
Pacific Gas and Electric Co.

Customized Electric Rebate Program Profile #4, 1992

Executive Summary	2
Utility Overview	3
<i>PG&E 1991 Electric Statistics Table</i>	
Utility DSM Overview	4
<i>PG&E DSM Programs 1991 TableM Overview Table; Annual DSM Expenditure (chart); Annual DSM Energy Savings (chart); Annual DSM Capacity Savings (chart)</i>	
Program Overview	6
Implementation	7
<i>Marketing & Delivery; Installed Measures; Staffing Requirements</i>	
Monitoring and Evaluation	9
<i>Monitoring; Evaluation; Data Quality</i>	
Program Savings	10
<i>Savings Overview Table; Annual Energy Savings (chart); Cumulative Energy Savings (chart); Annual Peak Capacity Savings (chart); Cumulative Peak Capacity Savings (chart); Number of Participants Table; Participation; Participation (chart); Annual Energy Savings per Participant (chart); Measure Lifetime</i>	
Cost of the Program	12
<i>Costs Overview Table; Total Program Cost (chart); Cost per Participant (chart); Cost of Saved Energy Table; Cost per Participant; Cost Effectiveness; Free Ridership; Cost Components; Cost Components (chart)</i>	
Environmental Benefit Statement	14
<i>Avoided Emissions Analysis Table</i>	
Lessons Learned / Transferability	16
Regulatory Incentives / Shareholder Returns	17
References	18

Executive Summary

Pacific Gas & Electric's Customized Electric Rebate Program is a "free-form" program where commercial, industrial, and agricultural customers can receive financial assistance for implementing electrical efficiency measures, subject to PG&E's approval. The program is designed to accommodate more complex projects than those covered by the menu-driven Direct Rebate Program. Projects range from commercial lighting retrofits, to industrial process changes, to agricultural irrigation efficiency measures. Customers learn of the Customized Rebate Program through personal contact with their PG&E customer representative; little direct marketing is conducted.

The program provides rebates based upon the quantity of energy that an efficiency measure saves in the first year of its operation. Rebates have varied between 2 and 7¢/kWh, since the program's inception in 1983, and are currently 6¢/kWh or 40% of the project cost, whichever is less. The maximum rebate per account is \$300,000. (Gas efficiency measures are covered by the Customized Gas Rebate Program for which other rebate levels apply.)

As a result of the California Collaborative Process, PG&E has been allowed to earn a return on its DSM expenditures. Therefore, it has placed greater emphasis on carefully documenting its DSM programs' savings and costs. For the Customized Electric Rebate Program, PG&E is conducting billing analyses, metering of customers' facilities and operations, and on-site validation of measures installed. Due to these efforts, data reported after 1989 are much more easily analyzed and compared than data produced in previous years. Our analysis will therefore only examine data from 1990 and 1991.

During 1990 and 1991, the program realized 380 GWh of cumulative energy savings and 40.6 MW of cumulative capacity savings. The cost of this saved energy was 0.72¢/kWh at a 5% real discount rate. PG&E's program expenditure was \$22 million, of which \$19 million were rebates. The average cost per participant was \$5,893.

One of the benefits of the Customized Electric Rebate Program is that it provides the utility with information on which types of energy saving projects and technologies are popular with its customers. If PG&E wishes to encourage such projects and technologies, it can determine standard rebates and procedures for them and incorporate them into the Direct Rebate program.

Customized Electric Rebate Program

Utility: Pacific Gas and Electric Company (PG&E)

Sector: Commercial/Industrial/Agricultural

Measures: All measures that can be shown to save electricity

Mechanism: Rebates

History: The program has existed with varying rebate levels since 1983.

1991 Program Data

Energy savings: 213,314,962 kWh

Lifecycle energy savings: 3,151 GWh

Peak capacity savings: 30.38 MW summer

Cost: \$15,241,210

1990-1991 Data

Energy savings: 380,639,166 kWh

Lifecycle energy savings: 4,290 GWh

Peak capacity savings: 40.59 MW summer

Cost: \$21,953,061

Conventions

For the entire 1992 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the International Monetary Fund's International Financial Statistics Yearbook: 1991.

The Results Center uses three conventions for presenting program savings. **Annual savings** refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. **Cumulative savings** represent the savings in a given year for all measures installed to date. **Lifecycle savings** are calculated by multiplying the annual savings by the assumed average measure lifetime. **Caution:** cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

Utility Overview

Pacific Gas and Electric is an investor-owned gas and electric utility with a service territory encompassing 94,000 square miles in northern and central California. In 1991, PG&E served 4.26 million electric customers and 3.5 million gas customers.

While most of PG&E's electric and gas customers are in the residential sector, sales volumes are highest to commercial and industrial customers. Electric sales far exceed gas sales and represent 75% of the company's total operating revenues. In 1991, PG&E's electric sales volume increased slightly, to 74,195,890 MWh. Over the same period gas sales dropped as PG&E began shifting its focus from gas sales to expanding its gas transmission capability.

