THE BUSINESS OF DELIVERING ENERGY SERVICES IN CALIFORNIA

prepared for
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"We are now able for the first time to make a profit on the energy savings we achieve by assisting customers conserve gas and electricity..... Customer Energy Efficiency is a new means to build earnings, reduce oil use and at the same time benefit customers and California's environment"

Chairman's Letter to Shareholders, Pacific Gas and Electric Company Annual Report 1990

EXECUTIVE SUMMARY

California's largest electric utilities have initiated a strategic expansion of their business activities from sellers of electric kWs and kWhs to providers of energy services. In their new roles as energy service providers, the Pacific Gas and Electric Company (PG&E) and the Southern California Edison Company (SCE) have each publicly announced major corporate commitments to meeting the bulk of projected demand increases in the 1990s with demand-side resources. As a result, PG&E and SCE customers will see their energy bills reduced, PG&E and SCE will have an opportunity to increase their profits, California will see its energy services delivery infrastructure mature, and the environment will reap the benefits of a least-cost energy system.

The most dramatic aspect of these announcements, of course, is utility delivery of customer energy efficiency. How is it that two of the United States' largest electric utilities (PG&E and SCE rank 3rd and 4th in total revenues) have decided to sell less of their basic product? Moreover, how will these utilities deal with the revenue losses that result if they are successful in improving the energy efficiency of their customers? And finally, why should utilities, as opposed to other institutions in the energy market, choose to become the providers of energy efficiency?

In this report, we attempt to provide answers to these questions by reviewing the origins of efforts to promote energy efficiency in California in the early 1980s, the decline of these efforts in the last half of the 1980s, the 1989 Collaborative Process that reversed this decline, and, finally, the situation today, in which California's largest utilities have initiated a major transformation of their business orientation toward becoming energy service providers.

PG&E and SCE are vertically integrated electric utilities that operate under monopoly franchises, which are administered by the California Public Utilities Commission (CPUC). Under these franchises, PG&E and SCE are allowed to earn a regulated rate of return on un-depreciated capital assets (the rate base) in return for the provision of reliable and reasonably priced

electricity. (PG&E also sells natural gas, under a similar monopoly franchise from the CPUC). The rate of return, the rate base upon which it applies, and the design of tariffs are all determined in a triennial "rate case." Rate cases are conducted in a semi-legalistic setting, which in the past were often characterized by acrimonious debate on rate design and conservation program plans between utilities, the CPUC staff, and a myriad of intervenors representing various customer groups. California is somewhat unique from other states in that a separate agency, the California Energy Commission (CEC), is charged with approving applications by the utility (and non-utility generators) for the construction of new powerplants.[1]

In the early 1980s, California's energy efficiency programs were held up as a model for the United States and the world. The CEC had established the nation's first set of comprehensive building and appliance standards and the utilities had implemented an impressive array of energy conservation and load management programs. The CPUC had modified its regulation of the utilities to eliminate the negative short-run impacts of conservation on utility earnings and had, for the first time, articulated a set of economic criteria for determining the cost-effectiveness of utility demand-side management programs. These regulatory initiatives were considered revolutionary at the time. However, by the second half of 1980's, utility energy efficiency programs were in decline. Something fundamental was missing.

In fact, the world had changed by the mid-1980s. World oil prices fell dramatically as did the price of natural gas. In California, the creation of an industry of independent power producers, coupled with the completion of two major nuclear power plants, put the utilities in over-capacity for the first time since the early 1970s. In economic terms, the short-run marginal cost of electricity was less than average cost. Saving electricity meant rate increases for all customers because fixed costs had to be recovered from a smaller base of sales. Utilities were systematically underspending their authorized conservation budgets, preferring instead to return un-spent program budgets to the ratepayers.

In 1989, the California Collaborative, a unique working group consisting of representatives from the utilities, their regulators, and major customer groups, was created to re-establish California's leadership in energy efficiency.

Examining the defining features of the first generation of California utility DSM activities illustrates clearly the challenges faced by the Collaborative. Generally speaking three words can summarize these early programs: residential, customer-oriented, and load-management. The residential sector emphasis of early programs was a response to political pressure from the always vocal residential consumer groups. The effect, however, was to divert utility priorities away from pursuing potentially more cost-effective (from a societal point of view) savings in the commercial and industrial sectors. The customer-orientation of early programs (which emphasized rebates and the provision of information and audits) was based on a limited view of the utility's potential role in addressing the institutional and social barriers to energy conservation. In fact, a defining characteristic of demand-side resources is their diversity, which

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[1]The CPUC, however, remains responsible for determining the prudence of utility generation expenditures and hence their recovery in rates.

in turn calls for a multi-faceted approach to acquiring these resources. The provision of information and rebates to customers, alone, will not capture all cost-effective demand-side resources. Load-management appears to be the only early utility demand-side activity that was pursued with vigor. The reasons are quite apparent: short-run marginal costs for new capacity almost always exceed average rates (as well as the costs of achieving the load reductions) and so the financial benefit of these programs to the utility is immediate.

