sprinkler bodies**
  - Market share of various sprinkler types
  - Market share sold with various water saving technologies such as pressure regulation and drain check valves

Spray Sprinkler Body
Installed Base Characteristics

- Identify how many spray sprinkler bodies are installed in California
- What percentage of landscape is irrigated by spray sprinkler bodies?

Spray Sprinkler Body
Thank You

Questions regarding Spray Sprinkler Bodies

Written comments should be submitted to the Docket:

17-AAER-08 by 5:00 p.m. on June 16, 2017

Sean Steffensen

Irrigation Controllers

Ryan Nelson, P.E.

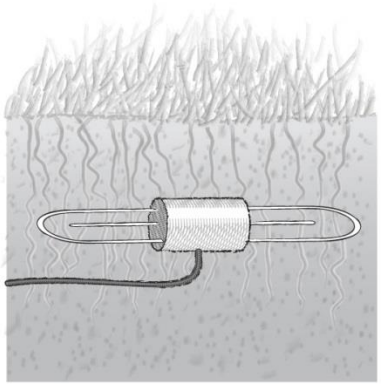
Senior Mechanical Engineer

What are Irrigation Controllers?

An irrigation controller is a device to operate automatic irrigation systems such as lawn sprinklers and drip irrigation systems. Most controllers have a means of setting the frequency of irrigation, the start time, and the duration of watering.

Types:

- ❑ Weather Based
- ❑ Soil Moisture Sensor
- ❑ Time Clock



Irrigation Controllers

Current status of regulations:

- Federal: U.S. EPA WaterSense: Weather-based voluntary labeling specification (2012)

Test Procedures:

- Irrigation Association Smart Water Application Technologies (SWAT)
  - CLIMATOLOGICALLY BASED CONTROLLERS, 8th Testing Protocol (September 2008)
  - SOIL MOISTURE SENSOR-BASED CONTROLLERS, Laboratory and Operational Tests, Version 3.0 August 2011
- WaterSense:
  - CLIMATOLOGICALLY BASED CONTROLLERS, 8th Testing Protocol (September 2008) With Modifications

Irrigation Controllers Information Requested

- ❑Product Definition & Scope
- ❑Existing Test Procedures and Test Procedures Under Development
- ❑Sources of Test Data:
- ❑Existing Standards & Standards under Development
- ❑Product Lifetime
- ❑Product Development Trends
- ❑Operations
- ❑Energy-consuming Features
- ❑Energy-saving Features & Technologies
- ❑Control Features
- ❑Market Characteristics
- ❑Installed Base Characteristics
- ❑Market Competition

Irrigation Controllers
Product Definition & Scope

- **How should products be defined and differentiated?**
- **What would be the scope for a water efficiency standard?**
- **What would be the scope for an energy efficiency standard?**

Examples:

- Low Power Mode & Standby
- Power supply

Irrigation Controllers

Existing Test Procedures & Test Procedures Under Development

- **Are there additional test procedures available?**
- **Are there new test procedures under development?**

Irrigation Controllers
Sources of Test Data

- **Test lab reports**
  - From existing and developing test procedures
    - including pictures of device, test setup, etc.
- **Field studies of the type of systems controlled**
  - drip
  - spray
  - lawn shrub
  - etc.

Irrigation Controllers

Sources of Test Data Continued

- **Behavioral Studies:**
  - Irrigation use
  - Water conservancy
  - Ideal landscape conditions
  - Consumer education

Irrigation Controllers

Existing Standards & Standards under Development

- **Is there current research and/or advancements of equipment standards for irrigation controllers?**

Irrigation Controllers

Product Lifetime

- **Expected Useful Life**
  - Controller
  - Weather Station
  - Power Supply
  - Sensors

Irrigation Controllers

Product Development Trends & Operations

- **Are there new technologies coming to market?**

  Example:

  - Wireless sensors
  - New types of controllers (combinations)

Irrigation Controllers

Energy-consuming Features

- **What features or options consume the most energy?**
  - Low power mode & standby power consumption
  - Active mode power consumption
  - Power supply efficiency

Irrigation Controllers

Energy-saving Features & Technologies

- **Are there any other energy-saving features and technologies?**

Irrigation Controllers

Market Characteristics

- **What are the yearly shipments to California?**
- **How many small businesses are involved in the manufacturing, sale, or installation of these products?**

Irrigation Controllers

Costs

- **What are the retail costs per unit?**
- **How do costs vary and what are the incremental differences?**
  - Number of zones controlled
  - Sensor inputs
  - Number of sensors included with the controller
  - Add on sensors
  - Weather stations
  - Power supplies
  - Communication (WiFi, Ethernet, radio, cellular)
  - Etc.

