



CALIFORNIA ENERGY COMMISSION

RESEARCH & DEVELOPMENT DIVISION



ELECTRIC PROGRAM INVESTMENT CHARGE

Research and Development Update

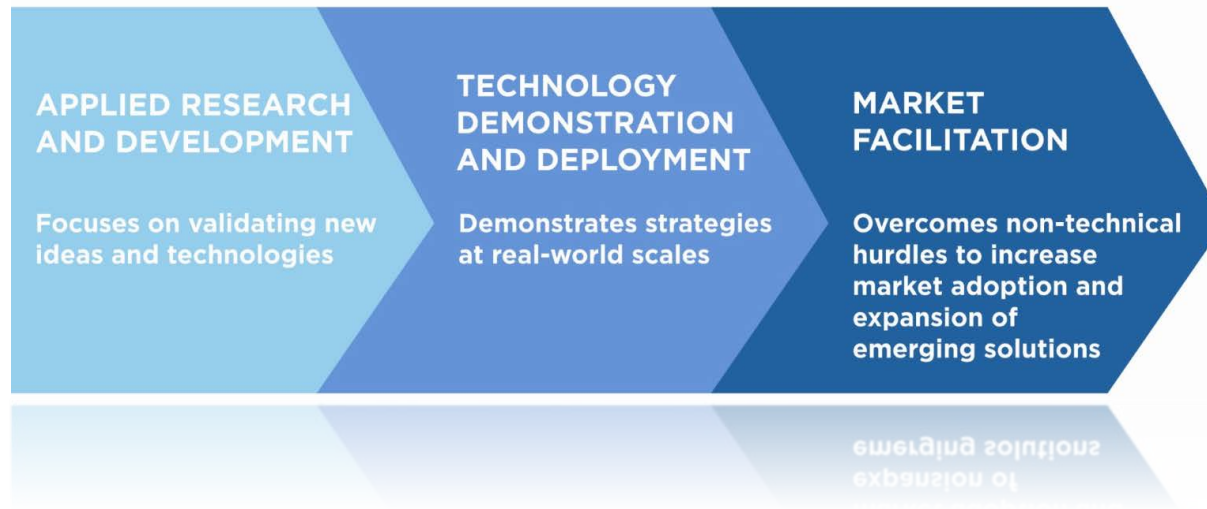
May 15, 2017

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Energy Research and Development Division