On the one hand, the charge to the Collaborative was simple: develop a consensus on the expansion of utility customer energy efficiency programs and on financial incentives to make these activities profitable for utilities. On the other hand, the process of reaching that consensus represented an unprecedented method (i.e., outside the traditional framework of the rate case) for establishing policies to govern utility business practices. Moreover, it gave all parties, especially the utilities, new insights into what customers expected from their utility, how the utility could fulfill these expectations, and what it could be worth in monetary terms to the utility.

The Collaborative made it clear to the utilities that Californians wanted them to become full-scale energy service providers. That is, Californians did not just expect their utilities to provide energy conservation programs for short-term economic or political reasons, but instead that they were willing to pay a reasonable price for sustained utility involvement in the acquisition of cost-effective demand-side resources. In particular, the Collaborative made it clear that the utilities should view these changes as an increasingly important component of their business activities in California. Although it is too early to determine how exactly the energy service industry will evolve ultimately in California, these utilities have made it clear that they plan to remain at its center.

It is useful to distinguish two key aspects to the transformation taking place at PG&E and SCE: The first is internal to both utilities. It concerns new profit-making incentives available to the utilities and the changes in organization and management initiated by the utilities in response to these new business opportunities. The second is external to the utilities. It concerns basic changes to the relationships between the utility, its customers, and the entire infrastructure of the markets that deliver energy services.

Prior to the Collaborative, customer energy efficiency programs were essentially a break-even proposition for the utilities and since long-run earnings were, in fact, increased through increased sales, reducing customer's energy bills was comparably less attractive. Following the Collaborative, a variety of methods were proposed to make customer energy efficiency as, or more, profitable than supply side activities. The most promising of these financial incentives was proposed by PG&E and is called shared savings.[2]

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[2] For example, SCE originally proposed to place its DSM expenditures into the utility's rate base and thereby achieve parity with the ratebasing of supply-side expenditures. Recently, SCE has dropped this proposal in favor of shared savings. For this reason, we have chosen to focus on PG&E's DSM activities in this report.

Under shared savings, the utility has the opportunity to earn a "profit" on the energy savings from their DSM activities that is tied directly to the value of these savings to society. The incentive is calculated as a percentage (currently, 15%) of the difference between the value of the measures to the utility (in the form of an "avoided" cost) and the cost of the measure.[3] In other words, the incentives to the utility to help its customers save energy have been harmonized with society's desire for a least-cost energy system. Shared-savings incentives represent a major departure from the traditional means of determining utility earnings and may be a forerunner of even more far-reaching utility incentives. More importantly and of direct relevance to publicly owned (not-for-profit) utilities, the achievement of energy efficiency program goals (i.e., savings and earnings) are being used as an element of incentives for utility employees.

To respond to these new business opportunities, PG&E has designed an expanded menu of demand-side activities that now address directly the short-comings of the first generation of utility DSM programs. The most significant change has been PG&E's recognition that the institutional and social barriers to energy conservation are so pervasive that only a sustained and multi-faceted strategy for acquiring demand-side resources will be successful. Now that the incentives for this success are in place, the utility has responded.

After reviewing the scope of PG&E's demand-side activities, we examine three programs in detail: 1. expanded rebates for high efficiency refrigerator; 2. residential new construction programs for builders; and 3. commercial/industrial customized rebates. This detail is warranted because it allows us to illustrate the process PG&E has created for identifying promising demand-side business opportunities and developing a comprehensive strategy for taking advantage of these opportunities.

Programs to offer rebates to customers for the purchase of more efficient refrigerators are not new to California utilities. Refrigerators have long been recognized as one of the largest consumers of electricity in the residential sector. What is new about the PG&E program is the acknowledgement that rebates (and appliance energy use labels, which are also in effect in California) only affect those consumers who pay attention to the trade-off between the first cost and energy operating costs of their purchases. Many consumers do not realize the significance of this trade-off. PG&E's program addresses both types of consumer. In addition to offering traditional rebates, whose size is related to expected energy savings, incentives are also provided to the sellers of the appliances. The sellers are typically the point-of-contact for consumer purchases and have a tremendous influence on consumer's choices. Thus, in addition to the customer, PG&E has incorporated the existing appliance distribution infrastructure into its own network for the delivery of energy efficiency. The program, itself, is administered centrally at PG&E corporate headquarters to ensure uniformity in program implementation.