Irrigation Controllers

Costs

- **What are installation costs?**
  - New construction
  - Retrofits
- **What are the repair costs versus replacement costs?**
- **What are the incremental costs differences for more efficient power supplies?**
- **What are the incremental cost differences for reduced standby mode power consumption?**

Irrigation Controllers

Installed Base Characteristics

- **Surveys/Census data collection of irrigation controllers installed**
  - **Type of controller**
  - **Number of sensors**
  - **Number of zones**
    - **What type of zone (drip, lawn etc)**
- **How many and what type of controllers are installed?**
  - Single-family
  - Multi-family
  - Light Commercial
  - Golf Course
  - Agricultural

Irrigation Controllers
Thank You

Questions regarding Irrigation Controllers

Written comments should be submitted to the Docket:

17-AAER-10 by 5:00 p.m. on June 16, 2017

Ryan Nelson

Low-Power Mode and Power Factor

Soheila Pasha, Ph.D.

Electrical Engineer

What is Low-Power Mode (LPM)?

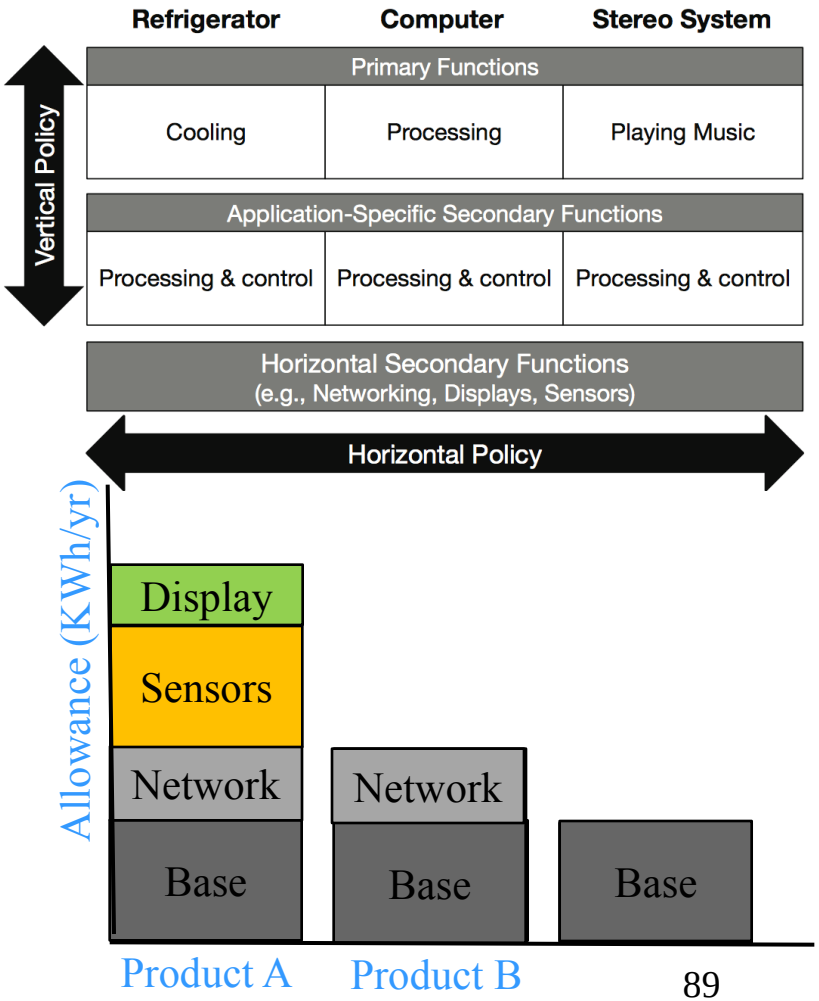
- LPM includes off, standby, sleep, and idle
  - Traditional:
    - When the device is off and consumes energy. Example: audio & video equipment, printer, heated towel rack
  - Network-connected
    - When it's connected to a network but is not in active mode. Example: Alarm system, security cameras, small network equipment