CEC Administered EPIC Funding



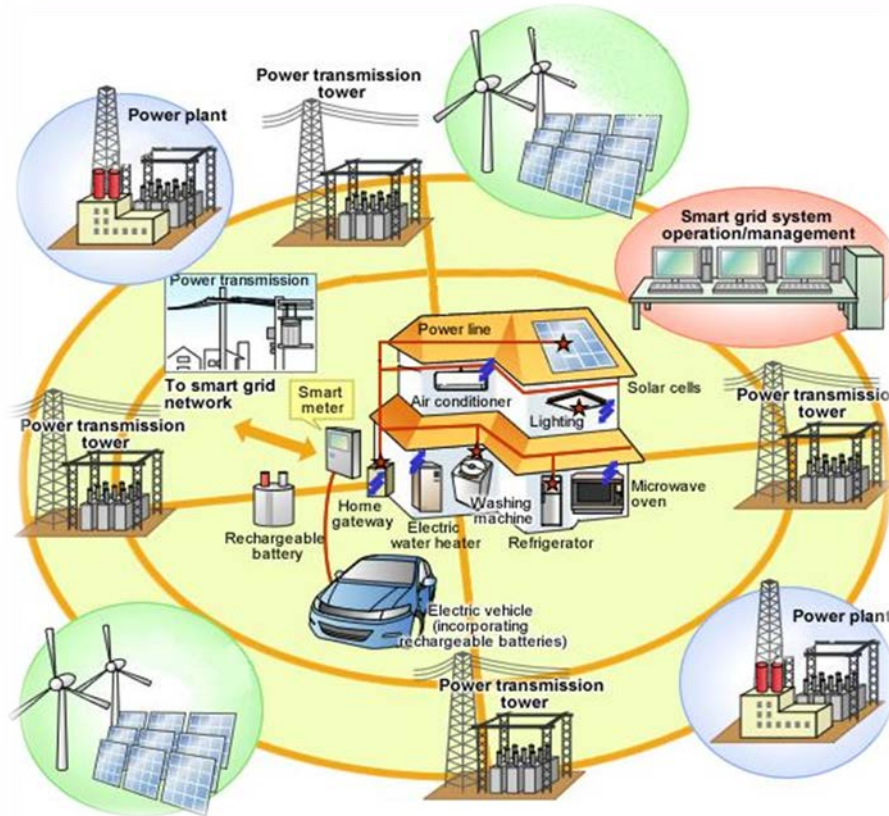
Funding Areas

- Energy Efficiency
- Clean Generation
- Smart Grid
- Cost Share for Federal Awards
- Renewables
- Demand Response
- Integration of EE, DR, DG and Smart Grid
- Cost Share for Federal Awards
- Entrepreneurial support and assistance
- Innovative local strategies
- Streamlined customer adoption



Policy Drives Innovation

- Increase RPS to 50% by 2030
- Reduce GHG to 40% below 1990 levels by 2030
- 1.3 GW of storage by 2020



- Double energy efficiency savings by 50%
- 1.5 million ZEVs by 2025
- Increase access to clean energy in disadvantaged communities



SB 350 Low-Income Barriers Study

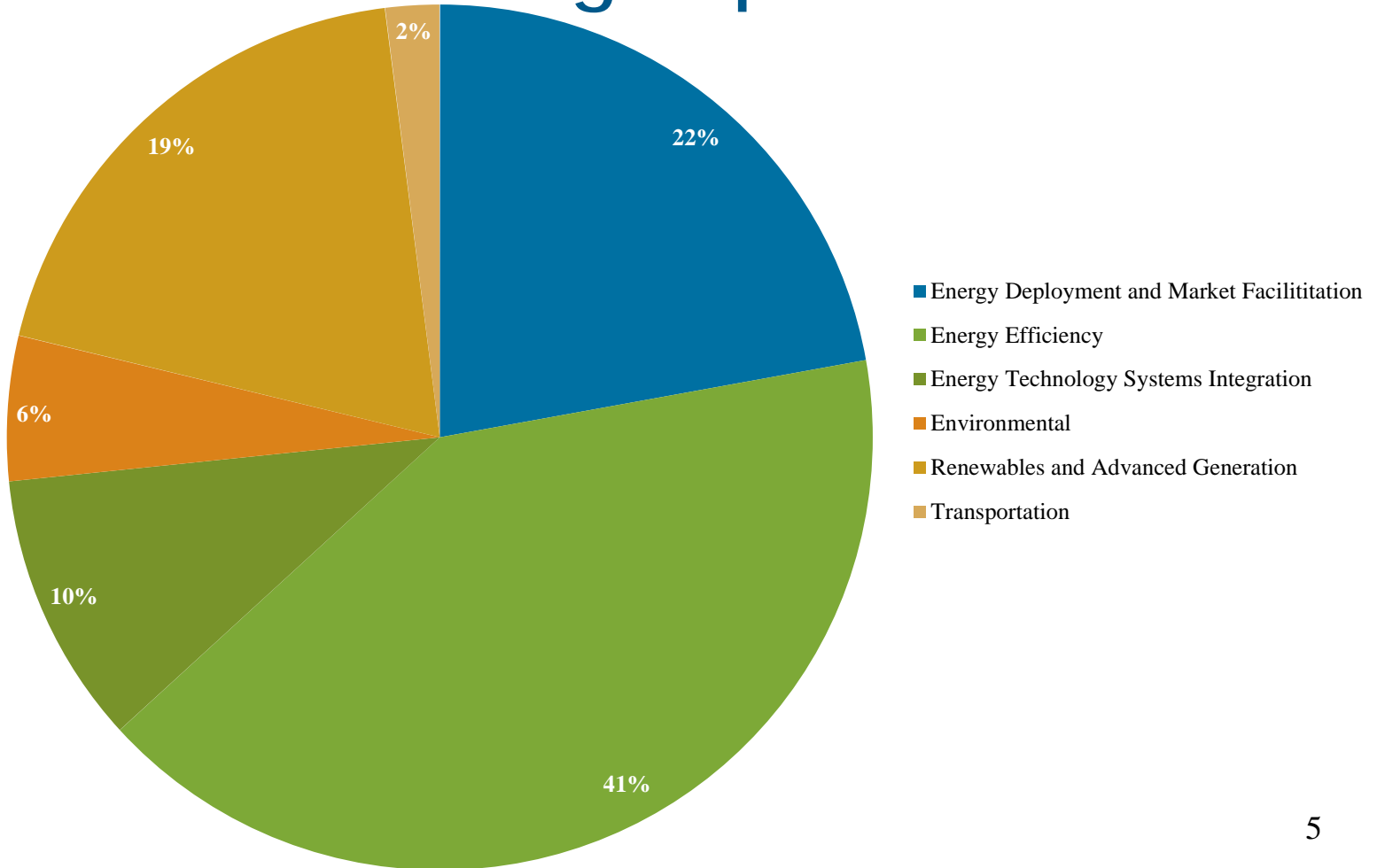
December 2016: CEC adopted *Low-Income Barriers Study*, which included recommendations to reduce barriers to people in disadvantaged communities (DACs) adopting efficiency and renewables. Recommendations included:

- EPIC should target 25% of TD&D funding for projects sited in DACs
- RD&D programs should conduct forums to share best practices and case studies on siting projects in DACs
- CEC should analyze business models that would create market opportunities for clean technology in DACs
- CEC should sponsor prize competitions and challenges for bringing clean technologies to DACs.

In 2016, 35.7 percent of the funding awarded to TD&D projects went to projects that included at least one site in a disadvantaged community.

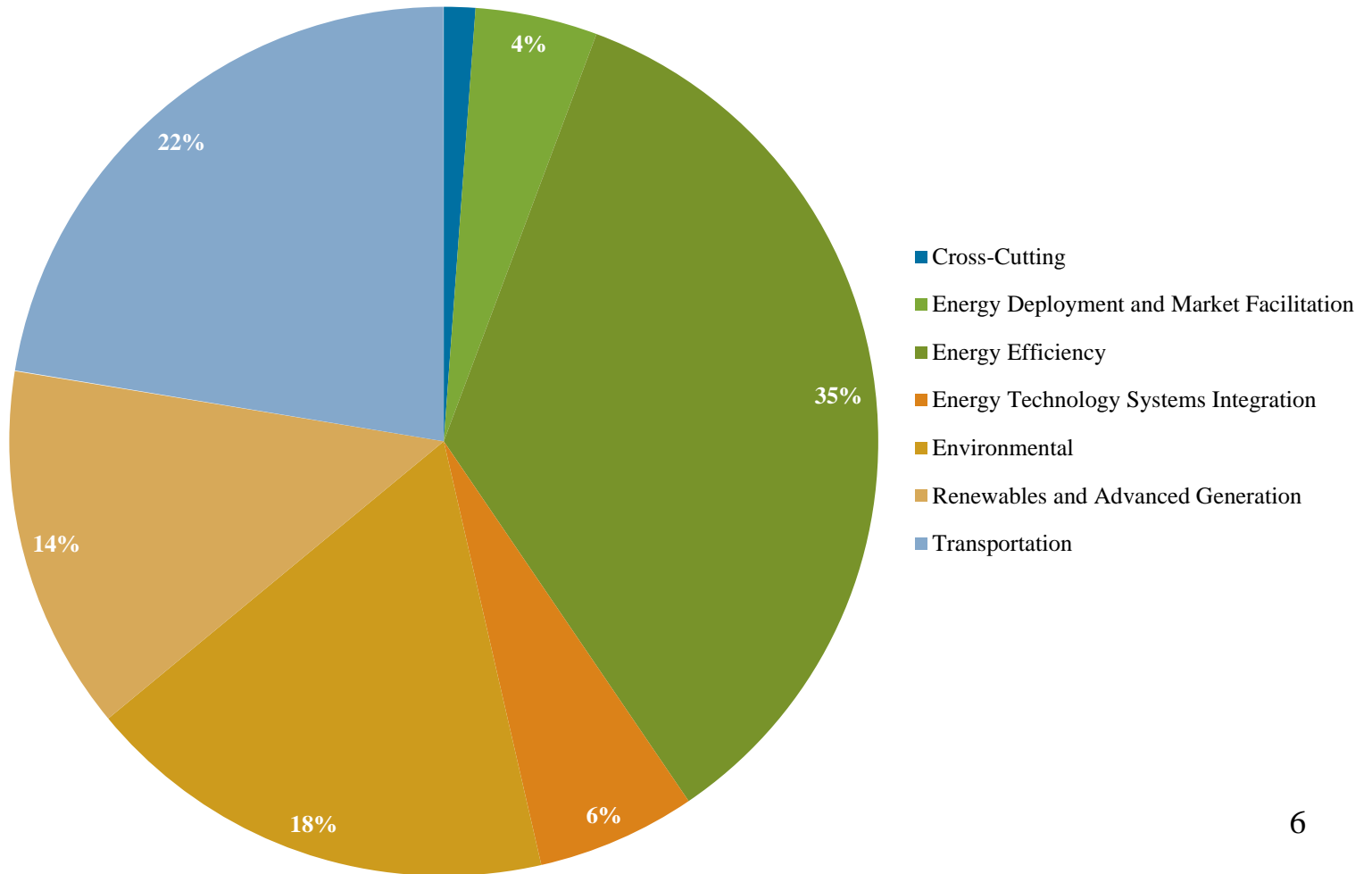


\$446 Million EPIC Awards 2014 through April 2017





\$209 Million Natural Gas Awards 2004 through April 2017





Investment Plan Development

The CPUC requires the four EPIC Administrators, including the Energy Commission, to develop a three year investment plan

The *EPIC 2018 – 2020 Investment Plan* was developed through an open process with multiple rounds of stakeholder engagement

- The Energy Commission received over 140 written comments in response to these workshops
- Summaries of all comments, along with staff responses are provided in Appendices A-C
- First scoping workshop was held on February 3, 2017
 - Staff presented draft strategic framework
- Second scoping workshop was held on March 14, 2017
 - Staff presented draft funding initiatives



Energy Commission Proposed EPIC Funding by Program Area 2018-2020 (millions \$)*

Program Area	Amount
Applied Research and Development	\$140
Technology Deployment and Demonstration	\$151.7
Market Facilitation	\$58.3
Program Funding Total	\$350
Administration	\$38.8
Total EPIC 2018-2020 Funding	\$388.8

*Any additional funds that may be allocated to the Energy Commission as a result of any CPI adjustment will be used to increase the budget proportionally across all areas.



Strategic Objectives

- 1 Advance Technology Solutions for Continuous Energy Savings in Buildings and Facilities
- 2 Accelerate Widespread Customer Adoption of Distributed Energy Resources
- 3 Increase System Flexibility and Stability from Low-Carbon Resources
- 4 Increase the Cost-competitiveness of Renewable Generation
- 5 Create a Statewide Ecosystem for Incubating New Energy Innovations
- 6 Maximize Synergies in the Water-Energy-Food Nexus
- 7 Develop Tools and Analysis to Inform State Energy Policy and Planning
- 8 Catalyze Clean Energy Investment in Underrepresented and Disadvantaged Communities