The residential new construction incentives are another example of how PG&E has tailored its energy efficiency programs to the reality of the current market for energy services. In new construction, there is a significant institutional barrier to energy conservation because the

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[3] For some New York utilities, an environmental "adder" is included as part of the avoided cost benefit in the shared-savings calculation.

builder's incentive to minimize the first cost of construction is in conflict with the eventual home-owners desire to have low energy bills. PG&E's program, therefore, targets the incentives to the builders. The program takes advantage of existing energy performance standards for buildings by using the efficiency levels in the standard as the basis for setting incentive levels. This program is implemented primarily by PG&E division staff who are responsible for marketing the program to builders.

Our final example is the customized rebate program for commercial and industrial customers. In this program, PG&E starts by recognizing: 1. the limitations of its energy auditors in identifying conservation measures in more complex energy using systems such as large commercial buildings and industrial operations; 2. the inherent advantages of its commercial and industrial customer's in-house staff in identifying these conservation opportunities; and 3. the lack of capital which prevents these customers from taking advantage of these savings on their own. Customers submit proposals for various energy efficiency improvements to PG&E, which PG&E reviews and evaluates. If the measures are acceptable, the customer then receives an incentive payment from the utility. This program is administered by customer service representatives operating locally at PG&E service divisions. The idea is to allow customers to work with a familiar and on-going contact person from the utility who will, in turn, promote a comprehensive retrofit of the customer's premise.

Beyond these dramatic changes to the design and implementation of demand-side programs, something more fundamental is taking place at PG&E. The corporation itself has recognized that, as a large and highly visible member of the California business community, an aggressive stand on environmental issues is a business necessity. Californians demand a high quality of living, which is reflected by increased emphasis on environmental quality. Moreover, they have also made it clear that they are willing to pay for it. In response, PG&E has developed a supply bridging strategy for the 1990s that relies heavily on customer energy efficiency to meet the majority of expected resource needs. The strategy is based on the utility's expectation that the next generation of environmentally benign, clean, renewable resources will not become commercially available and cost-effective until after the year 2000. Thus, PG&E's energy efficiency programs are but one part of a comprehensive business plan, which has now been made all the more compelling because incentives are available to make these programs profitable to the utility. The time appears ripe for the energy service corporation of the future.

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1. INTRODUCTION

California's largest electric utilities have initiated a strategic expansion of their business activities from sellers of electric kWs and kWhs to providers of energy services. In their new roles as energy service providers, the Pacific Gas and Electric Company (PG&E) and the Southern California Edison Company (SCE) have each publicly announced major corporate commitments to meeting the bulk of projected demand increases in the 1990s with demand-side resources. As a result, PG&E and SCE customers will see their energy bills reduced, PG&E and SCE will have an opportunity to increase their profits, California will see its energy services delivery infrastructure mature, and the environment will reap the benefits of a least-cost energy system.

Until recently, utility involvement in customer's energy consumption decisions was extremely rare. In fact, it actually signals a return to the original business of the electric utility industry. In those early days, for example, utilities provided the lighting systems that their customers used and the product sold was hours of lighting. Thomas Edison lamented the development of the electric meter because he felt the opportunities for improving the efficiency of energy-using equipment was substantial, but that the introduction of the meter between the customer and the utility would eliminate a utility's incentive to benefit from these improvements. In the years following Edison, tremendous technological innovation in electricity generation and transmission gave rise to a declining cost industry in which increased electricity consumption lowered costs to everyone.

In the last 20 years, the basic cost conditions of the industry have reversed; long-run marginal costs exceed average costs. Moreover, increased environmental awareness has lead the industry to become aware of the importance placed by the public on the external costs of electricity production. In the US, these changes have often placed the utilities at odds with their customers and regulators. This tension has only been increased by overwhelming evidence that efficiency opportunities, costing far less than the costs of new supply, remain un-tapped on the customer's side of the meter (i.e., demand-side resources).

At the same time, it is equally evident that tapping these resources will require over-coming the significant institutional and social barriers that have prevented energy markets from working efficiently in the past. For example, energy pricing reforms, though necessary, are inadequate by themselves because the infrastructure for delivering energy efficiency in this country is immature.

Beginning in the late 1970s, the public has looked to its utilities and, through regulation, directed them to nurture the development of an energy efficiency industry. However, for most utilities, aggressive pursuit of customer energy efficiency was in direct conflict with the firm's financial responsibility to its owners (i.e., shareholders). Customer energy efficiency meant reduced sales, and reduces sales meant lower revenues. Many US utilities have made the claim that, given the rules governing their business operations, the provision of reliable and reasonably priced electricity is their sole business.

Yet, something unique is taking place in California. How is it that PG&E and SCE, two of the United States' largest electric utilities, have decided to sell less of their basic product? Moreover, how will these utilities deal with the revenue losses that result if they are successful in improving the energy efficiency of their customers? And finally, why should utilities, as opposed to other institutions in the energy market, choose to become the providers of energy efficiency?

In this report, we attempt to provide answers to these questions by reviewing the origin and initial decline of efforts to promote energy efficiency in California in the 1980s, the 1989 Collaborative Process that reversed this decline, and, finally, the situation today in which California's largest utilities have initiated a major transformation of their businesses toward becoming energy service providers.