PG&E has developed its electric supply plan with four main objectives: to reduce dependence on oil for power generation, to conduct aggressive research and development of renewable energy resources, to participate in the competitive bulk power supply market, and to maximize customer energy efficiency. PG&E is working toward these goals in a variety of ways. In 1991, PG&E generated less than 0.5% of its power in oil-fired plants. In 1991, PG&E generated 53% of its total electric sales. The remainder was purchased from other entities. Of the PG&E generation, 42% was from natural gas-fired plants, 29% was from nuclear plants, 16% was from hydroelectric plants, and 13% was from geothermal plants.

PG&E 1991 ELECTRIC STATISTICS

Number of Customers	4,257,145
Electricity Sales	74,196 GWh
Electricity Sales Revenue	\$6.971 billion
Summer Peak Demand	16,630 MW
Generating Capacity	22,739 MW
Reserve Margin	36.73 %
Average Electric Rates	
Residential	10.97 ¢/kWh
Commercial	10.08 ¢/kWh
Industrial	6.81 ¢/kWh
Agricultural	9.54 ¢/kWh

[R#5]

Utility DSM Overview

Pacific Gas and Electric has been a leading U.S. utility in demand-side management since 1976. Over the years the giant west coast utility has spent over \$2 billion dollars on its conservation and load management activities, including a small sum for solar DSM programs. In California DSM is defined in four ways: conservation, load management, fuel substitution, and load building and retention. The data presented in this section refers only to conservation and load management and expenditures are expressed in leveled dollars.

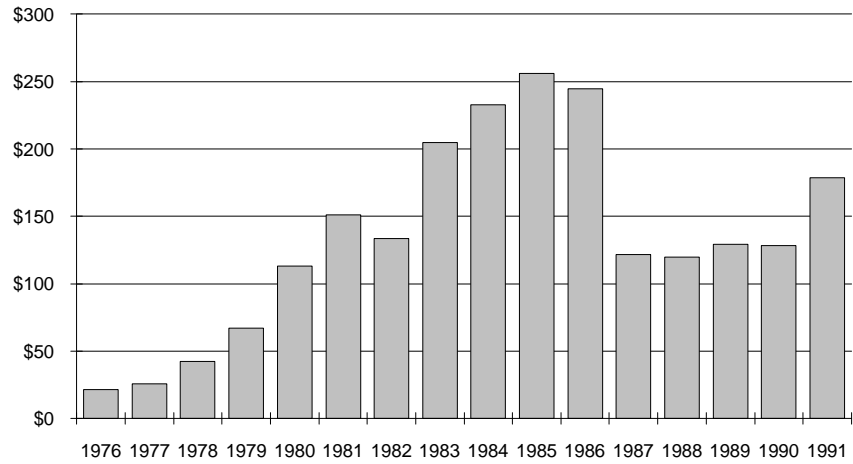
PG&E refers to its DSM programs as Customer Energy Efficiency (CEE) programs. These programs were significantly expanded in 1990 when the California Public Utilities Commission issued a decision authorizing the utility to implement new DSM programs and enhance existing ones. The combined goal of all of the CEE programs is to achieve a total 2,500 MW reduction in peak electric demand growth by the year 2000. In 1991, CEE program expenditures were equivalent to 2% of the utility's total energy revenues [R#3,4].

CURRENT DSM PROGRAMS AT PG&E

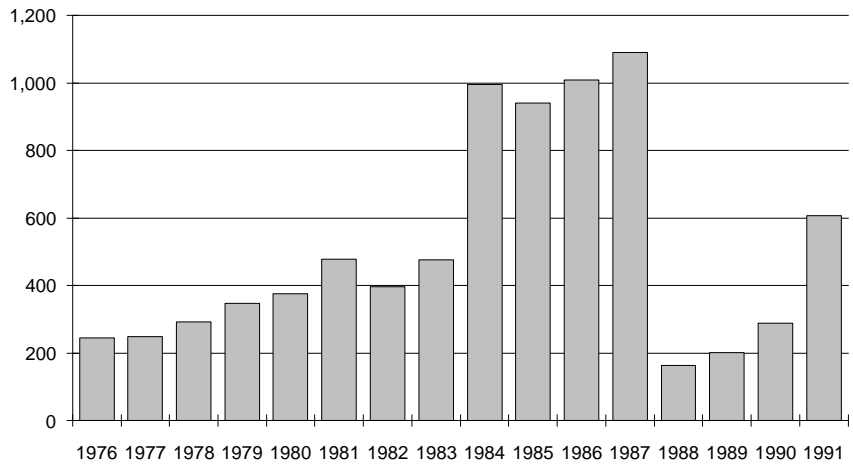
- | |
|--|
| Residential |
| New Construction Program |
| Appliance Efficiency Incentives Programs |
| Direct Assistance for Low-income Customers |
| Energy Management Services |
| Information Programs |
| Nonresidential |
| Commercial New Construction Program |
| Nonresidential Energy Efficiency Incentive |
| Retrofit Program |
| Customized Electric Rebates |
| Customized Gas Rebates |
| Commercial Market Sector Pilot Projects |
| CIA Energy Management Services |
| Load Management Programs |
| Fuel Substitution |
| Load Retention and Load Building |
| CEE Demonstration Projects |