Strategic Objective

1

Advance Technology Solutions for Continuous Energy Savings in Buildings and Facilities

This theme focuses on technology advancements to drive cost and performance improvements of energy efficiency components:

- Accelerate adoption and increase cost effective options in existing and future buildings/industries.
 - Solid state lighting features, cost effective building envelopes, standardized control platforms, plug load controls
- Focus on hard-to-reach market sectors
 - Disadvantaged communities - factory built
- Transition from traditionally natural gas equipment to electricity.
 - Climate appropriate, high efficiency heat pumps
 - Industrial decarbonization strategies
- Looking towards the future
 - Transition to DC buildings



Strategic Objectives

3 Increase System Flexibility and Stability from Low-Carbon Resources

Theme Highlights:

- Accelerate broad adoption of automated DR capabilities to provide grid flexible response services
- Enable electric vehicle-based grid services
- Increase value of DERs and renewables to the transmission and distribution systems
- Defining and demonstrating locational benefit and best configurations of grid-level energy storage



Strategic Objectives

5 Create a Statewide Ecosystem for Incubating New Energy Innovations

This theme seeks to leverage, align and expand California's existing assets to build a more efficient statewide energy innovation ecosystem that will:

- Provide a more systematic approach to move new energy inventions through the "technological valley of death"
- Reduce non-value added activities from the development of energy technology breakthroughs
- Overcome barriers to broader and more diverse clean energy entrepreneurship



Strategic Objectives

8 Catalyze Clean Energy Investment in Underrepresented and Disadvantaged Communities

This theme theme seek to increase investment, deployment, and adoption of clean energy innovations in low-income and disadvantaged communities by:

- Developing data-drive tools for energy projects targeting disadvantaged communities
- Scaling-up emerging technology solutions best suited to the needs of disadvantaged communities
- The Energy Commission is committed to allocate 25 percent of Technology Demonstration and Deployment funds for projects located in disadvantaged communities



