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Results of Annual Reports, Equipment Tables and Hours of Operation

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Realization Study of 1997 PowerSaving Partners Program

March 1, 1999

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Pacific Gas and Electric Company Study: 398a-g

Executive Summary

The following documents evaluate electric and natural gas energy savings measured for Pacific Gas and Electric Company's Power Saving Partners (PSP) Program for program year 1997. Power Saving Partners is designed to provide Pacific Gas and Electric Company customers with an opportunity to purchase turnkey energy efficiency solutions supplied by the private energy services industry.

The Power Saving Partners program consists of two phases; the original PSP I program (now in its fifth year of delivering energy savings) and PSP II, the Integrated Bid pilot program which is now in its third year of delivering energy savings. This study verifies peak kW, kWh and therm savings for the end uses installed in 1997 and claimed in the 1998 AEAP Earnings Claim. The measures evaluated include:

- Power Saving Partners I: Commercial Lighting
- Power Saving Partners II: Commercial Lighting
- Power Saving Partners I: Commercial Gas Boilers
- Power Saving Partners I: Industrial Process
- Power Saving Partners II: Industrial Process
- Power Saving Partners I: Residential Lighting
- Power Saving Partners I: Residential Gas Boilers

The study documents the original claim and the results of a thorough and rigorous monitoring study made by each of the PSP Partners and evaluated by Pacific Gas and Electric Company. PSP Partners are required to sample and meter all sites where measures are installed in order to receive payments for energy savings. This report tabulates the results of their findings and presents the basis for each realization rate claim.

For PSP 1997 program accomplishments, Pacific Gas and Electric Company claimed 6,409 kW, 43,548 mWh and 1,679,903 therms of annual energy savings. These accomplishments were derived from the industrial, residential and commercial market

sectors. Table One (1) lists the results of the Measurement and Verification (M&V) for these contracts by program end use.

PACIFIC GAS AND ELECTRIC COMPANY
TABLE ONE
PSP REALIZATION RATES

PY1997 1st Year Impact Study Power Saving Partner I & II Study ID # 398a,b,c,d,e,f,g	Claimed Savings			NTG Ratio	Measured Savings			Realization Rate		
	Peak kW	kWh	Therm		Peak kW	kWh	Therm	Peak kW	kWh	Therm
	Ex- Ante				Ex-Post					
PY97 Power Saving Partners I: Commercial Lighting	2,384	12,396,127	-	1.00	2,560	13,258,803	-	1.07	1.07	N/A
PY97 Power Saving Partners II: Commercial Lighting	224	1,742,807	-	0.90	259	1,874,693	-	1.04	0.97	N/A
PY97 Power Saving Partners I: Commercial Gas Boilers	-	-	888,861	1.00	-	-	1,084,616	N/A	N/A	1.22
PY97 Power Saving Partners I: Industrial Process	2,840	21,204,716	-	1.00	2,252	18,497,356	-	0.79	0.87	N/A
PY97 Power Saving Partners II: Industrial Process	742	6,499,920	-	0.95	705	4,784,963	-	0.90	0.70	N/A
PY97 Power Saving Partners I: Residential Lighting	220	1,704,468	-	1.00	220	1,731,992	-	1.00	1.02	N/A
PY97 Power Saving Partners I: Residential Gas Boilers	-	-	791,042	1.00	-	-	705,414	N/A	N/A	0.89
Program Total	6,409	43,548,039	1,679,903		5,996	40,147,806	1,790,030	0.93	0.91	1.07

Program Background

PSP I

In March 1992, the CPUC mandated that Pacific Gas & Electric Company implement a bidding pilot program of DSM resources (D.92-03-038). In good faith, Pacific Gas and Electric Company conducted an auction and announced a short list of winning bidders in April 1993. The CPUC found all contracts to be reasonable in Decisions 93-11-067, 94-04-039 and 95-10-037.

PSP II

In 1993, the CPUC mandated the development of an Integrated Bid pilot program in order D.93-06-040 (1993), 49 CPUC 2d 580. Pacific Gas & Electric Company was subsequently

ordered by the CPUC to conduct an auction to fulfill the Integrated Bid pilot in D93-06-040, D. 93-010-040, and D. 94-06-046.