Low-Power Mode

Horizontal and Vertical Policy

Horizontal approach: Apply standards to a group of products with a similar base function:

- ❑ Group products with similar functions (base function)
- ❑ Establish a baseline energy for the group
- ❑ Apply adders for specific functions other than the base function



Low-Power Mode Limits, Examples

Federal

- Per federal law[1], after July 1, 2010, energy conservation standards are required to address standby mode and off mode energy use

Examples:

- Microwaves: **1-2.2 Watts**
- Battery chargers: **5 Watts**

California

- Computers, monitors, and signage displays
- Connected LED lamps: **0.2 Watt** (after July 1, 2019)

1. Energy Independence and Security Act of 2007 ("EISA2007"), Public Law 110-140, 42 U.S.C. § 6295(gg).

Low-Power Mode Limits, Examples

European Commission[1]

- Networked devices with HiNA[2]: **8 Watts**
- Other networked devices:
  - Before 1/1/2019: **3 Watt**
  - After1/1/2019: **2 Watt**
- Others (not networked)
  - Off mode: **0.5 Watt**
  - Standby: **1 Watt**

  Exemptions: Large format printing equipment, computers

1. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32013R0801
2. Networked equipment with high network availability" (HiNA equipment) means equipment with one or more of the following functionalities, but no other, as the main function(s): router, network switch, wireless network access point, hub, modem, VoIP telephone, video phone;

Low-Power Mode Limits, Examples

Natural Resources Canada[1]

- **Compact audio products** (not clock radio)
- **Television**
- **Video products**
  - Standby power: **0.5-1.0 Watt**
  - Off mode power: **0.5 Watt**

- **Clock radio**
  - Standby power: **2.0 Watts**
  - Off mode power: **1.0 Watt**

1. http://laws-lois.justice.gc.ca/eng/regulations/sor-94-651/
   http://www.nrcan.gc.ca/energy/regulations-codes-standards/bulletins/7251

What is Power Factor (PF)?

- $PF = \frac{Working\ Power}{Apparent\ Power}$

- $0 < PF < 1$

  bad ↑ good ↑

- For resistive loads such as incandescent lamps PF=1
- Most loads are inductive
  - A low-cost improvement is adding capacitor

What is Power Factor (PF)?

- Consumers pay for "Working Power"
- Utilities supply "Apparent Power"
  - Example: A 10 Watts device with a PF=0.4 (very poor) draws 25 Watts. It is 2.5x the power that it uses:

$$\text{Apparent Power} = \frac{10\ Watts}{0.4} = 25\ \text{Watts}$$

- Consumers pay for poor PF either through overall electricity rate increase or PF penalties (larger consumers, mostly commercial/industrial) in addition to the power lost in the building's distribution system

Power Factor (PF)

- EPRI (Electric Power Research Institute)
  - If all plug-loads larger than 50 watts had power factors of at least 0.9 at 50 and 100 percent load, an estimated energy savings of 241 GWh per year after full stock turnover could be achieved
  - Most products that consume more than 50 Watts are federally regulated (out of scope)
- Test procedures exist for some products but need to investigate for other products
- More research and input is welcome in order to identify the benefits to consumers

Low Power Mode & Power Factor (PF) Information Requested

- ❑ Product Definition & Scope
- ❑ Existing Standards & Standards Under Development
- ❑ Existing Test Procedures
- ❑ Sources of Test Data
- ❑ Product Lifetime
- ❑ Product Development Trends
- ❑ Maintenance, Operation, Function
- ❑ Market Characteristics
  - ❑ Installed Base Characteristics
  - ❑ Market Share & Sales
- ❑ Products mode weighting
- ❑ Energy usage
- ❑ Energy Saving and efficiency opportunities
- ❑ Control features
- ❑ Costs
- ❑ Other

