

Proctor Engineering Group

Projects Completed for Pacific Gas and Electric Company



1992 Energy Saver Showerhead Coupon Program

Client: Pacific Gas & Electric Company, San Francisco, CA.

Services: Program implementation and analysis of on-site data.

Description:

The Energy Saver Showerhead Coupon Program was offered by PG&E to encourage early replacement of high flow showerheads with energy-efficient low-flow showerheads by residential customers. The objective of the study was to determine the net electric and gas energy savings actually realized by the 1992 program. The net savings were found to be a function of three elements: gross energy savings, net-to-gross ratio and the persistence ratio. The net to gross ratio was determined from a telephone survey of customers who redeemed program coupons in 1992. The persistence ratio was determined by a telephone survey of customers who installed an energy saver showerheads in 1991. The gross energy savings were based on measurements gathered during on-site visits. The sampling plans were designed to be representative of the populations involved. An engineering model was used with all of the parameters provided from data gathered on-site.

This work was done in combination with related work done by HBRS.

Team members involved: John Proctor, P. E., Tom Downey

Reference: Bill Gavelis (415) 973-7802 Completion Date: 9/93

Project Cost: \$195,000

Appliance Doctor TM Project

Client: Pacific Gas & Electric Company, San Francisco, CA

Services: Design and implementation of Appliance Doctor TM heat pump and air conditioner efficiency modification program.

Description:

Since 1989, Proctor Engineering Group has been the lead consultant for the Appliance Doctor TM Project. Proctor Engineering Group has guided the program through three pilot phases. The first pilot phase included 48 homes with heat pumps; the second phase included 15 homes with central air conditioners and gas forced air furnaces; and the third phase included 250 homes with central air conditioners. The complete results of the first three pilot programs can be found in the following Pacific Gas & Electric final reports: Heat Pump and Super Weatherization Pilot Project; Appliance Doctor TM Pilot Project - Summer 1990 Activity; Appliance Doctor TM Pre-Production Test.

Proctor Engineering Group was responsible for program concept, design, implementation strategy, and provided program management during pilots. In three instances Proctor Engineering Group trained contractor personnel on protocols developed to investigate and resolve field service problems. In addition, Proctor Engineering Group wrote the implementation plan to deliver full-scale production.

The fourth phase in 1995 involved 400 homes with heat pumps. In this phase Proctor Engineering Group acted as advisor to PG&E in program design, developed a training program, and trained contractor personnel. In addition, PEG developed, trained on, and implemented a comprehensive quality assurance program utilizing the Immediate Impact Management TM system.

A fifth phase in this series is being implemented in 1996 by Conservation Services Group under PG&E's IRM program. Proctor Engineering Group will act as technical advisor to CSG and will continue the implementation of the IIM TM Quality Assurance program.

Individuals involved: John Proctor, P. E., Tom Downey.
Reference: Brad Wilson, PG&E, (415) 973-4856
Richard Jacobson, PG&E, (415) 973-4805
Completion Date: 12/95 (fourth phase)
12/96 (fifth phase- estimated) Project Costs: Over \$500,000 for all phases

Assembly, Testing & Investigation of a Reduced Peak Load Air Conditioner

Client: Pacific Gas & Electric Company, San Francisco, CA
Services: Applied research on the impact of equipment configuration changes

Description:

The goals of this study were to assemble an air conditioner with design parameters similar to those simulated in an earlier study on the peak load impacts of high SEER residential HVAC units; to test the unit in the laboratory; and to calculate the potential peak reduction for PG&E. The aspects of the study were:

- Identify and purchase appropriate equipment components;
- Assemble those components into a functioning HVAC unit;
- Test the unit in the Energy Systems Laboratory at Texas A&M University under a variety of temperature and equipment conditions.
- Analyze the results of the tests to answer a series of questions relating to peak draw, capacities, SEER, and cost.
- Report on the results of the tests.

The evaluation included varying the charge and airflow of the HVAC unit to measure the impact of off-design conditions on efficiency and peak draw. The study was designed to allow comparison to standard test conditions as well as to assess the effect of off-design conditions.

Individuals involved: John Proctor, P. E., Tom Downey, Zinoviy Katsnelson, Ph.D.
Reference: Lance Elberling, PG&E, (510) 866-5519
Completion Date: 3/96 (estimate)
Project Cost: \$64,000

Heat Pump Efficiency and Super Weatherization Pilot Project

Client: Pacific Gas & Electric Company, San Francisco, CA
Services: Program design and implementation including prediction of projected program savings using pre/post metering.

Description:

This project was initiated to address the problem of a high level of complaints from homeowners with heat pumps in a section of PG&E's service territory. The objectives of the pilot program were to determine the range and frequency of problems and to create a program that would result in enhanced customer satisfaction, save 10 to 20 percent of the space heating energy for the selected customers, and facilitate increased customer acceptance of high efficiency heat pumps. Pre/Post submetering were used to determine projected savings. The project is part of the series of Appliance Doctor programs completed by PEG for PG&E.