Utility DSM Overview Table	Annual C & LM Expenditure (x1,000)	Annual Energy Savings (GWh)	Annual Capacity Savings (MW)	Annual Gas Savings (Therms Millions)
1976	\$21,413	246	64	47
1977	\$25,737	249	48	67
1978	\$42,245	292	59	50
1979	\$67,246	347	175	76
1980	\$113,082	375	277	66
1981	\$151,093	479	81	87
1982	\$133,601	396	63	99
1983	\$204,913	476	84	75
1984	\$232,788	997	211	59
1985	\$256,044	941	110	119
1986	\$244,701	1,010	129	140
1987	\$121,931	1,091	498	48
1988	\$119,708	163	296	12
1989	\$129,593	202	97	14
1990	\$128,292	288	676	25
1991	\$178,767	607	676	32
Total	\$2,171,154	8,159	3,544	1,016

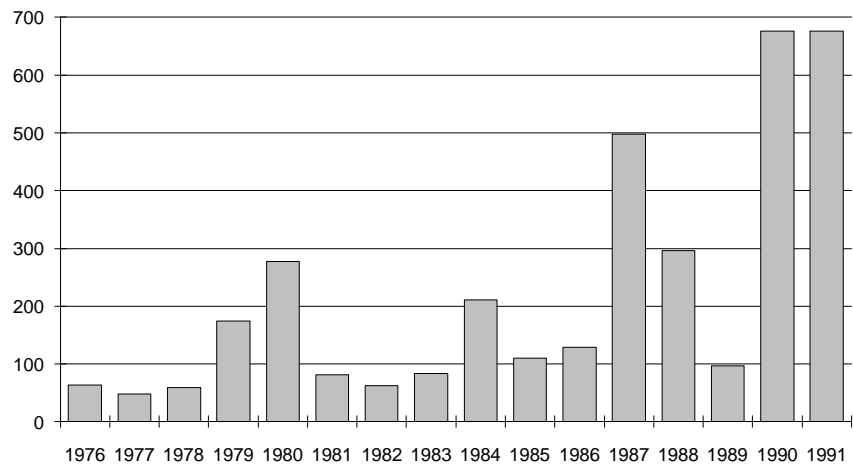
**ANNUAL DSM
EXPENDITURE
(\$1,000,000)**



**ANNUAL DSM
ENERGY SAVINGS
(GWH)**



**ANNUAL DSM
CAPACITY SAVINGS
(MW)**



Program Overview

The Customized Rebate Program is a free-form program that provides rebates for customer-designed energy-efficiency projects. The program contains two sub-programs -- the Customized Electric Rebate Program and the Customized Gas Rebate Program. These programs were designed primarily to meet the needs of large commercial and industrial customers, however all nonresidential customers are eligible to participate. A single project may not receive rebates from both the Customized Gas and the Customized Electric Programs. Customers may, however, submit separate applications for different projects to both the gas and the electric programs.

The Customized Rebate Program is a companion to PG&E's Direct Rebate Program through which customers receive predetermined rebates for installing a variety of energy-efficient equipment. The Customized Rebate Program provides financial incentives for customers who undertake more complex projects than those covered by the "menu-driven" Direct Rebate Program. The process to receive funding through the Customized Rebate Program is much more complex than that required for the Direct Rebate Program. The customer's project plans must be reviewed by PG&E and accepted into the Customized Electric Rebate Program prior to project initiation.

Projects in the Customized Electric Rebate Program range from commercial lighting retrofits to industrial process changes and agricultural irrigation equipment installations. Other common projects include space conditioning and water heating.

Rebates available to participants are based upon the estimated energy savings generated by a project's first year of operation. The participant can receive a rebate equal to \$0.06 per first year kWh saved, not to exceed 50% of the direct project cost. PG&E provides the rebates with the intention of receiving the benefit provided by the participant's energy use reduction for five years. Therefore, the participant is required to refund a pro-rated part of the rebate if he or she elects to discontinue receiving electricity through the PG&E system within five years of receiving the rebate. The minimum rebate per application is \$100, and the maximum rebate, which can include projects from more than one application, is \$300,000

per account. (Recently PG&E has made special exceptions allowing customers to exceed the maximum rebate amount in order to capture the energy savings from large industrial process changes.) This rebate level, maximum, and minimum have been in effect since 1990 and are planned to continue through the 1992 program year when the Customized Electric Rebate Program will be re-evaluated for another three-year operating cycle beginning in 1993.

PROGRAM HISTORY

The first version of the Customized Rebate Program was implemented in 1983 and was called the Customized Energy Management Incentives Program. It offered rebates for energy saving commercial or industrial projects. Its rebate was \$0.07 per kWh of estimated energy savings from a project's first year of operation or 40% of the cost of materials and outside labor, whichever was less. In 1984, the rebate was lowered to \$0.06 per first year kWh saved.

In 1987, the Customized Gas Rebate Program was begun and agricultural projects were first included in both the electric and the gas programs. The rebates that year were \$0.02 per first year kWh saved for the electric program and \$0.20 per first year therm saved for the gas program. The rebates could not exceed 30% of the project cost.