2. THE BUSINESS OF SELLING ELECTRICITY IN CALIFORNIA BEFORE THE COLLABORATIVE PROCESS

Prior to the Collaborative Process, the business of selling electricity in California differed little from that of the rest of the country. Although California had established a national reputation for leadership in energy efficiency in the early 1980s, the events preceding the Collaborative showed that this leadership could not sustain itself. Nevertheless, unique features of the California utilities, their regulators, and their customers were instrumental in re-establishing California's leadership through the Collaborative. In this section, we review key aspects of the background to the Collaborative. We focus on the utilities, PG&E and SCE, the system of regulation which determines how they operate as businesses, and the rise and fall of the first generation of California demand-side management programs.

2.1 The Pacific Gas and Electric Company and the Southern California Edison Company

By almost any measure, PG&E and SCE are two of the largest utilities in the US. In terms of revenues, they rank 3rd and 4th with electricity revenues in 1989 of $6.2 billion and $6.5 billion, respectively. Total assets for the two firms are $21.4 billion and $15.4 billion, respectively. Their service territories roughly divide the state of California in half.[1]

In 1989, PG&E sold 69.9 TWh to approximately 4.1 million residential (33% of sales), commercial (41% of sales), and industrial (22% of sales) customers. Load growth is expected to remain moderate through the next decade. Current projections show energy growing at 1.7%/yr between 1987 and 2009, with peak demands growing slightly faster at 2.3%/yr over the same forecast horizon. The commercial sector is expected to grow faster than the other two sectors. As a result, PG&E's relatively low load factor (60%) is expected to decline even further. Average retail rates are about $86/MWh. In addition to electricity, PG&E also sells natural gas.

The PG&E resource base consists mainly of steam (45% of generation in 1989), nuclear (21% of generation), hydro (14% of generation), non-utility purchases (17% of generation), and utility purchases (7% of generation).

In 1989, SCE sold 69.1 TWh to approximately 3.9 million residential (31% of sales), commercial (34% of sales), and industrial (32% of sales) customers. As with PG&E, load growth is expected to remain moderate through the next decade. Current projections show energy growing slightly faster than PG&E at 2.1%/yr between 1987 and 2009, with peak demands growing slightly faster at 2.5%/yr over the same forecast horizon. Due to increased

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[1] San Diego Gas and Electric Company, Los Angeles Department of Water and Power, and Sacramento Municipal Utility District are the other major utilities in California.

cooling loads, SCE's load factor (56%) is even lower than PG&E's. Average retail rates are about $97/MWh. Unlike PG&E, SCE is in competition with the natural gas utility, the Southern California Gas Company.

The SCE resource base consists mainly of steam (38% of generation in 1989), nuclear (16% of generation), hydro (4% of generation), non-utility purchases (25% of generation), and utility purchases (12% of generation).

2.2 The Business Environment and Regulation of PG&E and SCE

PG&E and SCE operate as regulated natural monopolies under franchises that are administered by the California Public Utilities Commission (CPUC). Under these franchises, PG&E and SCE are allowed to earn a regulated rate of return on un-depreciated capital assets (the rate base) in return for the provision of reliable and reasonably priced electricity. State regulation of investor-owned utilities in the U.S. evolved in the first half of the century to address abuses of utility monopoly power and its influence on local politics. It was ultimately perceived by both the utility and the public that a central, professional staff of economists and engineers was a superior alternative to a patchwork of often very uneven (and sometimes corrupt) regulation by the municipalities.

The rate of return, the rate base upon which it applies, and the tariffs the utilities are allowed to charge are determined in triennial "rate cases." In addition, general policy matters regarding utility business activities (such as the rates to pay non-utility generators or the level and extent of conservation activities) may also be reviewed in the rate case.

A rate case is a semi-legal forum, presided over by an administrative law judge. Testimony is prepared by the utility, the CPUC staff (which is distinct from the CPUC commissioners), and all interested parties (who are called intervenors). At the end of hearings, a draft decision is prepared and after discussions, the five CPUC commissioners prepare and sign a final decision.

In addition to holding a rate case every three years, the CPUC also exerts more frequent oversight of the utilities on a limited set of issues. Fuel and purchased power costs, customer attrition, and the cost of capital to the utility are reviewed annually. Sometimes, policy matters that are normally addressed in the rate case are re-visited between rate cases in these annual hearings.

In California, intervenor groups typically represent large customer groups (such as the steel industry, or manufacturers, or residential consumers), independent power producers (recall that the utilities acquire a significant amount of energy from non-utility sources), and advocacy groups (such as environmental or low-income). California intervenor groups have historically been very active participants in utility rate cases. The positions they articulate in support of their constituents often reveals a deep understanding of many aspects of the utility business. In the past, rate cases have been characterized by acrimonious debate between the parties on policy

issues regarding the prudence of utilities' plans and expenditures for nuclear power plants, the determination of prices to pay non-utility power producers, and the scope and magnitude of utility DSM programs.