Pacific Gas and Electric Company issued a Request for Proposal under the Integrated Bid pilot in December 1994. After extensive evaluation and negotiation, PG&E signed nine contracts representing 34mW and 247 gWh. The contracts were approved by the CPUC in July 1996. All contracts have three year implementation periods whereafter savings and payment streams continue for 5-10 years as specified in each contract. Energy savings from the bidding pilot were included in Pacific Gas and Electric Company's 1998 AEAP earnings claim (Application 98-05-001).

All PSP contracts are based on pay-for-performance over a contract life ranging from eight to ten years. The PSP Partners perform measurement and verification of energy savings annually before reporting program results. Each contract allows an implementation period of 36 months to accomplish contracted energy savings. Payments are based on initial savings projections and then reconciled according to *actual verified energy savings* after one year. If savings are not achieved as projected, payments are modified and subsequent savings projections are adjusted. A method for collecting overpayments, should they occur, is contained in each contract.

The M&V plans are consistent with the measurement and Evaluation (M&E) protocols adopted by the Commission in all instances where such protocols exist. The Commission emphasized in decision 93-05-063, p. 75:

Payments to winning bidders do not need to be linked to the completion of specific ex-ante measurement studies in the same manner as utility earnings. The utilities are expected to apply the basic concepts....., but to allow reasonable differences between these protocols and bidders' measurements and payments schedules.

Pacific Gas and Electric Company has fully complied with the Commission ruling and actually created a rigorous energy verification plan as accurate for site-specific measurement as the Protocols used for the utility programs.

Measurement & Verification Methodology

A short discussion of existing M&V requirement for each of the PSP Partners will assist in explaining the methodology for this realization report.

Pacific Gas & Electric Company developed the PSP DSM Measurement and Verification Procedures Manual (Manual) following the directions in Appendix H of the Measurement Protocols adopted in Decision 94-05-063. That is, the 1993 NAESCO protocols were adapted to California conditions (for example, use of Title 24 baselines where appropriate) and made more rigorous. The Manual was reviewed and, in its final form, accepted by all PSP Partners. The Manual was adopted in its entirety for the PSP contract with the State of California partly due to the fact that it covers all aspects of M&V electric savings.

The following list outlines the topics covered the M&V Procedures Manual:

- Common requirements and definitions
- Submittal requirements for each project
- M&V procedures for lighting efficiency and lighting controls measures
- M&V procedures for constant load motors
- M&V procedures for variable load motors and HVAC measures
- Maintenance and management plans
- Sample forms and report outlines

Here is a short summary of the measurement strategy based on end use/control group.

A. Lighting Efficiency Measures

Starting with the most basic lighting efficiency retrofits, the verification strategy would be as follows:

1. A Partner surveys the existing condition (baseline) and new (post-installation) conditions to include exact fixture and lamp counts, ballast types, and the identification of usage areas. Usage areas must be defined in a way that

groups areas with similar lighting requirements (for example, areas of comparable average operating hours as determined by the proportion of lights in operation during each of Pacific Gas and Electric Company's five costing periods).

2. Pacific Gas and Electric Company inspects the existing (and the new) conditions for accuracy of fixture count and type, and identification of usage areas. The measurement techniques employed for this measure after installation requires the use of a table of standard wattage to determine the kW per fixture used for pre- and post-installation conditions, as well as proof of operating hours. The operating hours are proven by short-term metering of fixture 'on-time' in the various costing periods. The short-term metering length is determined by market segment and ranges from one to four months. The required sample sizes for the metering are for 90 percent confidence and 10 percent precision. The majority of measures installed by PSP in 1997 were lighting efficiency retrofits and the M&V followed by each and every Partner conforms with the above statements.