Low Power Mode & Power Factor (PF) Information Requested

- **Information can be submitted for**
  - Low Power Mode
  - Power Factor
  - Or for both
- **Where appropriate, breakdown to more details**
  - Residential/Commercial
  - California/Nationwide
  - Other

Low Power Mode & Power Factor (PF)

Scope

- **Scope of the products shall be defined in a way that proposed voluntary requirements meet the following criteria**
  - Saves energy
  - Is cost effective
  - Is technically feasible

Low Power Mode & Power Factor (PF)

Scope

- **Determine the list of products that should be included**
  - For example: Small network equipment, digital clocks, others
  - Justification
- **Products that should be excluded:**
  - They are subject to other federal or state regulations
  - They don't meet the 3 criteria
  - Other reasons (specify)

Low Power Mode & Power Factor (PF)

Framework for LPM

- **Propose ideas on how to group together and apply standards across multiple product types**

  Example:

  - Propose a horizontal function as the "base" function and vertical energy adders.
  - Propose cluster(s) of products with the same "base" function

Low Power Mode & Power Factor (PF)

Product Definition

- **Provide definitions in cases where**
  - No definition exists
  - Existing definitions need further distinction/specification
  - Existing definitions needs to be included or clarified

Low Power Mode & Power Factor (PF)

Existing Standards & Standards Under Development

- **Existing Standards & Standards Under Development**
  - Federal, States, Europe, Canada, China, and Australia

Low Power Mode & Power Factor (PF)

Test Procedures and Sources of Test Data

- **Existing Test Procedures:**
  - Test procedures that are specific to each product
    - For example, test procedure for audio/video equipment that includes measurements for low power modes
  - Test procedures that are specific to the base function (LPM) product
    - For example, test procedure to measure idle power for all network connected equipment
  - Test procedures for measurements at various specified loads (PF)
- **We are seeking sources of test data**

Low Power Mode & Power Factor (PF)

Product Lifetime and Market Characteristics

- **What is the product lifetime?**
- **Historical & Projected Market Characteristics**
  - Products stock
  - Shipment
  - Growth rate:
    - California and Nationwide
    - Residential and Commercial
- **How many small businesses are involved in the manufacturing, sale, or installation of these products?**

Low Power Mode & Power Factor (PF)

Products Mode Weighting & Energy Usage

- **Duty cycle for various operating modes**
  - Commercial & Residential
- **Energy usage for different modes if it applies**

Low Power Mode & Power Factor (PF)

Energy Saving and Efficiency Opportunities & Control Features

- **What are energy saving opportunities?**
- **Proposed improvements:**
  - Hardware upgrades
  - Software improvements
  - Power management
  - Auto power down
- **Include potential trade-offs and potential solutions**

Low Power Mode & Power Factor (PF)

Costs

- Breakdown of costs per unit, per product to make units more efficient

Low Power Mode & Power Factor (PF)

Other

- ❑ Research documents, studies, and reports exploring benefits, costs, and methods of power factor correction
- ❑ Any other relevant information or data

Low Power Mode & Power Factor (PF)

Maintenance, Operation, Function

- Spec sheets and high level circuit diagrams
- Modes of operations that the standards apply

Low Power Mode & Power Factor (PF)

Product Development Trends

- Are there any future product development trends?

Low Power Mode & Power Factor
Thank You

Questions regarding Low Power Mode & Power Factor

Written comments should be submitted to the Docket:

17-AAER-12 by 5:00 p.m. on June 16, 2017

Soheila Pasha

Set-Top Boxes

Patrick Saxton, P.E.