A program was designed and implemented to evaluate the problems and make needed system/equipment modifications. Pre/Post sub-metering and building testing was used to gather data on the effects of the repairs in the program. Contractor crews were trained on protocols established to evaluate and correct the problems that had been found. This training included classroom and field sessions. Participant surveys were used to determine the value of the service to the customer, behavioral changes and a listing of services they would like the utility to perform. Customer satisfaction with heat pumps and utility service was increased dramatically by the pilot program.

Individuals involved: John Proctor, P. E., Tom Downey.

Reference: Richard Jacobson, PG&E, (415)973-4805

Completion Date: 1/93

Project Cost: \$96,000

Investigation of High Temperature Performance of High SEER Air Conditioners

Client: Pacific Gas & Electric Company, Research/ Development, San Ramon, Ca.

Services: Research into peak performance of current air conditioner designs. Initial design of a new air conditioner that would mitigate peak.

Description:

New high efficiency air conditioners have a high SEER which is a rating based on tests at 82 degrees F (for single speed units). This test does not adequately project the peak performance of these air conditioners.

Proctor Engineering Group was hired to investigate the extent of this problem and to evaluate potential air conditioner design changes that would mitigate the peak problem. This research included:

Determination of performance at high temperatures of existing high market penetration models.

Projection of diversified peak effect of existing air conditioner designs.

Design simulation of component and unit changes to mitigate peak.

Team members involved: John Proctor, P.E., Zinoviy Katsnelson, Ph.D.

Reference: Ash Agboatwalla, Pacific Gas and Electric Company, 510-866-5353

The Model Energy Communities Program

Client: Pacific Gas & Electric Company, Research/ Development, San Ramon, Ca.

Services: Program design, technical oversight, training, analysis, evaluation and quality control consulting.

Description:

The Model Energy Communities Program is described as the largest transmission and distribution demand-side management program in the United States. Proctor Engineering Group provided lead technical consulting services since the program's inception.

Proctor Engineering Group's services included:

Implementation assistance in the project start-up phase.

Development of protocols used by residential program field personnel.

All classroom and field training for residential program personnel.

The last phase of Model Energy Communities Program provided installation of high efficiency air conditioning equipment in targeted customers' homes.

Proctor Engineering Group performed the analysis and evaluation which led to the current Residential Air Conditioner Early Replacement (RACER) phase of the program.

Services include:

Analysis and consulting leading to the AC replacement phase of the project.

Design of sizing methodology and computer program for replacement air conditioning systems.

Analysis of cost/benefit ratio of air conditioner replacement for the utility, which helped create the sliding scale customer contribution tables used by the program.

Refrigerator Metering Analysis Energy Consumption Comparison and Costing Period Study

Client: Pacific Gas & Electric Company, Research/ Development, San Ramon, Ca.

Services: Analysis of metered data from 256 refrigerators and development of factors to estimate energy consumption and peak watt draw.

Description:

This program is part of the largest refrigerator metering project conducted to-date. It was conducted to help determine kW savings associated with PG&E's Residential Refrigerator Rebate program. Analyses were performed on 1992 and 1993 metered data to:

- Determine high efficiency refrigerator kW savings in PG&E's five costing periods directly from the metered data.
- Develop residential diversity factors using data from the Refrigerator Metering Project and PG&E's Appliance Metering Project (AMP).
- Derive load shapes for "old" refrigerators from PG&E's AMP data and perform a comparison analysis of "old" refrigerators versus efficient refrigerators.
- Show graphically, the kW draw determined for three time periods- a system summer peak day, an average summer day, and an average winter day.

All of the above was normalized to PG&E's residential customer distribution across the climates of PG&E's service territory and to a typical meteorological year. The evaluation included employing on-site contractor and utility surveys, review of program records and customers files, analysis of related survey results, and examination of utility documentation on costs and impact calculations. Hourly sub-metered data and a number of conditional variables were used to determine annual energy use and peak effect. The methodology included multivariate regression analysis with White's method for correcting standard errors.

Individuals involved: John Proctor, P. E., Michael Blasnik, Zinoviy Katsnelson, Ph.D.

Reference: Elsia Galawish, PG&E, (415)973-5347

Completion Date: 9/94

Project Cost: \$35,000

Residential Cooling Load and Calculation Analysis

Client: Pacific Gas & Electric Company, San Francisco, CA.

Services: Evaluation of air conditioner sizing methodology and residential cooling load calculation methods.

Description:

This study was an outgrowth of concern over the coincident peak effect of residential air conditioners. Residential AC coincident peak load depends on (among other factors) the size of the unit.

The study mirrored the two stages of air conditioner equipment selection :

Building sensible and latent load at the design conditions is calculated

An equipment selection method is applied to choose a particular unit from the manufacturer's catalog

In the first phase of this project forty-one cooling methods submitted by over fifty contractors and distributors were compared against ACCA manual J. As submitted, ten of the methods calculated methods within 20% of Manual J. With revisions, another ten methods came within 20% of Manual J.

In the second part of the study, equipment selection methodologies were compared based on how they actually sized units to the expected indoor design conditions. A method of predicting indoor conditions specific to each piece of equipment was developed. Existing equipment methodologies can oversize units on houses in hot dry climates by 50% or more.

Team members involved: John Proctor, P. E., Zinoviy Katsnelson, Ph.D.

Reference: Brad Wilson 415/973-4856