In 1988 the minimum rebate level per application was reduced from \$500 to \$100, and the rebate for electricity savings was raised to \$0.03 per kWh. The rebate for gas savings remained \$0.20 per therm. Rebates could not exceed 30% of the project cost or \$100,000 per account. Direct mail marketing was planned to stimulate customer interest in the program.

In 1990 the rebates, maximum, and minimum were adjusted to their current levels. The electric rebate was increased to \$0.06 per first year kWh saved, the gas rebate remained at \$0.20 per first year therm saved, the minimum rebate per application remained \$100, and the maximum value of all rebates received per account was raised to \$300,000.

Implementation

MARKETING AND DELIVERY

There is little marketing effort for the Customized Rebate Program. (PG&E places much more emphasis on marketing the Direct Rebate Program.) Customers usually find out about the Customized Rebate Program through personal contact with PG&E's marketing representatives. Occasionally a customer will learn of the program from a trade ally who is working with PG&E's Direct Rebate Program and is familiar with both programs.

To participate in the Customized Rebate Program the customer must submit a project proposal/documentation package containing:

- a completed application form,
- a qualitative project description,
- a calculation supporting the energy savings estimates included on the application form,
- a project cost estimate,
- a documentation summary, and
- certification by a professional engineer, if requested by PG&E.

The project description must briefly describe the existing system, either the new system or the modifications to be made to the existing system, and the expected lifetime of the measure(s). The description must also include a short description of the basic engineering principles that account for the energy savings.

The energy and capacity savings that the project is expected to produce in its first year of operation must be calculated using site-specific and system-specific values. The savings represent the difference between the energy use of the proposal and the energy use of a similar measure conforming with the minimum equipment performance standards included in California's Title 20. The energy savings must be presented in terms of: energy (kWh), capacity (kW), as a percentage of the energy (kWh) used by the existing system, and as a percentage of the energy (kWh) used by the entire account or facility. All assumptions, data, and formulae used in the calculations must be presented. All references used for the calculations or their methodology must be cited, such as ASHRAE documents or manufacturers' product specification literature.

The cost estimate must disaggregate costs such as materials and outside labor costs. Not acceptable for inclusion in the cost estimate are sales taxes, delivery charges, in-house labor and other indirect costs such as design fees. Valid proposals from contractors or suppliers may be used to document the project costs.

The documentation summary must contain the results of all of the energy savings calculations. Included are:

- annual electricity and gas savings (if a project saves both natural gas and electricity, estimates of both savings are included),
- demand (kW) reduction,
- energy savings as a percentage of the energy use of the existing system, and
- energy savings as a percentage of the energy use for the entire account or facility.

PG&E may request that a customer have a California registered professional engineer verify and certify the customer's savings estimates. The engineer indicates verification of the documentation package by stamping and signing it in a prominent location.

When complete, a project proposal is submitted to the customer's marketing representative. If the marketing representative is familiar with the technology the customer wishes to use and the calculations are clearly presented, the marketing representative will evaluate the proposal and submit it, with his/her recommendation for its approval or disapproval, to the Division Incentive Coordinator. (This coordinator is generally an engineer.) If the coordinator agrees with the marketing representative's recommendation, the two can approve or disapprove an application, up to the full allowable rebate amount (\$300,000). Few applications are rejected. Those that are rejected may be corrected and resubmitted.

Most of the time, review of applications is completed at the "division" level. In a few rare cases, however, the technology may be unusually complex or out of the ordinary, and the application is forwarded to the central office for review. In most cases in which the technology and/or calculations included in the application are unusually complex, the Division Incentive Coordinator will require that the customer

Implementation (continued)

resubmit the documentation package with the stamp of a California registered professional engineer certifying that the design has been reviewed and found to be sound.

After the proposal is reviewed, PG&E sends a letter of acceptance or rejection to the customer. An acceptance letter states the amount of money that PG&E has allocated for the customer's project and how much time the customer has to complete the work. A rejection letter explains the reasons for rejection.

INSTALLED MEASURES

All measures that save electricity are acceptable within the Customized Electric Rebate Program, subject to PG&E approval. Specifically excluded from the program are projects which involve routine maintenance, wind power, solar energy, cogeneration, and fuel switching to alternative fuels such as propane, oil, etc.

The Customized Rebate Program allows customers to take advantage of technologies that are not included in PG&E's other DSM programs. Once PG&E staff become aware that a particular technology is being frequently employed through the Customized Rebate Program, they often

design a new program to facilitate the implementation of that technology. As participation in most other programs is simpler, from the customer's perspective, than participation in the Customized Rebate Programs, customers tend to use the Customized Rebate Programs for projects that can not be included in any other program.