Energy Efficiency Research



Lighting



HVAC



Plug Loads



Food Service



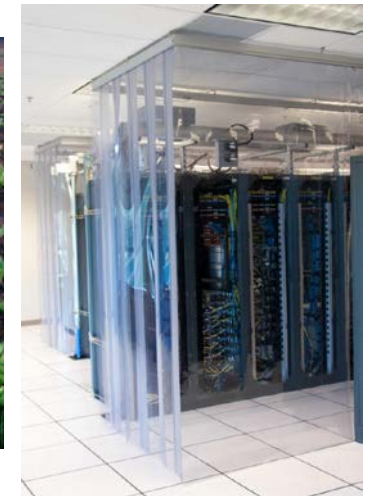
Commercial Laundry



Food Processing



Water



Data Centers



Cutting Costs for Ratepayers through Energy Efficiency Improvements

- **Optimizing building efficiency** by developing, demonstrating and incorporating near-zero-cost, non-invasive plug and play building diagnostic technology into existing building controls in 252 California Target stores resulted in \$2.4 million in first year savings, primarily from HVAC, lighting and refrigeration. Demonstration by Ezenics.
- **Demonstrating the value proposition of commercial building retrofits** that use emerging technologies, such as dynamic daylighting, passive cooling/heating, night flushing, LED lighting and plug load controls, resulted in annual operating savings that more than paid for the upgrade costs, plus yielded higher rents. Demonstration by View.
- **Developing and testing wireless lighting controls** that respond to occupancy and daylighting has optimized lighting retrofits without costly rewiring can result in typical energy savings of about 60 percent and led to the creation of Adura.





Cutting Costs for Ratepayers through Energy Efficiency

- **Saving energy and time by sealing leaks with an aerosol mist** can reduce time labor of envelope sealing, increase effectiveness and improve air tightness. Demonstration by UCD.



Sealed leak in between manual caulk application at the Honda Smart Home



Large sealed leak on a ceiling beam at the Honda Smart Home

- **Demonstrating innovative radiant cooling system** that uses the floor plate as a heat exchanger led to 30% energy savings and has resulted in it being the “standard design” for new Wal-Mart stores in hot and dry climates. Demonstration by UCD and Walmart.





Renovating Homes to Increase Efficiency and Reduce Energy Consumption





Residential and Commercial Plug Loads Research

Goal: Improve devices/technologies that are highly inefficient and have potential for large energy savings.

Examples:

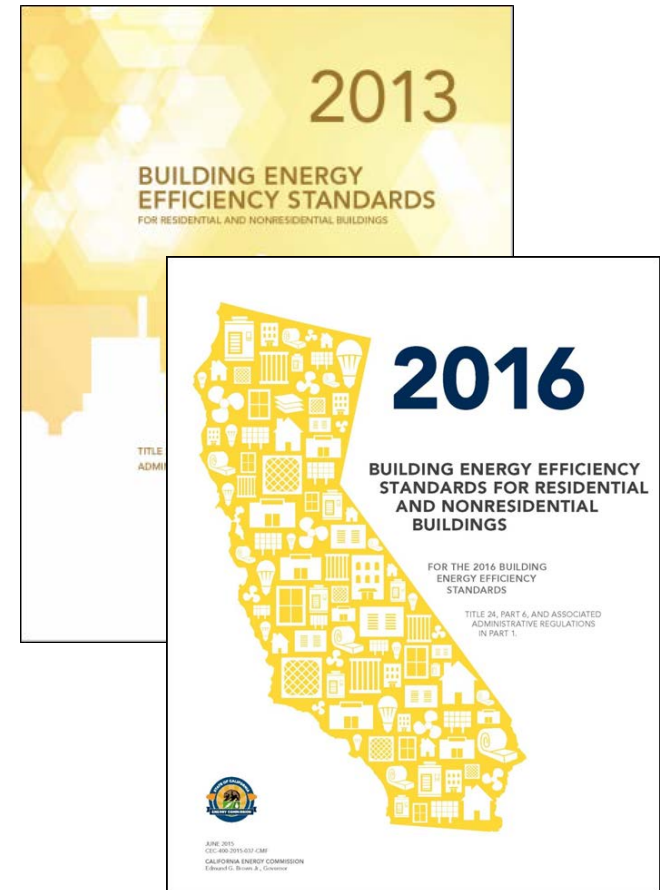
- **Aggios: Mobile Efficiency for Plug Load Devices:** Use mobile design practices, hardware components & energy management software to reduce energy consumption on other plug load devices (set top boxes, TVs, computers, game consoles, etc.)
- **LBL: Gaming System Energy Efficiency:** Demonstrate the next generation of gaming systems to capture gaming energy savings potential without compromising performance.