California is somewhat unique from other states in that a separate agency, the California Energy Commission (CEC), is responsible for approving both utility and non-utility applications to construct new generating facilities greater than 50 MW in size. (When approved, however, the CPUC retains the responsibility for determining the prudence of the utility's expenditures and hence their recovery in rates.) The CEC holds its own set of hearings on a biennial basis to determine first the need for generating resources (i.e., a demand forecast) and second the preferred resources for meeting any needs that arise. In addition, the CEC is also responsible for establishing statewide building and appliance energy performance standards.

2.3 The Rise and Fall of the First Generation of California Utility Energy Efficiency Programs

In the early 1980s, California's energy efficiency programs were held up as a model for the United States and the world. The CEC had established the nation's first set of comprehensive building and appliance standards and the utilities had implemented an impressive array of energy conservation and load management programs. Utility spending on energy efficiency peaked in 1984 at nearly $55 million for PG&E and $54 million for SCE. At that time, California utility spending on energy efficiency led the nation in terms of total dollars spent. California utility spending on energy efficiency, in fact, exceeded the combined spending on energy efficiency by government and energy service companies in California. The combined effect of California DSM activities in all sectors from 1973 to 1987 was to reduce energy use per capita 15% and reduce energy use per dollar of gross state product by 30%, while at same time the state experienced population growth of 33%.

The CPUC actively encouraged (and often ordered) the utility to undertake these activities. To their credit, CPUC also instituted several regulatory changes to address the negative short-run financial impacts of these programs. First, the utility was allowed to recover DSM program expenditures automatically through the annual fuel and purchase power hearings, rather than have to wait three years for the next rate case. Second, a balancing account, called the Electricity Revenue Adjustment Mechanism (ERAM) was established to track and ensure that authorized revenues would be collected. In their time, these two regulatory reforms were considered revolutionary. Finally, the CPUC also articulated a set of economic criteria for evaluating the cost-effectiveness of utility demand-side management programs, called the Standard Practice Manual. The Standard Practice Manual established a model for regulatory policies for utility DSM that has since been widely cited by utility regulators throughout the US.

Despite these impressive accomplishments, by the second half of the 1980s, utility energy efficiency programs were in decline (see Figures 1 and 2). From their high point in 1984, by 1989, California utility spending on total DSM fell by nearly 50%. PG&E, for example, went

from spending slightly more than 1% of operating revenues on energy efficiency to spending only 0.5% on DSM. Savings from these programs fell by an even greater amount to about 30% of the levels reached in 1984. Indeed, by 1989, utilities were actually under-spending authorized DSM program expenditures, preferring instead to return the monies to ratepayers. Clearly, something was wrong.

In fact, the world had changed by the mid-1980s. World oil prices fell dramatically as did the price of natural gas (see Figure 3). In California, the creation of an industry of independent power producers, coupled with the completion of two major nuclear power plants, put the utilities in over-capacity for the first time since the early 1970s (see Figure 4).

In economic terms, the short-run marginal cost of electricity was now less than average cost. In the early 1980s, the situation had been very different (short-run marginal costs were greater than average rates). As a result, there had been a convergence of utility shareholder and consumer interests; selling less electricity lowered costs to everyone. These benefits were further enhanced by the regulatory innovations, previously described. Now, however, saving electricity meant rate increases for all customers because fixed costs had to be recovered from a smaller base of sales. When faced with these basic macro-economic changes, the regulatory innovations that once seemed so revolutionary were inadequate.

Before turning to the Collaborative, it is instructive to examine the defining features of the first generation of California utility DSM programs because they serve to illustrate the challenges faced by the Collaborative. As indicated in Table 1, the first generation of PG&E and SCE DSM programs fell neatly into three categories: residential, information and rebate, and load management.

The residential sector emphasis of early programs was a response to political pressure from the always vocal residential consumer groups. The effect, however, was to divert utility priorities away from pursuing potentially more cost-effective (from a societal point of view) savings in the commercial and industrial sectors.

The customer-orientation of early programs (which emphasized rebates and the provision of information and audits) was based on a limited view of the utility's role in addressing the institutional and social barriers to energy conservation. In fact, a defining characteristic of demand-side resources is their diversity, which we now realize calls for a multi-faceted approach to acquiring these resources. The provision of information and rebates to customers, alone, will not capture all cost-effective demand-side resources.

Load-management appears to have been the only early utility demand-side activity that was pursued with vigor. The reasons are quite apparent: short-run marginal costs for new capacity almost always exceed average rates (as well as the costs of achieving the load reductions) and so the financial benefit of these programs to the utility is immediate.

