



Title of Proposed Initiative: Develop Methods and Demonstrate Accurate Determination of Effective Useful Lives for Energy Efficiency Measures

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.

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

California Energy Commission

DOCKETED

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Issues and Barriers:

For programmatic purposes, California computes potential (gross) life-cycle energy efficiency savings as the energy use of equipment or buildings below applicable standards or codes for the expected useful life (EUL) of the equipment or building. This potentially underestimates life-cycle energy savings as EUL's may underestimate the length of time equipment and building provides savings. Thus for planning energy efficiency activities to meet GHG or other policy goals, California's planning processes may have a bias against longer-lived measures in commercial and residential retrofits. Given the magnitude of energy use from currently existing equipment and buildings, accurate information is essential to plan activities that result in the substantial increase in efficiency necessary if CA is to reach it's future efficiency and GHG goals.

Initiative Description and Purpose:

This initiative will address the challenge of accurately determining the duration of savings whether the equipment being replaced has failed or not. The more difficult part of this challenge is how to determine a reasonable estimate of the remaining life of functioning equipment that is replaced by more efficient equipment prior to the original equipment's failure. Currently, the default total life for energy efficiency savings potential determination and program design has usually been manufacturer's rated life. For "early replacement" programs, the "early" period during which the savings are larger is usually a "deemed" value (In the CA DEER this is 1/3 the original life). Thus the technical question is whether there is a way to develop (distributions of) remaining equipment life that more accurately reflects the time-frames equipment is actually used. Like actuarial statistics, these distributions would

1. describe remaining life of new equipment in terms of likelihood of lasting for various time periods, and
2. describe the remaining life of existing equipment probabilistically, accurately reflecting additional savings from early replacement.

The project would do this for a few categories of equipment or building/shell types for which sufficiently rich equipment age data could be found, for example commercial roof-top AC units. Likely sources are CEUS, CBECS, audit databases for ESCO projects, or the upcoming audits of schools in

California (following prop 39 implementation). Building on this data, actuarial methods would be adapted to determine actuarial expectation of equipment life.

A significant opportunity exists for raising efficiency in schools, and the savings estimates from audits that will accompany many Prop 39 projects should provide abundant data on the age of equipment in schools in California (and facilitate the most efficient capture of energy savings in schools). This should indicate the accuracy of current EUL assumptions in those situations.

Key deliverables will be

- proof of concept in determining accurate distributions of expected useful lives
- results (accurate EULs) of immediate use in potential determination and program planning for the demonstrated equipment/building types
- scalable methods applicable to the majority of existing energy using equipment and measures

Recommended funding: minimum: \$400,000 maximum \$800,000

Stakeholders:

Potential stakeholders include entities or organizations interested increasing California's estimates of energy efficiency potential and the creation of more efficient program efforts to realize that potential: the CEC, CPUC, ARB and energy efficiency Program Administrators.

Background and the State-of-the-Art:

- Little work has been done beyond the gathering of manufacturers rate lives of equipment, which are believed to generally set purchaser expectations and protect manufacturers from liability, not accurately predict equipment lives (or even necessarily to give the mean expected life. Manufacturers do perform tests in setting equipment lives, and the basic test data is often hard to access.
- Anecdotal information from auditors and building managers indicates that equipment is often maintained to operate past rated life.

**Justification:**

The methods and results would be first applicable to the commercial sector, and could be extended to the residential sector. The current approach to identifying potential and planning programs has had limited success in tapping the energy savings in existing buildings which generally have older, less-efficient equipment. This proposal addresses this challenge by refining the methods used to determine the expected length of the benefits from realizing those potential energy savings. By determining whether those savings are larger, as expected, the ability of the existing policy framework to develop effective approaches to realizing that potential will be enhanced. The expectation is that EULs of many measures may prove to be longer than has been used to date. This might provide increased cost-effectiveness in more aggressively attacking the potential in existing buildings with older, less efficient equipment.

The development of refined methods for assessing the basic technical inputs to California's policy framework is an appropriate expenditure of public funds.

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

The specific benefit of this project would be that methods would be developed to determine accurate EULs, a necessary component of energy efficiency savings calculations. More accurate EULs will result in more effective policies and programs. In particular, by having accurate EULs for longer-lived measures, the likelihood that more effective programs can be developed that realize the potential savings from upgrading existing buildings and replacing inefficient equipment.

Benefits organized by PU Code 740.1 categories:

- (a) The project will improve the efficiency with which energy efficiency funds can be used to achieve savings,
- (b) The project has a high probability of success in developing satisfactory methods and identifying data needed to obtain accurate EUL estimates on an on-going basis,
- (c) The project will support better attainment of electricity corporation energy efficiency goals,
- (d) No other similar research has been or is currently underway to proposers knowledge
- (e) (1) Improving energy efficiency planning and delivery results in environmental.