Introduction

- California's Building Energy Efficiency Standards
- Title 24, Part 6
 - 2016 Standards
 - Policy Drivers
 - 2019 Standards





Origin Story

Public Resources Code § 25402: The commission shall ... do all of the following, in order to reduce the wasteful, uneconomic, inefficient, or unnecessary consumption of energy, including the energy associated with the use of water:

- (a) (1) Prescribe, by regulation, ... building design and construction standards that increase the efficiency in the use of energy and water for new residential and new nonresidential buildings.

CALIFORNIA'S ELECTRICITY QUANDARY:
I. ESTIMATING FUTURE DEMAND

CALIFORNIA'S ELECTRICITY QUANDARY:
II. PLANNING FOR POWER PLANT SITING

CALIFORNIA'S ELECTRICITY QUANDARY:
III. SLOWING THE GROWTH RATE

PREPARED FOR THE CALIFORNIA STATE ASSEMBLY, WITH
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R-1116-NSF/CSA
SEPTEMBER 1972

Rand
RAND CORPORATION



Standards Development Timeline

2016

- Stakeholder Outreach
- Research to Identify Measures

2017

- Proposals Submitted to Commission
- Start of Rulemaking (ISOR, NOPA, etc.)

2018

- Comment Responses
- Adoption

2020

- Standards Effective January 1, 2020



Utility-funded Codes and Standards Enhancement Studies

- Evaluate regulated and un-regulated products and systems for potential energy savings
- Conduct engineering assessments to assess feasibility and cost-effectiveness of potential technology improvements
- Develop use-cases and collect data on duty cycles
- Develop test procedures
- Propose metrics and standards language
- Estimate savings potential



CASE Studies Under Consideration for Inclusion in the 2019 Standards

- **Cooling Tower Minimum Efficiency:** the proposal is the prescriptively require cooling tower efficiency to be no less than 80 gpm/hp. This is almost double the mandatory minimum. We are not pre-empted on this measure because cooling towers are not a “covered product”.
- **Economizer Fault Detection Diagnostics (FDD):** the proposal is to extend the current FDD requirement (only for packed RTU’s over 4.5 tons) to built-up systems. This would essentially require the Central Energy Management Systems to incorporate FDD into its control logic.
- **Proposals Based on ASHRAE 90.1-2016:** Fan system power, exhaust air energy recovery, water side economizing, transfer air for exhaust air makeup, demand control requirements for classrooms and occupant sensor controlled ventilation for certain spaces.
- For **residential air-handlers** we are updating our watts/cfm criterion to align with the 2019 DOE Residential Furnace Fan Standard that will be in effect.



For More Information

- Research Program Information
www.energy.ca.gov/research
- Upcoming solicitations
<http://www.energy.ca.gov/contracts/>
- Innovation Showcase – highlights funded R&D projects
<http://innovation.energy.ca.gov/>
- Research Reports
http://www.energy.ca.gov/research/reports_pubs.html
- Codes and Standards Proceedings
<http://title24stakeholders.com/2019casetopics/>



Backup slides



Policy Guidance

SB 96 provides additional direction to the Energy Commission in its administration of EPIC

EPIC should award, “funds to projects that may lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state’s statutory energy goals and that may result in a portfolio of projects that is strategically focused and sufficiently narrow to make advancement on the most significant technological challenges.”

The Energy Commission shall, “use a sealed competitive bid as the preferred method to solicit project applications and award funds pursuant to the EPIC program.”



CEC Administered EPIC Funding

Applied Research and Development

Applied Research and Development includes activities to support pre-commercial technologies and approaches at applied lab-level or pilot-level stages.

Technology Demonstration and Deployment

Technology Demonstration and Deployment involves installation and operation of pre-commercial technologies or strategies at a scale that will reflect actual operating, performance, and financial characteristics and risks.

Market Facilitation

Market Facilitation focuses on a range of activities, such as commercialization assistance, local government regulatory assistance and streamlining, market analysis, and program evaluation to support deployment and expand access to clean energy technology and strategies.