Figure 1. Utility Energy Efficiency Program Spending 1980 - 1988

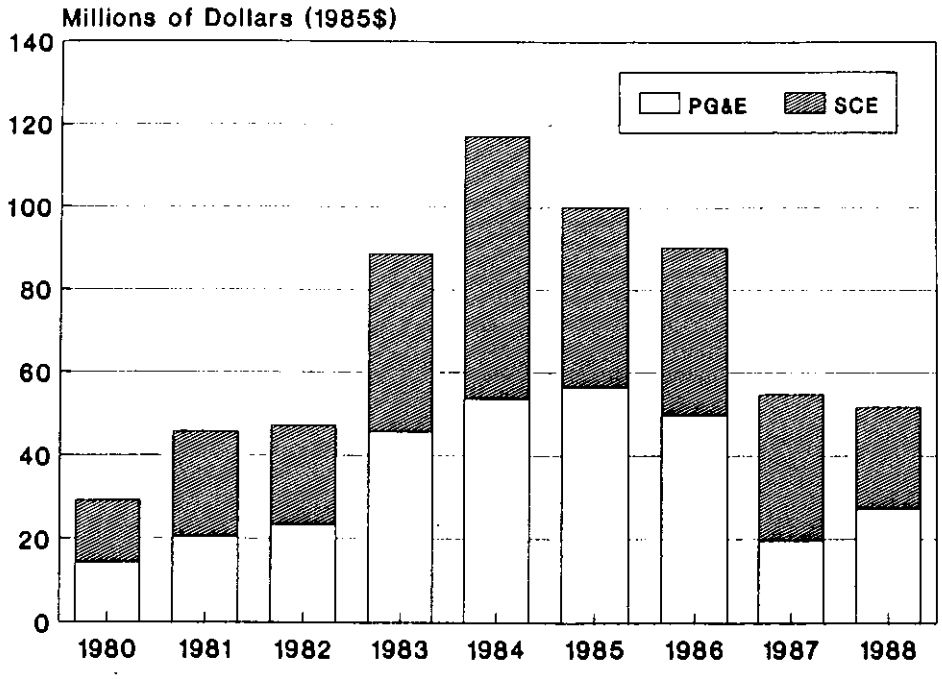
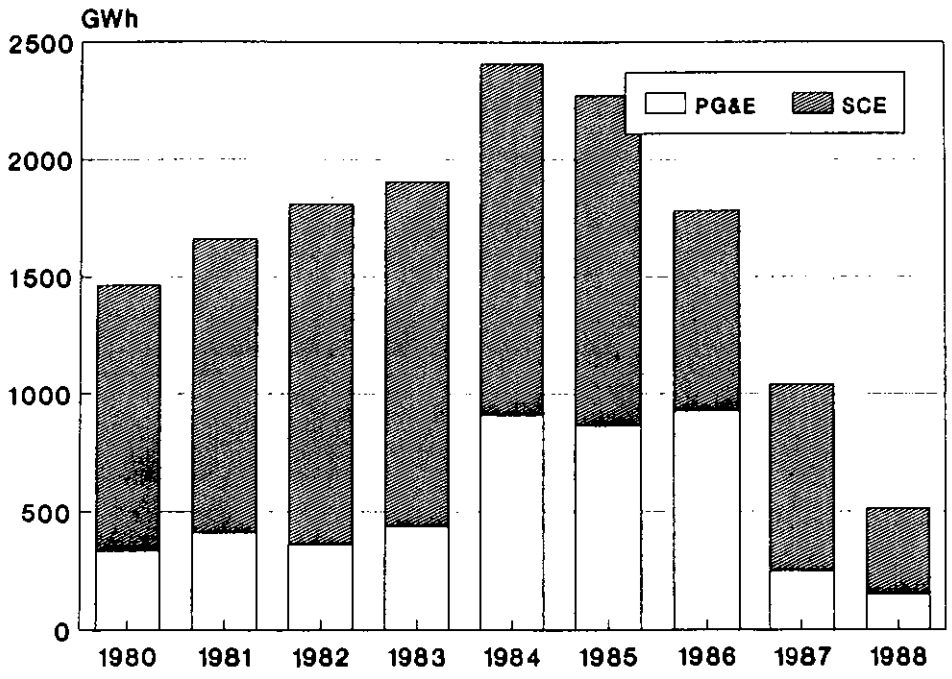


Figure 2. Utility Energy Efficiency Program Savings 1980 - 1988



Source: Caldwell, C. and Cavanagh, R. 1989. "The Decline of Conservation at California Utilities: Causes, Costs, and Remedies." Natural Resources Defense Council.