Senior Electrical Engineer

Set-Top Boxes

- A set-top box (STB) is a device capable of receiving digital television services and that processes those signals for delivery to a consumer display or recording device

Photo Source: www.arris.com

Set-Top Boxes

- **There are no mandatory energy efficiency regulations for STBs in North America**
  - The Commission is not considering the development of mandatory efficiency regulations for STBs as part of this phase
  - The Commission is gathering information and considering the development of a roadmap for STBs
- **Voluntary ENERGY STAR specification is version 5.0, except for thin clients which are version 4.1 through January 1, 2018**

Set-Top Boxes

- **Voluntary agreement (VA) between industry and efficiency advocates**
  - Term of VA is January 1, 2013 to January 1, 2018
  - The weighted average typical electricity consumption was reduced for major set-top box categories for procurements in 2013-2015 period compared to 2012
  - 67% of 2015 procurements were “tier 2” (similar to ENERGY STAR v4.1)
  - Commitment to 90% of 2017 procurements being tier 2

Set-Top Boxes

- **Form and function changes to STBs since the Commission last collected information in 2013**
  - Continued STB product evolution
  - Increased adoption of over-the-top devices and service provider application based services
- **Current sources of information**
  - VA annual reports
  - VA energy usage information for specific consumer models at http://www.energy-efficiency.us/#sci-sect-5
  - ENERGY STAR data
  - Manufacturer and service provider websites

Set-Top Boxes

Product Definition & Scope

- Are current definitions adequate given changing form and function of STBs?
- Should other customer premise equipment (e.g. modems gateways, optical network units) be included in the STB roadmap or the low-power mode roadmap?
- How can the roadmap best address existing STB stock?

Set-Top Boxes

Test Procedures

- Is the ANSI/CEA 2043-2013 test procedure adequate or should the roadmap include further development of test procedures?

Set-Top Boxes

Sources of Test Data

- What additional sources of STB test data are available?
- What are the best available estimates of STB duty cycle?

Set-Top Boxes

Market Characteristics

- How are application based streaming services changing the number of newly deployed STBs? Are existing subscribers switching to streaming? Are DVRs moving to the cloud?
- How many refurbished STBs are being deployed in California?
- How many newly procured STBs are being deployed in California?

Set-Top Boxes

Product Lifetime

- What are estimates of STB lifetime?
- How can STB product lifetime be segmented by equipment type or customer class?

Set-Top Boxes

Installed Base Characteristics

- What are estimates of current STB stock in California?
- What are the estimates of current customer premise equipment?
- Can these estimates be segmented by equipment type?

Set-Top Boxes

Product Development Trends

- What new energy-saving features are present in STBs?
- What progress has been made on low-power, low-latency modes? Auto power down?
- What are the barriers to improving the efficiency of new STBs?
- What are the barriers to improving the efficiency of existing STB stock in California?

Set-Top Boxes
Thank You

Questions regarding Set-Top Boxes

Written comments should be submitted to the Docket:

17-AAER-11 by 5:00 p.m. on June 16, 2017

Patrick Saxton

Solar Inverters

Patrick Saxton, P.E.

Senior Electrical Engineer

Solar Inverters

- A solar inverter converts the DC output of a photovoltaic system into AC. The inverter typically performs additional power electronics, safety, communication, and monitoring functions.

Photo Source: en.wikipedia.org

Solar Inverters

- The Commission is gathering information and considering the development of a roadmap for solar inverters
- Inverters can be grid-tied, off-grid, or hybrid (combined with storage)
- Inverters have numerous form factors – string, micro, utility scale – and can work with additional electronics in the photovoltaic array (e.g., power optimizers)

Solar Inverters

- Inverters have multiple efficiency metrics
  - DC to AC conversion efficiency, including self-consumption
  - Maximum power point tracking (MPPT) efficiency, static and dynamic
- There are no mandatory energy efficiency regulations for solar inverters

Solar Inverters

- However, there are many other standards for safety and interconnection
  - UL 1741, Standard for Inverters, Converters, Controllers
  - UL 1741 Supplement A (SA), Grid Support Utility Interactive Inverters and Converters
  - IEEE 1547, Standard for Interconnecting Distributed Resources with Electric Power Systems
  - ANSI/UL 62109-1, Standard for safety of power converters for use in photovoltaic power systems, part 1
  - IEC 62109-2, Safety of power converters for use in photovoltaic power systems, part 2

Solar Inverters

- California Rule 21 interconnection requirements for investor owned utility (IOU) territories will require "smart inverters" evaluated per UL 1741 SA effective September 8, 2017

- Per CPUC resolution E-4832, communications capabilities for smart inverters will be required on the later of April 1, 2018, or nine months after the release of an industry-recognized communication protocol certification test standard

- The Smart Inverter Working Group (SIWG) has made recommendations on advanced functions for smart inverters
  - Mandatory capability date is yet to be determined
  - IOU advice letters are due to the CPUC in June 2017

Solar Inverters

Product Definition & Scope

- Should the scope of this roadmap include power optimizers and other related electronics that interact with inverters?

