

**Proposed Agreement between California Energy Commission
and
The Regents of the University of California, Irvine**

Title: California Plug Load Research Center
Amount: \$1,000,000.00
Term: 36 months
Contact: Bradley Meister
Committee Meeting: 1/6/2011

Funding

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
09	Electric	Buildings	Technology Innovations	\$10,900,000	\$101,996	\$0	0%
09	Electric	Buildings	Preliminary Research and Market Characterizations	\$1,500,000	\$760,510	\$0	0%
09	Electric	Buildings	Standards and Policy Coordinations	\$2,434,200	\$137,494	\$0	0%

Recommendation

Approve this interagency agreement with the University of California, Irvine for \$1,000,000. This funding is to support plug load research that could be the foundation of future appliance standards (Title 20). Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

Issue

Energy use in the residential and commercial sectors in California for plug loads is growing rapidly. Currently, residential and commercial plug loads are responsible for about 15 to 20 percent and 10 to 15 percent of electric energy use, respectively. Some estimates show plug loads being almost 30 percent of residential electric consumption by 2030.

Plug loads are devices that plug into electrical outlets (as opposed to being hard-wired). They do not fall into other traditional end-use categories (appliances, lighting, HVAC, etc.), can be residential or commercial, and contain internal or external ac-dc power supplies with some or all of their energy used in the form of low voltage dc. They can have digital displays/timers, remote and/or soft touch controls, rechargeable batteries, etc. There are 3 to 4 billion individual devices accounting for about 10 percent of total U.S. electricity use.

The energy consumption is high for a variety of reasons. First, there is a large variety of energy-consuming devices that residents and business people bring into their buildings. These include everything from televisions and mobile phones to copiers, cash registers, refrigerators and freezers, portable lamps, hair dryers, electric can openers, and portable electric heaters.

Second, consumer behavior in using these devices is also quite varied - it varies by region, consumer age, and appliance type. Consumers typically have little knowledge about the energy consumption of each activity. It is a social problem as well as a technical problem.

Third, particularly for electronic devices, the load is growing rapidly and there is a high turnover of products. Cell phones are typically replaced every year or two. Homes that once had five electronic devices now may have 50, according to a recent Energy Commission study.

Finally, even the category definitions keep shifting - BluRay replaces DVD and CD, which replaced VHS. Many of these products consume power even when turned off, and the old equipment remains plugged in, consuming power even though it's seldom used. As a result, one of the fastest growing energy loads is also the least well defined, least regulated, and most difficult to regulate. That fact bodes ill for California's energy future.

Background

Why a Research Center?

Concentrating research activities in a single institution has the effect of creating a critical mass of activities and expertise. It forms a locus which attracts the attention of industry, utilities, and the scientific and engineering community. Utilities are willing to provide funding for specific projects which serve their interests. High quality students and faculty are attracted by research sponsorship and the excitement of working on relevant projects.

Industry sees the research institute as a source of ideas and future talent, a way to get an advantage over the competition, and a neutral venue for discussing potential standards and initiatives which go beyond their own companies. For government, the research institute provides a way to interact with industry regarding standards and policies, and to a way to avoid sponsoring duplicative research.

Since 2004, PIER has funded over \$4,000,000 in research associated with curbing energy use in plug load devices. This research has included six contracts involving external power supplies, battery chargers and internal power supplies, medical and computer equipment, statewide surveys, active and low power mode research, and energy efficient digital networks.

The results of the research have been primarily used to develop appliance efficiency standards (T-20) for external power supplies in 2007 and televisions in 2009. Additionally, an approved Battery Charger Test Procedure was approved in 2006. The federal government and other states have taken similar measures, usually following California's lead. Though this research has been very beneficial, we are not identifying new solutions fast enough.

The center will provide a central and coordinated focus dedicated to supporting future T20 standards, improving the energy efficiency of plug loads and will leverage the work of dozens of others. The PIER program will direct the research through work authorizations, which will be an excellent means of responding quickly to research needs in the ever changing plug load industry.

