



(This is a Request for Information only - Complete Pages 1 and 2 for each initiative)

Title of Proposed Initiative (Short and concise): Putting Buildings to Sleep

Investment Areas (Check one or more) – *For definitions, see First Triennial Investment Plan, page 12:*

- Applied Research and Development
 Technology Demonstration and Deployment
 Market Facilitation

Electricity System Value Chain (Check only one): See CPUC Decision 12-05-037, Ordering Paragraph 12.a. http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF.

- Grid operations/market design
 Generation
 Transmission
 Distribution
 Demand-side management



Issues and Barriers:

Barriers to raising the part-load efficiencies include need for new technologies, test procedures to give innovations adequate credit, and simple means to enable system-wide integration.

Initiative Description and Purpose:

Both residential and commercial buildings consume large fractions of their annual electricity during periods when they are vacant or when requirements for energy-related services are greatly reduced. These times include weekends for office buildings and when people are sleeping in homes. In half of California homes, more than 40% of annual electricity use occurs 24/7; the fraction is higher in commercial buildings. The fraction will be even higher for new buildings of both types. Buildings cannot reach their targets for near-zero energy use unless strategies are developed to address these remaining HVAC and diverse miscellaneous loads.

The needed research consists of innovations in technologies and systems that enable buildings to reduce their energy use when the need for those services is reduced. Put another way, buildings must more closely follow the need for services while maintaining a high efficiency. The principle must be applied to both HVAC and miscellaneous electrical loads that, to date, have not been controlled.

Stakeholders:

Policymakers and public seeking to meet California's emissions objectives will support this initiative.

Background and the State-of-the-Art:

- *What research development and demonstration has been done or is currently being done to advance this technology or strategy (cite past research as applicable)?*
- *Describe any public and/or private successes and failures the technology or strategy has encountered in its path through the energy innovation pipeline: lab-scale testing, pilot-scale*

testing, pre-commercial demonstration, commercial scale deployment, market research, workforce development.

- *Identify other related programs and initiatives that deal with the proposed technology or strategy, such as state and federal programs or funding initiatives (DOE, ARPA-E, etc.).*

Very little research has directly addressed making building services more carefully follow the actual needs. The problem has been identified in DOE's Building America program but not seriously addressed. Some technical standards groups, such as ASHRAE, have recently begun investigating partial solutions, such as HVAC.

Improving the nameplate efficiencies of HVAC, consumer electronics, and other appliances will provide some energy savings but efficiency improvements do not typically adjust output to match requirements. One reason is that energy test procedures stress full-load performance; however, many devices will be operating most of the time at below 30% of full load. The potential role of communications has also been discussed but typically to control HVAC and large equipment. Smaller equipment has been mostly ignored.

**Justification:**

Describe how this technology or strategy will provide California IOU electric ratepayer benefits and provide any estimates of quantified annual savings/benefits in California, including:

- Name of sector and estimated size and energy use.
- Quantifiable performance improvements for the proposed technology/strategy.
- Maximum market potential, if successful.
- Number of direct jobs created in California.
- Why this research is appropriate for public funding.

This research topic addresses residential and commercial buildings, which represent the majority of electricity use in California. The performance improvements involve lowering the energy use of future buildings (and retrofits of current buildings) beyond what simple efficiency improvements would yield and closer to the near-zero goals.

The results of this research will apply to all California buildings as they are retrofitted or equipped with new energy-using products.

Public funding is appropriate because the problem requires a systems solution, which is unlikely to be offered by the private sector.

Ratepayer Benefits (Check one or more):

- Promote greater reliability
- Potential energy and cost savings
- Increased safety
- Societal benefits
- Environmental benefits - specify
- GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost
- Low emission vehicles/transportation
- Waste reduction
- Economic development

Describe specific benefits (qualitative and quantitative) of the proposed initiative

Public Utilities Code Sections 740.1 and 8360:

Please describe how this technology or strategy addresses the principles articulated in California Public Utilities Code Sections 740.1 and 8360. The California Public Utilities Code is available online at www.leginfo.ca.gov/cgi-bin/calawquery?codesection=puc.