STAFFING REQUIREMENTS

As with many large utilities operating extensive DSM programs, the same personnel deliver a variety of programs to the customers. PG&E's central DSM implementation staff consists of five people. Of the five, one person spends approximately half of her time on the Customized Rebate Programs (both gas and electric), three spend approximately 25% of their time, and one spends no time. The design team consists of thirteen people. Each of the thirteen may have spent between 20 and 40 hours designing the program. The 300 marketing representatives in the field account for the bulk of the staff time spent on the program. Each of these representatives is responsible for delivering all of PG&E's DSM programs and may spend less than 5% of his or her time on the Customized Rebate Programs. [R#2]

Monitoring and Evaluation

MONITORING

PG&E has an extensive monitoring and evaluation process that encompasses all of its DSM programs. Each year, PG&E compiles a summary report on all of its demand-side management programs. In that report, PG&E presents its plan for measurement and evaluation, which includes: program evaluation, load metering, new technology assessment, customer surveys, forecasting, CPUC compliance activities, and economic analysis.

EVALUATION

Several studies are underway that relate directly to evaluation of the Customized Electric Rebate Program. A short-term metering study of three sites where commercial and industrial customers have installed energy-efficient motors is expected to be completed in the summer of 1992. Another metering study to be completed at that time will include a side-by-side comparison of refrigeration installations.

A billing analysis currently underway is comparing 150 HVAC rebate recipients to similar non-participants to determine the actual savings attributable to the program. An on-site validation survey of 50-100 sites is also underway and is expected to be completed in 1992. (In all cases, PG&E verifies that customers have installed the appropriate measures. PG&E does not, however, perform end-use metering to verify savings estimates as a routine aspect of the Customized Rebate Program.)

PG&E has completed a two-phase engineering study to identify measures with the highest energy-savings contributions to the Customized Rebate Programs, and to compare PG&E's savings estimates to other published research. The study found that PG&E's estimates were within the range of other published values.

DATA QUALITY

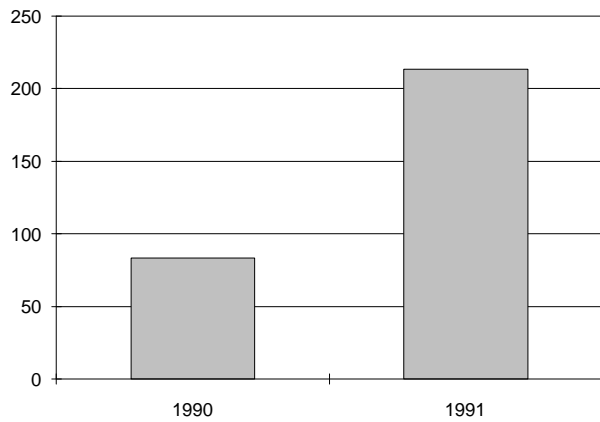
The California Collaborative Process, which was initiated to facilitate the negotiation process between the California Public Utilities Commission, California's utilities, and consumer advocacy groups, has had a positive effect on the quality and accessibility of data concerning PG&E's DSM programs. The collaborative process resulted in revision and expansion of most of PG&E's DSM programs, including the Customized Electric Program. The process has also resulted in PG&E being required to make a much more careful accounting of its DSM expenditures. Because its DSM expenditures (including rebates paid to customers) are more carefully scrutinized than before, PG&E has become much more careful in checking its customers' calculations of energy savings, upon which their rebates are based. For these reasons, data reported after 1989 is much more easily analyzed and compared, and is probably more accurate, than data reported prior to 1989. Therefore, although the various forms of the program have been operating since 1983, only 1990 and 1991 data are included in this profile. [R#1]

One difficulty encountered when analyzing the Customized Electric Rebate Program is that PG&E reports administrative expenditures for all of its commercial/industrial/agricultural (CIA) rebate programs together. However, the methodology it uses to report these costs can be applied to each individual program. PG&E determined that its 1990 administrative expenditures accounted for 9.5% of the total cost of the CIA rebate programs (where total cost equals administrative cost plus rebates paid). Administrative expenditures for 1991 accounted for 15%. The Results Center applied these percentages to the yearly rebates reported for the Customized Electric Rebate Program to determine its administrative costs. [R#3]

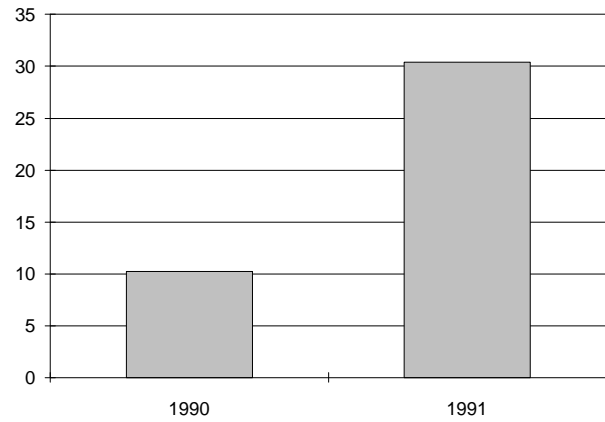
Program Savings

Savings Overview Table	Annual Energy Savings (kWh)	Cumulative Energy Savings (kWh)	Lifecycle Energy Savings (kWh)	Annual Summer Peak Capacity Savings (MW)	Cumulative Summer Peak Capacity Savings (MW)
1990	83,662,102	83,662,102	1,139,239,563	10.22	10.22
1991	213,314,962	296,977,064	3,151,437,100	30.38	40.59
Total	296,977,064	380,639,166	4,290,676,663	40.59	