PIER has found for other energy problems that it helps to establish a research center at a university that can integrate needed research, demonstration, and education on the problem while working with industry to support future T20 standards. These organizations are neutral sources of expertise available to the public, the industry, the utilities, and government. Several significant projects that advance

energy efficiency can be traced to the initiative and assistance provided by these organizations. By their neutrality, expertise, and success they have also been able to garner financial support from other sources to supplement the baseline support from the Energy Commission.

Why UC Irvine?

UC Irvine was selected because Irvine is the headquarters for many North American electronics and biomedical firms. UC Irvine through its California Institute for Telecommunications and Information Technology (Calit2) Research Center (information technology) already had connections with many of these firms and has an established track record of applied as well as basic research pertaining to electronic devices. The facility includes laboratories for designing, fabricating and testing electronic and electromechanical equipment.

Additionally, UC Irvine has established expertise on the use of information technology in the home and office. The Director of Calit2 has enthusiastically taken on the responsibility of organizing the research institute, including outreach to many potential industrial partners. The center at UC Irvine has the support of the investor owned utilities, SMUD, the South Coast Air Quality Management District and consumer electronics firms and consumer groups in Southern California. It would be patterned after the California Lighting Technology Center model with an emphasis on supporting future T20 standards and developing technology to help California lead the world in developing efficient electronic equipment.

Proposed Work

UC Irvine will host a California Plug Load Research Center in an existing building on the UCI Campus. The center will develop research capabilities that will connect the industry, utility and regulatory markets in finding cost effective solutions to curbing energy loads associated with consumer electronics.

One purpose of the research is to support of future appliance standards (Title 20) to address the growing plug load in California. All assignments will be done through work authorizations approved by the Policy Committee to identify specific work and tasks. PIER staff will work closely with the Energy Commission's Efficiency and Renewable Energy Division, utilities, industries and others to coordinate all research activities. The activities to be funded by PIER, include but are not limited to:

Technical research (estimate 50% of research funds)

- Active Power Research
 - o Improve efficiency of power supplies, battery chargers, displays, TVs, computers, TEVO players, WiFi, 3D TVs and Cameras, etc.
- Low Power Mode Research
 - o Improve enabling features of equipment, power management software, improved power strips, set top boxes, gaming consols, inter-device control, etc.
- Building Networks
 - o Improve efficiency of routers, switches, ethernet, android technology for control of equipment, wireless controls, voice over internet, proxying technology, etc.

Market outreach and information dissemination (estimate 25% of research funds)

- Demonstrate and publicize ways various types of end users can manage plug loads
- Establish partnerships with industry and coordinate what is needed to realize the benefits of more efficient plug loads.

- Provide education and training: The center will have a strong connection with utilities and the Energy Commission's Efficiency Division-Appliance Standards staff. These entities will use research results as the basis to justify the need for future Title 20 appliance standards and for incentives/rebates.
- Hold workshops to present research ideas and findings by students, professors, industry and Commission staff
- Prepare and disseminate research results through printed material, websites, newsletter or through conferences.

Administrative activities (estimate 25% of research funds)

- Establish center structure including, recruiting a director and hire staff and establish office operations, recruit members, purchase limited equipment
- Establish advisory groups and a governing board
- Seek follow-on funding from partners to further develop energy technologies that will potentially benefit California electric ratepayers.

Justification and Goals

This project "[will develop, and help bring to market] increased energy efficiency in buildings, appliances, lighting, and other applications beyond applicable standards, and that benefit electric utility customers" (Public Resources Code 25620.1.(b)(2)), (Chapter 512, Statues of 2006)).

This project also addresses Public Resources Code Section 25620.1. This section states that the PIER program shall include a full range of RD&D activities not adequately provided for by competitive and regulated markets. The goal is to develop and help bring to market technologies that provide increased environmental benefits, better system reliability, and other tangible benefits to electric customers by making investments in energy efficiency, and other applications, beyond applicable standards.

This will be accomplished by:

- Targeting and supporting research in new and emerging energy efficiency technology.
- Facilitating and accelerating the development and commercialization of energy efficient plug load devices in California that put California on the path to zero net energy buildings by 2020 for residential and 2030 for commercial.