Solar Inverters

Test Procedures

- What test procedures are available specific to conversion efficiency and MPPT efficiency?

Solar Inverters

Market Characteristics

- What are the estimated number of inverter sales by product category in California?
- SIWG Phase 1 autonomous functions will soon be mandated by Rule 21 interconnection requirements in IOU territories. Are publicly owned utilities also planning to require inverters that have been evaluated per UL 1741 SA or are there inconsistent interconnection requirements in CA?
- What additional inverter functions are being mandated in Hawaii and other states?
- How many small businesses are involved in the manufacturing, sale, or installation of these products?

Solar Inverters

Product Lifetime

- What is a reasonable estimate of inverter lifetime and does it vary based on product category?

Solar Inverters

Potential Efficiency Regulations

- Very high levels of conversion efficiency are already demanded by purchasers of solar inverters. What would be the benefits of mandatory testing and reporting requirements?
- What would be the benefits of requirements regarding MPPT efficiency?
- What would be the benefits of limiting self-consumption during non-production hours, similar to a standby power requirement?

Solar Inverters
Thank You

Questions regarding Solar Inverters

Written comments should be submitted to the Docket:

17-AAER-13 by 5:00 p.m. on June 16, 2017

Patrick Saxton

General Service Lamps – Expanded Scope

Patrick Saxton, P.E.

Senior Electrical Engineer

General Service Lamps– Expanded Scope

- **The federal Energy Independence and Security Act of 2007 (EISA)**
  - Set a "backstop" minimum requirement of 45 lumens per watt for general service lamps (GSL) beginning 1/1/2020
  - For California and Nevada, allowed the backstop to become effective as early 1/1/2018
- **In 2008, California adopted the backstop effective for lamps manufactured on or after 1/1/2018**
  - Will eliminate incandescent and halogen versions of lamps, unless they are otherwise exempt

General Service Lamps – Expanded Scope

- **The backstop applies to general service lamps as defined in CCR, title 20, section 1602(k)**
  - General service incandescent lamps (GSIL)
  - Compact fluorescent lamps
  - General service light-emitting diode lamps (LED and OLED)
  - Any other lamps that the Secretary (of the Department of Energy) determines are used to satisfy lighting applications traditionally served by general service incandescent lamps

General Service Lamps – Expanded Scope

- **The backstop does not apply to:**
  - Lamps excluded from the definition of GSIL as defined in CCR, title 20, section 1602(k)
    - Bases other than medium screw base
    - Less than 310 lumens or greater than 2,600 lumens
    - Cannot operate in a voltage range that partially includes 110 to 130 volts
    - Exempt lamp types: reflector lamps, 3-way incandescent lamps, shatter-resistant lamps, and 19 other lamp types
  - General service fluorescent lamps
  - Incandescent reflector lamps

General Service Lamps – Expanded Scope

- **Two final rules changing the definition of GSL were published in the Federal Register on 1/19/2017**
  - Has an ANSI base
  - For integrated lamps, operates at a voltage of 12V or 24V, at or between 100-130V, at or between 220-240V, or of 277V
  - Lumen output greater than or equal to 310 and less than or equal to 3,300
  - Is not a light fixture or LED downlight retrofit kit
  - Discontinues exemption for: many but not all reflector lamps; rough service lamps; shatter-resistant lamps; 3-way incandescent lamps; vibration service lamps; certain T shape lamps; and B, BA, CA, F, G16-1/2, G25, G30, S, M-14 lamps of 40W or less

General Service Lamps – Expanded Scope

- The expanded definition of GSL would result in much larger electricity savings from the backstop
  - Inclusion of many reflector lamps
  - Inclusion of other light distributions and base types
  - Closing of loopholes for certain incandescent lamps