ANNUAL ENERGY SAVINGS (GWH)



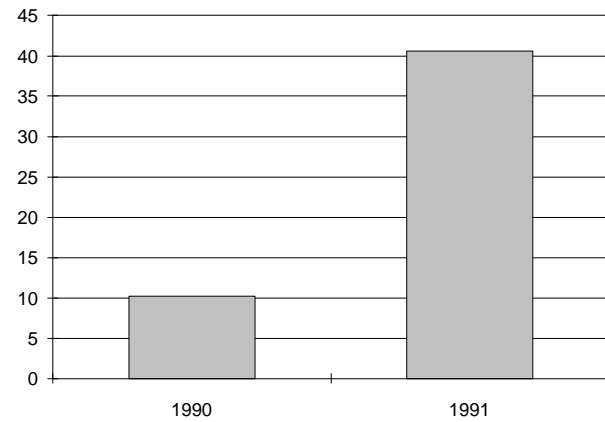
ANNUAL PEAK CAPACITY SAVINGS (MW)



CUMULATIVE ENERGY SAVINGS (GWH)



CUMULATIVE PEAK CAPACITY SAVINGS (MW)

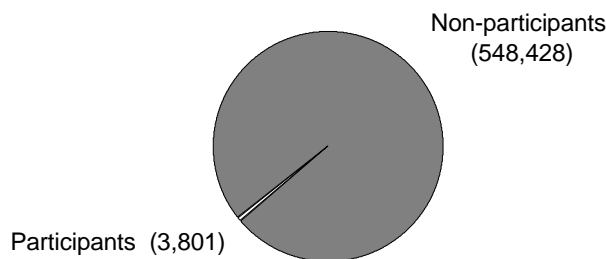


The Customized Electric Rebate Program generated cumulative energy savings of 380,639,166 kWh in 1990 and 1991 and cumulative summer peak demand savings of 40.59 MW. Most savings were due to commercial sector participants. Within the commercial sector, lighting measures generated the majority of the savings. In the industrial sector, process change projects generated the majority of the energy savings.

PARTICIPATION

In 1991, PG&E approved 2,713 applications for projects under the Customized Electric Rebate Program. This number was more than double the 1,088 applications approved in 1990. Repair and adjustment of agricultural pumps was the most popular single project type, with 302 applications being approved in 1991. Commercial customers installing compact fluorescent fixtures was also a common project type, with 288 applicants.

Although the number of applications is rising, relatively few of eligible customers have taken advantage of the Customized Electric Rebate Program. If we assume that each of the applications approved in 1990 and 1991 are from different customers, the number of participants equals 3,801. The number of eligible customers, however, is 552,229 -- all commercial, industrial, and agricultural customers. Participation is, therefore, less than 1%. [R#5,6,7]



SAVINGS PER PARTICIPANT (KWH)



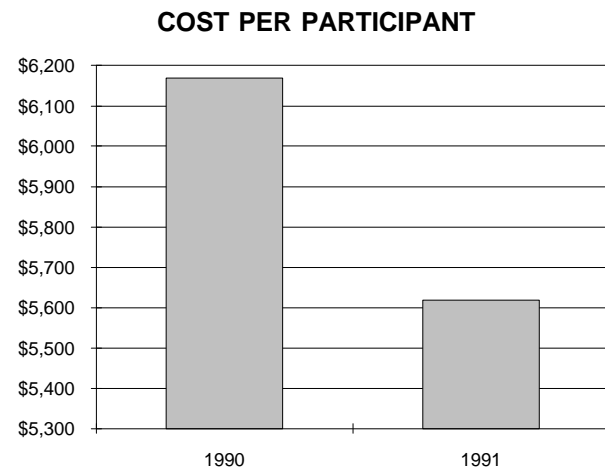
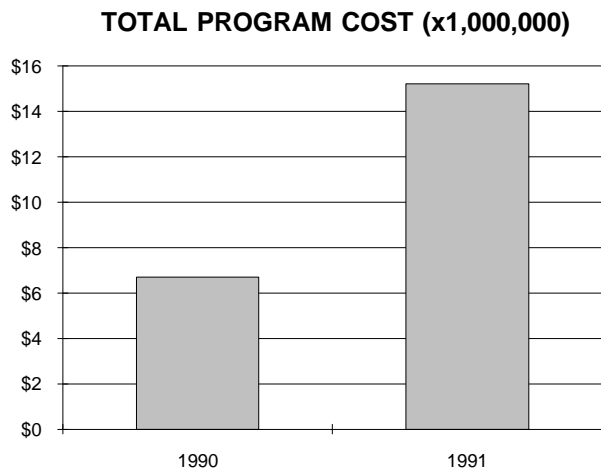
Customers Served Table	Gross Number of Participants	Average Annual Energy Savings per Participation (kWh)
1990	1,088	76,895
1991	2,713	78,627
Total	3,801	

MEASURE LIFETIME

Measure lifetimes range from 1 to 30 years. Lighting projects have lifetimes from 3 years for lowering wattages on incandescent lamps, to 25 years for converting fixtures to operate with F32T8 lamps and electronic ballasts. Space conditioning projects such as cleaning condenser coils have a lifetime of 1 year, while installation of high-efficiency chillers have lifetimes of 23 years. High-efficiency motors have the longest lifetime, at 28 to 30 years. The weighted average lifetime of all measures was 13.6 years in 1990 and 14.8 years in 1991.

