



California Energy Commission



EPIC Residential and Commercial Plug Loads Research

Miscellaneous Electric Loads Workshop
DOE/EERE Buildings Technologies Office
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Background

- The Electric Program Investment Charge (EPIC) is funded by an electricity ratepayer surcharge established by the California Public Utilities Commission in 2011
- The purpose of EPIC is fund innovative technologies, tools and approaches to benefit electric ratepayers of three electric investor-owned utilities (PG&E, SDG&E, and SCE)
- EPIC projects promote greater electricity reliability, lower costs, and increased safety
- Funded projects must lead to technological advancement and breakthroughs to overcome the barriers that prevent the achievement of the state's statutory energy goals
- Annual program funds total approximately \$162 million with 80% administered by the California Energy Commission



Investments Will Fill Key Funding Gaps Within the Innovation Pipeline

Energy Innovation Pipeline





Paths to Market



**Rebate
Applications**
Apply now



**Codes and
Standards-
Title 20 and
Title 24**

**Utility
Incentive
Programs –
rebates and
incentives**

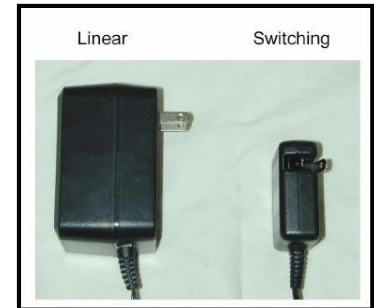
**Direct
deployment
into the
market
place**



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Examples of CEC Past Research Supporting Codes and Standards

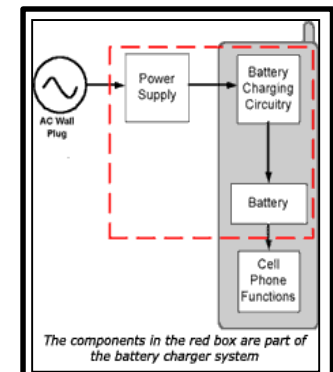
- ✓ Developed External Single Volt Power Supply Test Procedure and Primer
- ✓ Tested numerous external single volt power supplies
- ✓ Data was used to support Title 20 Standard
- ✓ **Result: External Single Volt Power Supply Efficiency Standard** (effective 1/1/2007)



- ✓ Contributed to TV Title 20 Standard Test Procedure
- ✓ Tested numerous TVs
- ✓ Data was used to support Title 20 Standard
- ✓ **Result: TV Efficiency Standard** (effective 1/1/2011)



- ✓ Developed Battery Charger Test Procedure and Technology Assessment
- ✓ Tested numerous battery chargers
- ✓ Data to support Title 20 Standard
- ✓ **Result: Battery Charger Efficiency Standard** (eff. 2/1/2013)





Benefits of Research Impacting Codes and Standards (Title 20)

Research	CEC R&D Costs	Estimated Annual Monetary Savings*
External Power Supply	\$288,541	\$100,000,000
TV	\$300,000	\$800,000,000
Battery Charger	\$400,000	\$300,000,000

* Savings accrue once measures are implemented

\$1 million in research funds catalyst for saving the the State approximately \$1.2 billion every year



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Recent Awards - Plug Load Technologies and Approaches for Buildings

- The purpose was to fund applied research and development projects that develop next generation plug load efficiency technologies and strategies for the building sector.
(<http://www.energy.ca.gov/contracts/epic.html#GFO-15-310>)
 - **Group A:** Develop Next Generation Plug Load Devices and Technologies
 - Improve energy efficiency of plug load devices (electronic and miscellaneous), with attention to those that are highly inefficient, operate uncontrolled with long operating hours, and have potential for large energy savings and tested in hardware
 - **Group B:** Develop Integrated Plug Load Strategies
 - Improve energy efficiency by integrating plug load devices (electronic and miscellaneous), such as integration with building energy management systems to minimize energy use.
- Research project term approximately 4 years (2016-2020)



Mobile Efficiency for Plug Load Devices

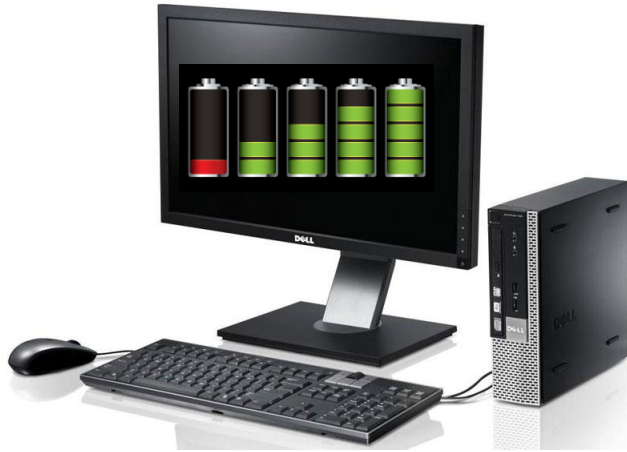


Use mobile design practices, hardware components, and energy management software to reduce energy consumption on other plug load devices.