BR30

40W CA

Shatter-resistant

Photo Source: www.1000bulbs.com

General Service Lamps – Expanded Scope

- LBNL analysis of savings impact on backstop from expanded GSL definition
  - https://eaei.lbl.gov/publications/impact-eisa-2007-energy-efficiency
- EISA gives California authority to adopt the expanded GSL definition and have it become effective as early as 1/1/2018
- Adopting the expanded GSL definition requires:
  - Standard California rulemaking process
  - Is cost-effective and technically feasible
  - Warren-Alquist Act minimum one year period prior to effective date

General Service Lamps – Expanded Scope

Scope

- What are the benefits to California if the expanded GSL definition is adopted?
- If California adopts the expanded GSL definition, what should be the timing of the effective date(s)?

General Service Lamps – Expanded Scope

Market Characteristics

- What are the California sales of incandescent/halogen reflector lamps with diameter greater than 2.5 inches and other lamp types that fall within the expanded GSL definition?
- What are the California sales by small businesses of lamp types that fall within the expanded GSL definition?
- What is the availability of LED versions of the lamp types that fall within the expanded GSL definition?
- What is the availability of LED versions meeting the 1/1/2018 California state-regulated LED lamp requirements of the lamp types that fall within the expanded GSL definition?

General Service Lamps – Expanded Scope

Installed Base Characteristics

- What are the existing California installations of incandescent/halogen reflector lamps with diameter greater than 2.5 inches and other lamp types that fall within the expanded GSL definition?

General Service Lamps – Expanded Scope Thank You

Questions regarding General Service Lamps – Expanded Scope

Written comments should be submitted to the Docket:

17-AAER-07 by 5:00 p.m. on June 16, 2017

Patrick Saxton

How to Submit Data & Information

- **Public Comment**

  Written comments. Written comments should be submitted to the Dockets Unit **by 5:00 p.m. on June 16, 2017**.

  Please note that your written and oral comments, attachments, and associated contact information (e.g. your address, phone, email, etc.) become part of the viewable public record. This information may become available via Google, Yahoo, and any other search engines.

How to Submit Data & Information

(Continued)

- **Public Comment Continued…**

  The Energy Commission encourages use of its electronic commenting system.

  Visit the website at:

  https://efiling.energy.ca.gov/EComment/ECommentSelectProceeding.aspx

  Or go directly to this rulemaking:

  http://www.energy.ca.gov/appliances/rulemaking.html

  Please enter your contact information, any organization name, and a comment title describing the subject of your comments. You may include comments in the box titled "Comment Text" or attach a file in a downloadable, **searchable format** in Microsoft® Word (.doc, .docx) or Adobe® Acrobat® (.pdf). Maximum file size is 10 MB.

How to Submit Data & Information

(Continued)

- **Public Comment Continued…**

  Written comments may also be submitted by emailing them (include the docket number and appliance type in the subject line) to the Docket Unit at:

  docket@energy.ca.gov

  If you prefer, you may send a paper copy of your comments to:

  California Energy Commission
  Docket Unit, MS-4
  Re: Docket No. [see below]
  1516 Ninth Street
  Sacramento, CA 95814-5512

How to Submit Data & Information

(Continued)

- **Public Comment Continued…**

  The docket numbers for this proceeding are:

  17-AAER-06 – Commercial and Industrial Fans & Blowers
  17-AAER-07 – General Service Lamps (Expanded Scope)
  17-AAER-08 – Sprinkler Spray Bodies
  17-AAER-09 – Tub Spout Diverters
  17-AAER-10 – Irrigation Controllers
  17-AAER-11 – Set-Top Boxes
  17-AAER-12 – Low-Power Mode & Power Factor
  17-AAER-13 – Solar Inverters

How to Submit Data & Information

(Continued)

- If the file size is more than 10 MB, if the information includes an application for confidential designation, or if you prefer, paper copies of responses with electronic information provided on a CD or DVD may be sent to:

California Energy Commission
Dockets Office, MS-4
Re: Docket No. [*Insert Appropriate Docket Number*]
1516 Ninth Street
Sacramento, CA 95814-5512

How to Submit Data & Information

(Continued)

Confidential Information:

If interested parties wish to maintain the confidentiality of specific data or information, they should contact Jared Babula in the Commission's Chief Counsel's Office *before* submitting a response to this Invitation. Otherwise, all responses received will become publicly available.