Cost of the Program

Costs Overview Table	Administrative Cost	Rebate Cost	Total Program Cost	Utility Cost per Participant
1990	\$637,626	\$6,074,225	\$6,711,851	\$6,169
1991	\$2,286,181	\$12,955,028	\$15,241,210	\$5,618
Total	\$2,923,807	\$19,029,253	\$21,953,061	



Cost of Saved Energy Table (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%
1990	0.73	0.78	0.83	0.88	0.93	0.99	1.05
1991	0.61	0.65	0.70	0.74	0.79	0.84	0.89

1991 administrative cost of saved energy at 5%=0.10

PG&E spent \$21,953,061 for the Customized Electric Rebate Program during 1990 and 1991.

COST PER PARTICIPANT

The average cost per participant for 1990 and 1991 was \$5,893. The average cost was significantly lower for commercial and agricultural customers than for industrial customers. The average cost was ~\$4,000 per commercial and agricultural participant and ~\$12,000 per industrial participant. Energy savings for industrial participants were proportionately higher.

COST EFFECTIVENESS

In its Annual Summary Report on Demand Side Management Programs, PG&E presents the results of its benefit cost test conducted in its determination of shareholder incentives. However, the results are not broken down by DSM Program, rather, they are presented according to customer type.

The cost of saved energy for the 1991 Customized Electric Rebate Program calculated at a 5% discount rate is 0.7 ¢/kWh. When this value is compared to PG&E's average industrial electric rate of 6.8 ¢/kWh, it can be seen that the program is highly cost effective.

FREE RIDERSHIP

An independent evaluation of both Customized Rebate Programs, completed in January of 1990, reported that the

majority of incentives were being spent on equipment that has a payback period of three years or less. The evaluation further reported that previous market research done by the evaluators, and confirmed by another consulting firm, had shown that most commercial and industrial customers will accept a three year or less payback on their own. This suggests that free ridership may be high. [R#4]

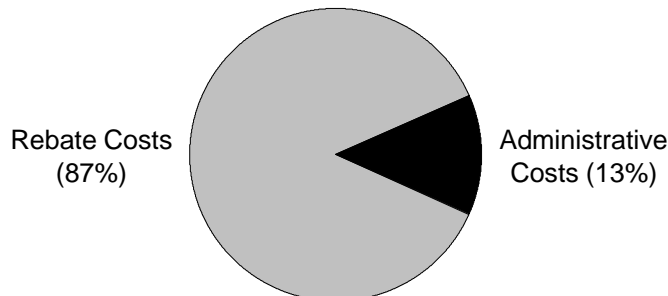
PG&E does not report free ridership but reports "net-to-gross impacts". Net-to-gross is the ratio between the program impacts for which the utility can assume credit (net) and the total program impacts (gross) including those that would have taken place without the program. PG&E has determined net-to-gross to be 0.7 for both Customized Rebate Programs. [R#2]

COST COMPONENTS

In 1991, 52% of the gas and electric program rebate expenditures went to commercial sector projects, with 34% to industrial sector projects, and the remaining 14% to agricultural projects. Commercial sector projects represented the majority of the electric program costs, while industrial projects were a full 72% of the gas program rebate expenditures.

Of the program costs for 1990 and 1991, rebate costs were approximately 87% and administrative costs were approximately 13% of the total.

Raw data for all of the above from [R#6,7]. Comparisons done by The Results Center.



Environmental Benefit Statement

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
----------------------	-------------------	------------------	-----------	-----------	-----------	------------

Coal Uncontrolled Emissions

A	9,400	2.50%	820,658,000	19,470,000	3,936,000	394,000
B	10,000	1.20%	875,089,000	7,537,000	2,542,000	1,884,000

Controlled Emissions

A	9,400	2.50%	820,658,000	1,947,000	3,936,000	31,000
B	10,000	1.20%	875,089,000	754,000	2,542,000	126,000
C	10,000		875,089,000	5,024,000	2,512,000	126,000

Atmospheric Fluidized Bed Combustion

A	10,000	1.10%	875,089,000	2,303,000	1,256,000	628,000
B	9,400	2.50%	820,658,000	1,947,000	1,574,000	118,000

Integrated Gasification Combined Cycle

A	10,000	0.45%	875,089,000	1,549,000	251,000	628,000
B	9,010		787,162,000	561,000	189,000	38,000

Gas Steam

A	10,400		477,322,000	0	1,089,000	0
B	9,224		414,516,000	0	2,596,000	123,000

Combined Cycle

1. Existing	9,000		414,516,000	0	1,591,000	0
2. NSPS*	9,000		414,516,000	0	754,000	0
3. BACT*	9,000		414,516,000	0	105,000	0

