Commercial Facilities Contract Group
2006-2008 Direct Impact Evaluation

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Final Report

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ABSTRACT

The Commercial Facilities Contract Group performed evaluation activities pertaining to two programs (PGE2005 and PGE2007) and to two high-impact measures ("HIMs") (refrigeration strip curtains and refrigeration door gaskets). The overall objective for the evaluation was to determine the gross and net electricity and natural gas savings and demand (kW) reductions resulting from participation in the programs or from installing the HIMs.

The two programs evaluated were ones offered during 2006-2008 by Pacific Gas and Electric to its high tech (PGE2005) and large commercial (PGE2007) customers to provide assistance in installing energy efficiency measures. Samples of participant sites were chosen for each program, and data were collected and analyzed for these sites to determine gross savings realization rates. A survey of customers was also conducted to gather information with which to determine the net impacts of the programs.

The two high-impact measures that were evaluated—door gaskets and strip curtains—affect the energy use for refrigeration in commercial facilities by reducing infiltration from non-refrigerated space into refrigerated space. The evaluation effort for these two HIMs therefore involved identifying the factors affecting such infiltration, collecting data on these factors through field monitoring of freezers and coolers in different types of commercial facilities, and analyzing these data to determine how door gaskets and strip curtains affected infiltration and thereby energy use.

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DISCLAIMER

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1. EXECUTIVE SUMMARY

This report presents the results of the evaluation effort conducted by the Commercial Facilities Contract Group. The EM&V activities performed by the Commercial Facilities Contract Group pertained to two programs (PGE2005 and PGE2007) and to two high-impact measures (refrigeration strip curtains and refrigeration door gaskets). The overall objective for the evaluation was to determine the gross and net electricity and natural gas savings and demand (kW) reductions resulting from participation in the programs or from installing the HIMs.

The two programs evaluated were offered during 2006-2008 by Pacific Gas and Electric to its high tech (PGE2005) and large commercial (PGE2007) customers to provide assistance in installing energy efficiency measures. The approach for the impact evaluation of these programs had the following main features:

- Available documentation (e.g., audit reports, savings calculation work papers, etc.) was reviewed for samples of sites from both programs, with particular attention given to the calculation procedures and documentation for savings estimates.
- On-site data collection was conducted at sampled sites to provide the information needed for verifying savings and demand reductions. Monitoring was also conducted at some sites to obtain more accurate information on the operation of measures for which PG&E had claimed savings.
- Gross savings were estimated using proven techniques.
  - For PGE2005, many of the measures customers installed affected energy use for space conditioning. The impacts of these measures were analyzed using the eQuest energy analysis simulation model. HVAC measures installed by customers in PGE2007 were also analyzed using eQuest.
  - Analysis of savings from lighting measures was accomplished using information collected on-site on the equipment installed and, if appropriate, monitoring of hours of operation for lighting.
- A telephone survey was conducted of samples of participants from both programs to gather information on their decision making, their likes and dislikes of the programs, and other factors determining net-to-gross savings ratios for the programs. This information was used to determine net savings according to the standardized Large Nonresidential net-to-gross methodology used by several evaluation contract groups.

For PGE2005, the overall gross realization rate for kWh savings was estimated to be about 44.6 ± 6.3% (at the 90% confidence level). The relatively low realization rate is attributable to the importance that internal loads have in calculating energy usage and savings for high tech facilities. The EM&V effort revealed that the analyses underlying the claimed savings for projects were often made using a bin method, which is not a robust method when internal loads are high. Moreover, the data collection also revealed that the estimates of internal loads used in

the underlying analyses were often significantly higher than the internal loads actually observed at the facilities. In part, this resulted because facilities were being designed in expectation of higher demand than actually materialized.

The NTGR analysis for PGE2005 in this study showed a lower net-to-gross ratio (NTGR) than was used by PG&E in developing its claimed net savings estimates. PG&E used a NTGR of 0.94 for projects they classified as "process" and of 0.70 for most other projects. The weighted NTGR across all PGE2005 projects from these calculations was 0.84. Based on the information collected and analysis performed during this study, the NTGR for PGE2005 was calculated to be 0.47.

For PGE2007, the gross realization rate for kWh savings was estimated to be about 79.5 ± 13% (at the 90% confidence level), also less than 1, but not as low as for PGE2005. This was because most of the claimed energy savings for PGE2007 were attributable to lighting and HVAC measures that are more standardized than the measures receiving rebates under PGE2005.

In developing the net claimed savings for the projects in PGE2007, PG&E used a NTGR of 0.70 for most projects. The NTGR for PGE2007 that was calculated during this study was 60%, which was somewhat lower than the NTGR that was used by PG&E.

The two high-impact measures that were evaluated—door gaskets and strip curtains—affect the energy use for refrigeration in commercial facilities by reducing infiltration from non-refrigerated space into refrigerated space.[1] The evaluation effort for these two HIMs therefore involved identifying the factors affecting such infiltration, collecting data on these factors through field monitoring of freezers and coolers in different types of commercial facilities, and analyzing these data to determine how door gaskets and strip curtains affected infiltration and thereby energy use.

The gross impact evaluation for door gaskets utilized engineering calculations that were informed by detailed data collected at 40 sites. The gross impact evaluation of the strip curtains utilized a site-specific engineering methodology that consisted of retrofit isolation engineering models that were calibrated to and informed by detailed data collected at 150 sites. Estimates of NTGR were developed using information collected through interviews with decision-makers for 71 sites with door gaskets and 101 sites with strip curtains.

For door gaskets, a major finding from this evaluation effort is that the estimates of baseline gasket efficacy used by the IOUs in calculating claimed savings are too low, thereby inflating the ex ante estimates of savings from installing new gaskets. The realization rates on savings from

[1] HIMs are defined as those efficiency measures common across IOU programs that contribute greater than one percent to the entire IOU savings portfolio for reductions in electrical consumption, electrical demand, or natural gas consumption.

door gaskets are relatively low. The gross realization rate for kWh savings for door gaskets was 13% for SCE and 3% for PG&E and SDG&E.[2] The NTGR that was calculated for door gaskets during this study was 19%.

For strip curtains, the gross realization rate for kWh savings was 85% for SCE and 39% for PG&E and SDG&E. The NTGR that was calculated for strip curtains during this study was 40%.

Specific recommendations come out of this study regarding values for the ex-ante parameters used to calculate energy savings from strip curtains. It is recommended that the ex-ante estimations for the door-open time, the temperature differentials between the refrigerated and infiltrating airs, the difference in efficacy between the new and old strip curtains, the refrigeration system coefficients of performance, and the empirical discharge coefficients be updated with market-specific values developed during this study.

[2] The realization rates are reported separately for PG&E/SDGE and SCE because SCE had different ex-ante estimations than PG&E and SDG&E.