

Proposed Amendment between California Energy Commission and Portland State University

Title: Advanced Residential Energy and Behavior Analysis Project
Amount: \$984,100.00
Term: 24 months
Contact: Matt Coldwell
Committee Meeting: 3/16/2011

Funding

FY	Program	Area	Initiative	Budget	This Project	Remaining Balance	
09	Natural Gas	ETSI	Improve Understanding of Consumer Behavior and Market Issues	\$984,100	\$984,100	\$0	0%

Recommendation

Approve this amendment with Portland State University for \$984,100.00. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

Issue

There is limited understanding of residential energy consumption behavior and choice, which poses a problem for the implementation of effective energy policies and programs (whether these are focused on efficiency, demand response or distributed generation). The Energy Commission routinely uses data on residential sector energy use, household technologies, building characteristics, and efficiency potentials to produce forecasts of growth in energy demand and to inform the development of energy policies and programs. Conventional modeling approaches that generate this data focus narrowly on hardware technologies, treating the behavioral dimensions of technology choice and energy use as relatively unimportant. As a result, considerable variability in energy use and efficiency across the residential sector tends to be overlooked in energy policy analysis and forecasting.

Background

The purpose of the Advanced Residential Energy and Behavior Analysis (AREBA) project is to better understand how households use energy in order to enable better policy models, better technologies and better-informed choices by residential consumers. Because there is considerable variation in energy use across the residential sector, knowledge developed by AREBA about the drivers of that variation can improve the efficiency of energy services and reduce greenhouse gas emissions. The AREBA project has been limited to the study of highly aggregated data with considerable uncertainty about consumption by households at the end-use level. Aside from survey self reports and statistical estimates, we have no way of knowing just what combinations of building characteristics, technology, weather, and behavior are responsible for the large variations seen in the data. In short, best efforts have been hampered for decades by the poor granularity of available data.

The AREBA project is currently under contract until September 30, 2012 and was originally awarded \$1.2 million in funding. Portland State University was chosen to conduct this research because the

principal investigator for the University, Professor Loren Lutzenhiser, is considered as one of the leading experts on this subject. Professor Lutzenhiser has worked on many related projects and has published numerous papers and scientific reports in the area. Two related projects that the Portland State University team is currently a subcontractor on are two separate ARRA projects, one with Lawrence Berkeley National Laboratory, and the other with Pacific Northwest National Laboratory. The Portland State University team is providing their technical expertise in behavioral research for both of these projects and will be able to leverage the knowledge and information gained in these projects with their work for the Energy Commission.

As an example, the knowledge and information gathered by the AREBA project will provide significant benefit to the Energy Commission's Demand Analysis Office, which uses data collected by the California Residential Appliance Saturation Survey (RASS), and other sources as inputs to the California residential demand forecasting modeling system. The inputs almost exclusively use estimates of average appliance holdings, average usage rates, and average energy consumption per end use. Research shows, however, that the averages mask extreme differences in all of these factors. The AREBA research explores weaknesses in the RASS sample and data, and also provides better quality estimates of patterns of variation in appliances, uses and end-use rates.

Proposed Work

The current AREBA project, per the terms of the existing agreement, is investigating limitations in current data and models of residential energy use in order to better understand patterns of residential energy demand. The results are intended to improve the accuracy of the Energy Commission's large-scale demand forecasting models, medium scale policy models (e.g., Title 24, DEER) and micro-scale building audit models. The project is currently developing and testing alternative understandings of how building characteristics, technologies, climate, and household behavior combine to produce different energy demands under different circumstances.

This amendment will allow the researchers to build upon the existing work by making use of new sources of data that were not available when the AREBA project was initiated. These fine-grained data will enable a more detailed picture of residential energy use patterns and more accurate predictions for energy policy and efficiency programs. The data include: advanced meter infrastructure (AMI) interval meter/time-of-use demand data, low-cost end-use measurement (EUM) technology data, detailed building/equipment characteristics data from new Energy Commission-sponsored energy audit programs, improved climate data from an expanded range of California micro weather stations, and detailed behavioral data from on-site ethnographic interviews and new behavioral survey instruments to be designed and tested by the project. Combined with work currently underway, a minimum of eighteen new studies of specific aspects of residential energy use and conservation will be produced.

Justification and Goals

Supports California's goal to the 2008 Program Plan and Funding Request as approved by the CPUC; and to rigorously evaluate, measure, and monitor natural gas efficiency programs to ensure that they produce the intended savings, and that public funds are well spent per the Integrated Energy Policy Report 2005.

This will be accomplished by:

- Developing next-generation models, data sources, policy and technology analyses to provide an improved understanding of residential demand for natural gas.
- Significantly advance the state-of-the-art in residential energy modeling and policy support.