Figure 3. Southern California Edison Gas Prices 1980 - 1990

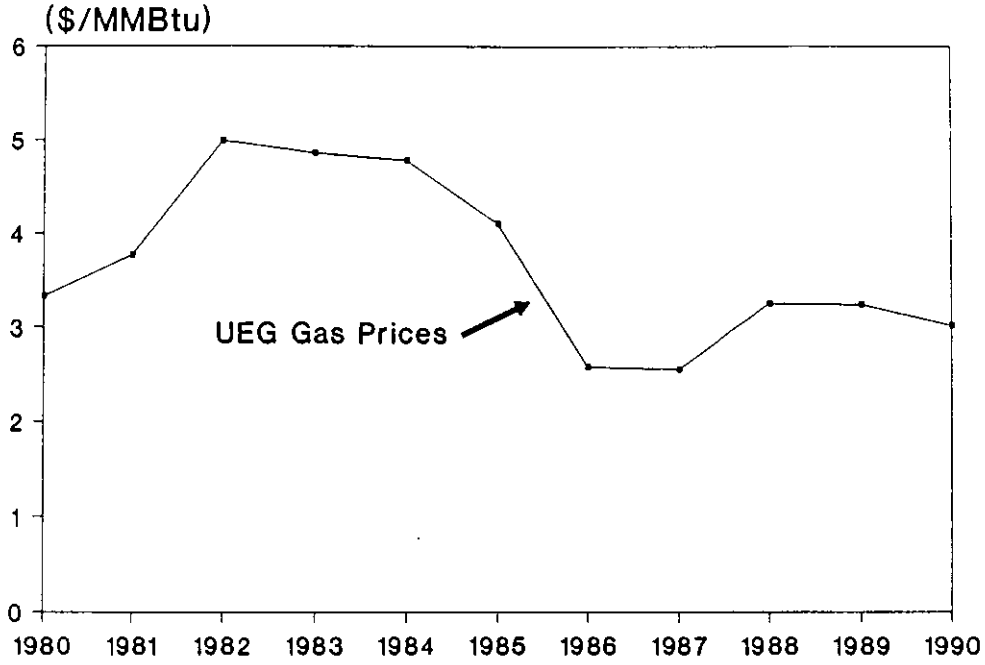
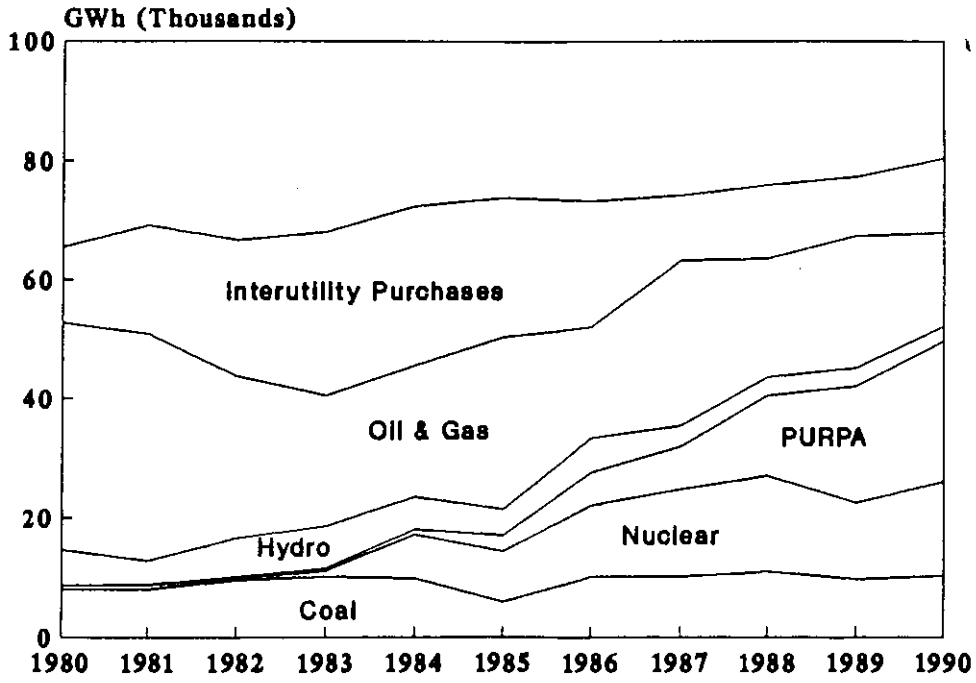


Figure 4. Southern California Edison Resource Mix 1980 - 1990



Source: Southern California Edison Company.