- Other devices include set-top boxes, TVs, computers, and game consoles.
- Energy savings between devices range between 20-50%
- Estimated annual energy savings 1.6- 8 TWh after stock turnover



Power Management (PM) User Interface



Introduce a new user interface that could increase the use of existing PM, and to collect data on users' behaviors toward PM in computers to help in future innovation in energy-efficient design.

- New user interface would benefit individuals with desktops at home and at work
- Users can reduce power consumption by 50%
- Estimated annual cost savings in CA of \$1.9 million



Gaming System Energy Efficiency without Performance Compromises



Demonstrate the next generation of gaming systems and help capture the gaming energy savings potential.

- Estimate energy use through improved hardware, firmware, software, and behavioral applications
- EE improvements help gamers who dislike noise, heat, and thermal discomfort
- Estimated annual energy savings of 3TWh or approximately \$500 million

Project Investigator: Lawrence Berkeley National Lab



Efficient and ZNE-Ready Plug Loads



Develop and demonstrate technologies and strategies that can change the way plug load devices are powered in ZNE buildings.

- “Zero-standby” power supply to eliminate no-load losses
- Low-energy DC devices vs. traditional AC powered devices
- Low-energy security, safety, and medical service devices
- Less energy consumed by plug loads = lower utility bills
- Estimated to annually save 5,100 GWh/year

Project Investigator: Lawrence Berkeley National Lab



Plug Load Reduction App: RYPL



Develop an engaging and free mobile application to analyze a home's idle load using smart meter data, help the user identify specific causes, and recommend ways to reduce it.

- Prioritizes which loads to tackle first
- Engages Californians to reduce plug load energy use through an easy-to-use app
- Lower energy bills by reducing idle loads
- Potential to reduce energy use and GHG emissions

Project Investigator: Home Energy Analytics



Electric Plug Load Energy Savings Potential of Commercial Foodservice Equipment



Assess the size of the market for unventilated electric equipment and characterize the energy use and energy savings potential for electric cooking and warming equipment

- Toasters, Food Warmers, and Coffee Brewers
- Appliance monitoring at selected restaurants over 3 years.
- Replacement equipment monitoring or applying energy-reduction technology
- Assuming 15% penetration, estimated annual savings of 362.3 GWh, resulting in reductions of \$54.4 million in operating costs and 118,000 tons of CO₂ emissions.

Project Investigator: Fisher Nickel, Inc.



Unlocking Plug Load Energy Savings Through Energy Reporting



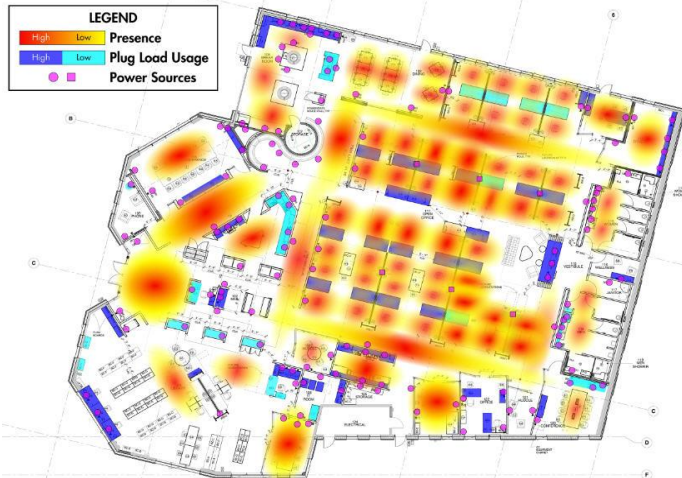
Implement energy reporting to enable plug-load devices to transmit operating information, such as identity, power consumption, and functional state, through a communications network.

- Empower buildings owners and operators to take control of energy used
- Applying technology to appliances
- Estimated 10% reduction in plug-load energy use and demand reduction of more than 700 MW

Project Investigator: Lawrence Berkeley National Lab



Flexible Control Strategies for Plug Loads with Context-Aware Smart Power Outlets to Mitigate Electricity Waste and Support Demand Response



Develop integrated plug load control strategies for different spaces within multiple building types in the commercial sector

- User presence (i.e. Bluetooth) for predicting and detecting wasted electricity usage.
- Determine appropriate control strategies based on type of building, space assignment, and plug load in question.
- Estimated annual energy savings 2,293 GWh

Project Investigator:
Electric Power Research Institute



Websites

- Information on Research Activities
 - <http://www.energy.ca.gov/research/>
- Sign up for Listservers to obtain information about future Opportunities:
 - <http://www.energy.ca.gov/listservers/>



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Questions?

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