B. Lighting Controls and Constant Load Motors

Another category of projects are constant load and variable hour projects, such as lighting controls or motor efficiency retrofits. The verification strategies involve surveying the existing measure for the load served, including a physical kW or horsepower measurement and a typical operating schedule. This verification survey includes: spot-metering to determine actual demand, (possible) short-term metering of a sample to verify constant load and to normalize results. The post-installation verification also includes spot metering to determine demand. The ongoing measurement activities for these types of measures include short-term metering for demand and actual run-hours. Again, the short-term metering length is determined by application and ranges from one to four months.

C. Variable Load Projects

The last family of projects are those which have variable loads, variable operating hours or variations in seasonal operational. For both measurement and verification, a comprehensive approach is necessary for variable load or multiple measures. In these cases, end-use measurements can be difficult or cost prohibitive to isolate. When a project-specific approach is necessary, continuous metering or billing analysis are acceptable approaches. The Manual outlines a continuous metering approach as well as pre- and post-installation billing analysis.

Gas Projects

The gas energy efficiency projects that were performed have protocols that are specific to the Partner and their particular M&V Plan. The M&V Plan associated with the gas projects in this report have been attached to the Partners section in the Appendix.

Realization Study Methodology

The 1997 Pacific Gas and Electric Company savings claim was comprised of savings from a total of 228 Application Codes or Sites. The Sites were aggregated by end use or sector and reported in the 1997 E tables. The following tables document the claimed and the actual measured savings for each Site.

1997 Realization Rate by End Use/Study

Tables 2 through 8, "Realization Rate by End Use/Study," lists a tracking code that represents each customer site, kW, kWh and therm savings as reported in the 1997 AEAP claim, and measured kW, kWh and therm savings as determined by analyzing metering and monitoring data. The realization rate is equal to the measured savings (multiplied by the appropriate net-to-gross ratio) divided by the claimed savings. This table is sorted by end use for each required study.

1997 Realization Rate by Partner

Table 9, "Realization Rate by Partner," lists the same information as tables 2-8, however, each of the sites are sorted by participating Partner corresponding to each section of the Appendix.

Appendix

The Appendix contains three sets of documents for each Partner. There are eleven contractually distinctive Partners (some Partners had multiple contracts) that installed projects in 1997. The first set of documents for each Partner includes the Partner submitted usage data for their sites as required by the Manual. This information is based on the tabulation of actual monitored data from data loggers installed at each site or by a representative sample of similar sites. The data was analyzed by Pacific Gas and Electric Company and a third party, Schiller Associates.

Upon approval, the revised hours of operation for each usage group were adopted (for payment) and incorporated into the invoices for the following year. The second and third sections of each Partner data section include the forms that describe the baseline and retrofit equipment, the kW and kWh, and therm savings necessary for payment.

For two Partners, there are additional savings included in the tables. Both Princeton Development Corporation contracts allow for a three percent interactive adder. The UC Davis contract allows for a four percent addition to savings to compensate for transformer losses. These savings are as filed and approved in the original PSP contracts.

The forms have also been provided electronically. These are the forms that are representative of the database information and include information about the existing equipment and the retrofit equipment at each customer site, and for each

measure installed. After submittal of this information (at the request of Pacific Gas and Electric Company) a third party inspects each site for accuracy. If the installation is approved, the site tables are loaded into Pacific Gas and Electric Company's data files and a kW savings is recorded for each usage group and reported as a maximum kW (connected load reduction). For the purposes of PSP, kW savings are an average peak kW savings, that is, the total connected load multiplied by the ratio of hours of operation in the peak period divided by seven hundred seventy four (the maximum hours in a peak period based on the 1993 calendar year). The energy savings reported are the kW savings multiplied by the total hours of operation. Per the manual, the first year savings claim is based on engineering estimates. Each successive year saving claim is based on metered data gathered during the previous year.

Summary

Pacific Gas and Electric Company has adhered to or exceeded the basic concepts of ex-post measurement protocols by implementing the adjusted NAESCO standards for the first and second set of DSM bidding contracts. The kW, kWh and therm realization rates in this report link the savings measured at 228 sites to the values reported in the E-tables filed in support of Pacific Gas and Electric Company's 1997 earnings claim.