Jared Babula, California Energy Commission, Office of the Chief Counsel

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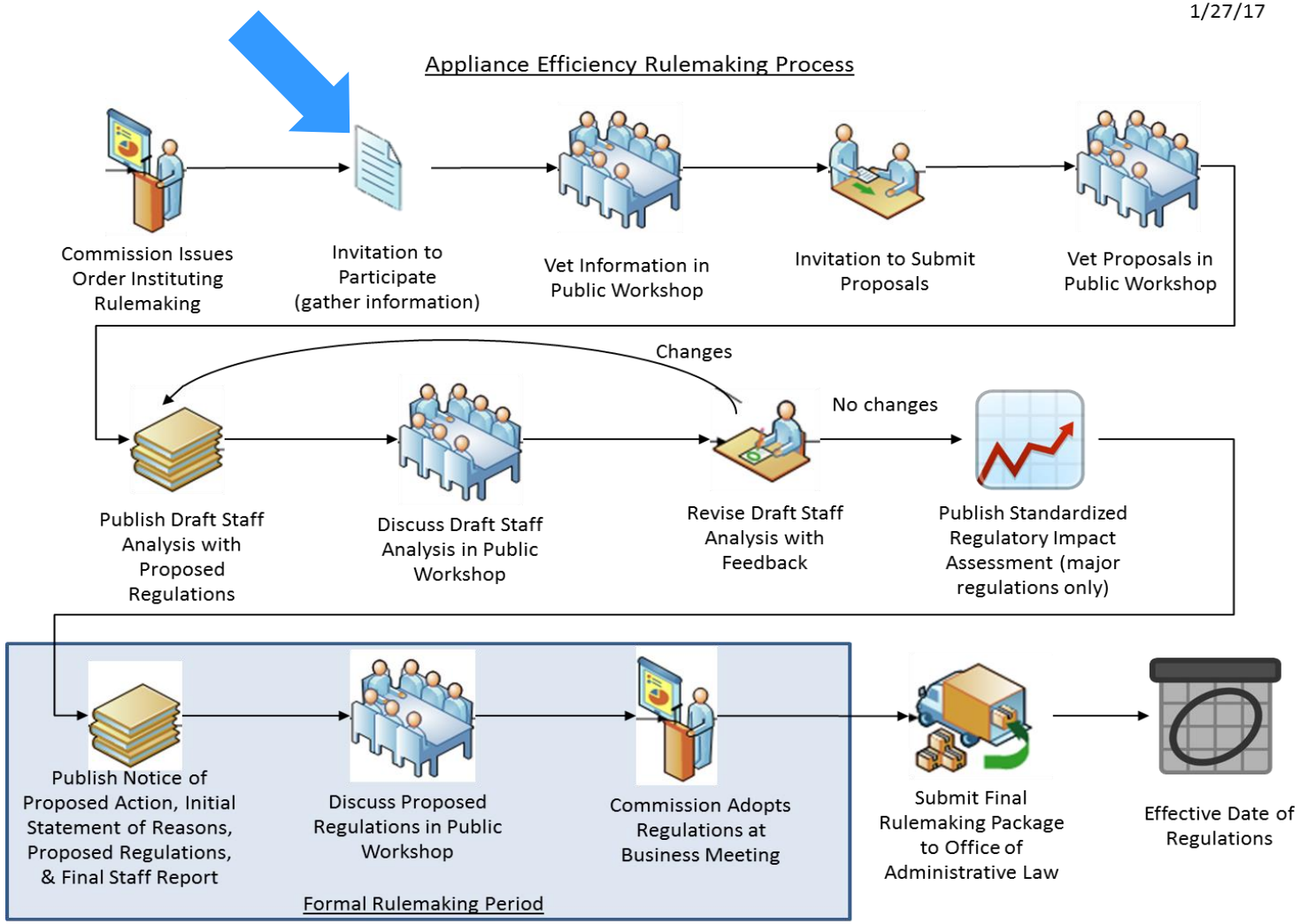
Public Participation

1/27/17



Questions & Answers

Thank you!

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