Oil Steam--#6 Oil

A	9,840	2.00%	690,860,000	10,468,000	1,235,000	1,172,000
B	10,400	2.20%	732,730,000	10,384,000	1,553,000	754,000
C	10,400	1.00%	732,730,000	1,482,000	1,248,000	394,000
D	10,400	0.50%	732,730,000	4,355,000	1,553,000	239,000

Combustion Turbine

#2 Diesel	13,600	0.30%	916,960,000	1,826,000	2,835,000	155,000
-----------	--------	-------	-------------	-----------	-----------	---------

Refuse Derived Fuel

Conventional	15,000	0.20%	1,088,628,000	2,805,000	3,693,000	821,000
--------------	--------	-------	---------------	-----------	-----------	---------

Avoided Emissions Based on 380,639,166 kWh Saved (1990 - 1991)

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some of environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

1. The purpose of the next page is to allow any user of this profile to apply PG&E's level of avoided emissions saved through its Customized Electric Rebates program to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables include a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources.

* Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

Lessons Learned / Transferability

LESSONS LEARNED

In general, the Customized Electric Rebate Program has worked very well. Most of the lessons learned concern improving the distinction between when customers should participate in the Customized Rebate Programs and when they should participate in the Direct Rebate Program.

Customers generally calculate rebates for both the Direct and the Customized Electric Rebate Programs before submitting their application to either program. Whichever program provides the higher rebate is the one in which the customer participates. Generally, only customers who have low hours of operation will use the Direct Rebate Program. Those who have longer hours of operation will generally save more energy and be eligible for a larger rebate if they participate in the Customized Rebate Program. PG&E is trying to move some technologies from the Customized Rebate Program into the Direct Rebate Program to eliminate this practice. In the future, customers will not be able to submit an application to the Customized Rebate Program if all of the measures included in the application are included in the Direct Rebate Program.

Another lesson learned by program staff is that the calculations customers are required to submit for participation in the Customized Rebate Program provide insight into how PG&E's customers are utilizing new technologies. This information is helpful in designing new programs and refining existing ones.

TRANSFERABILITY

The Customized Electric Rebate program is highly transferable. There is nothing about the program which should limit it to any particular area or type of utility. It requires very few staff to implement. Of these few, some personnel must have the technical expertise necessary to verify the customers' calculations of energy savings. Minimum project size must be set based upon the resources that a utility wishes to assign for implementing the program (i.e. the fewer personnel available to the program the larger the minimum project size should be to insure maximum program impact).

When PG&E staff were asked what advice they would have for other utilities wishing to implement the program, they responded, "Keep it simple!" PG&E staff attribute much of the program's success to its simplicity. They also point to the high level of trust PG&E has established with its customer base and the good relationship that the utility has with its public utilities commission.

Regulatory Incentives and Shareholder Returns

The California Public Utilities Commission (CPUC) considers the Customized Electric Rebate Program to be a "resource program" for the purpose of assigning it an appropriate incentive mechanism. Resource programs typically apply technologies that reduce customers' energy use while maintaining or improving their living standards, if they are residential customers, or their output levels, if they are commercial, industrial, or agricultural customers. Resource programs are cost-effective alternatives to supply-side resources and are thus valuable as "resources" to the utility. Non-resource programs might include education or auditing programs which are very important to successful implementation of a utility's entire DSM portfolio, but produce energy savings that are not easily quantifiable.

The relatively simple incentive mechanism approved by the CPUC for PG&E's resource programs includes both rewards and penalties. Every year each resource program is assigned a minimum performance standard (MPS). The MPS is the level of the net present value (NPV) of lifecycle benefits that a program must achieve to avoid penalties. The lifecycle benefits include both actual and committed results and are computed by the utility cost test (the avoided energy costs

minus the utility's costs to implement the program). When program achievements are greater than the MPS, the utility receives 15% of the NPV of the lifecycle benefits of the program. When program achievements are less than the MPS, the utility is required to pay a penalty of 15% of the difference between the MPS and the NPV of the achieved lifecycle benefits. The formulae are:

NPV Lifecycle Benefits = (NPV Avoided Energy Costs) - (NPV Program Expenditures)

Shareholder Incentive Reward = 0.15 * (NPV Lifecycle Benefits)

Shareholder Incentive Penalty = 0.15 * (MPS - NPV Achieved Lifecycle Benefits)

References

1. Joe Barrington, Supervising Planner, PG&E, personal communications, April 1992.
2. Diane Calden, Rebate Program Manager, PG&E, personal communications, March through May 1992.
3. Mike Clark, Supervising Planner, PG&E, personal communication, April 16, 1992.
4. Pacific Consulting Group, "Evaluation of the Customized Gas and Electric Financial Incentives Program for Pacific Gas & Electric Company: Final Report," January 1990.
5. PG&E, "Annual Report," 1991.
6. PG&E, "Annual Summary Report on Demand Side Management Programs in 1990 and 1991," March 1991.
7. PG&E, "Annual Summary Report on Demand Side Management Programs in 1991 and 1992," March 1992.
8. PG&E, "CIA Rebate Evaluation Scoping Study," December 1991.
9. Jim Flanagan, Senior Planner, PG&E, personal communication, March-May 1992.

Special thanks to Jim Flanagan and Diane Calden for their patience and help throughout the development of this profile.