Table 1. Utility DSM Spending and Sales Among Market Sectors in 1983

Pacific Gas and Electric Company
(total 1983 DSM spending $85 million)

DSM Program	Residential	Commercial	Industrial/Other	Total
Info/audit	4.5	0.0	0.0	4.5
Customer rebate	19.0	27.9	4.9	51.8
New construction	1.2	0.0	0.0	1.2
Load management	13.4	1.8	9.6	24.9
Other	4.2	2.7	10.7	17.7
Spending totals	42%	33%	25%	100%
Sales	33%	41%	26%	100%

Southern California Edison Company
(total 1983 DSM spending $102 million)

DSM Program	Residential	Commercial	Industrial/Other	Total
Info/audit	8.9	0.0	0.0	8.9
Customer rebate	18.0	23.3	8.4	49.8
New construction	0.4	0.0	0.0	0.4
Load management	2.3	3.0	6.7	12.0
Other	1.8	0.0	27.1	28.9
Spending total	31%	26%	42%	100%
Sales	31%	34%	35%	100%

Source: Caldwell, C. and Cavanagh, R. 1989. "The Decline of Conservation at California Utilities: Causes, Costs, and Remedies." Natural Resources Defense Council.

3. THE CALIFORNIA COLLABORATIVE PROCESS

The decline in California utility DSM program spending and savings did not go un-noticed. In the early months of 1989, the Natural Resources Defense Council (NRDC) released "The Decline of Conservation at California Utilities: Causes, Costs, and Remedies. Based on its analysis of utility spending and savings trends, and interviews with representatives of the utilities, the CPUC and CEC, and utility customers, the NRDC study identified five major deficiencies in current utility DSM programs: 1. lack of institutional commitment to conservation; 2. gaps in program coverage (e.g., no programs in new construction); 3. absence of incentives for utility employees to meet or exceed conservation performance goals; 4. counterproductive utility advertisements that equated energy savings with a loss of convenience or comfort; and 5. reduced quality in energy audits (e.g., preferences for mail-in audits as opposed to on-site audits by trained energy professionals).

California's major newspaper, the Los Angeles Times, read the NRDC report and ran a well-publicized article that was highly critical of SCE's apparent lack of commitment to its conservation programs. Discussions ensued between SCE's senior management, Ralph Cavanagh of NRDC (the report's co-author), and the CPUC. In July 1989, the CPUC held a formal hearing to re-examine current regulatory policies toward DSM.

At the hearing, several speakers suggested that a collaborative process would be a useful vehicle to reinvigorate utility DSM programs. Although, California utility regulation had never tried them, recent collaborative processes had been quite successful in other parts of the United States (e.g., New England and the Pacific Northwest). The proponents of collaborative processes pointed out that collaboratives were capable of producing results much quicker than the formal investigations and evidentiary hearings used in traditional regulatory processes.

Two of the five CPUC Commissioners (Wilk and Hulett) indicated they would be supportive of proposals that would test the usefulness of financial incentives to utility shareholders for DSM. More importantly, they also suggested that all interested parties work collaboratively for six months to develop these proposals. They expressed their desire to see utility DSM activities re-vitalized and indicated that, if the collaborative was not successful, they were prepared to impose policies of their own design to achieve this end.

3.1 The Process of Making Energy Policy by Consensus

In response to the CPUC's public invitation, representatives of fifteen groups ultimately convened as stakeholders to participate in the California Collaborative process. The participants included representatives of the state's major investor-owned electric and gas utilities (PG&E, SCE, San Diego Gas & Electric or SDG&E, and Southern California Gas or SCG), their regulators (CPUC and CEC), major customer groups, independent energy producers, and consumer and environmental advocacy organizations (see Table 2).

Table 2. Participants in the California Collaborative Process

Electric and Gas Utilities
- Pacific Gas & Electric (PG&E)
- Southern California Edison (SCE)
- San Diego Gas & Electric (SDG&E)
- Southern California Gas Company (SoCal Gas)

California State Agencies
- California Public Utilities Commission, Division of Ratepayer Advocates
- California Energy Commission (CEC)
- California Department of General Services

Representatives of Major Customer Groups
- Association of California Water Agencies
- California Energy Coalition
- California Large Energy Consumers Association (CLECA)

Environmental & Consumer Advocacy Groups
- Natural Resources Defense Council (NRDC)
- Toward Utility Rate Normalization (TURN)
- California/Neveda Community Action Association (CALNEVA)

Independent Energy Producers and Energy Service Companies
- Independent Energy Producers Association
- A&C Enercom

Source: California Collaborative. 1990. "An Energy Efficiency Blueprint for California."

Many of the participants were initially skeptical that a collaborative approach could produce positive results. Although many of the participants knew each other through involvement in previous regulatory proceedings and workshops relating to DSM issues, they had never worked together collaboratively. In fact, previous proceedings often tended to be adversarial, which produced some mistrust and bad feelings among some of the participants (e.g., between utility and non-utility parties). The utilities, themselves, were uncomfortable working with each other; SCE and SCG had historically competed for customers, and SCE was then in the process of attempting to acquire SDG&E through a merger.

The Collaborative began by defining a scope of work:

1. To establish priorities for improving and expanding utilities' DSM programs with emphasis on energy efficiency programs;
2. To identify promising options for creating performance-based incentives for utilities to operate energy efficiency programs; and
3. To define a mutually agreeable framework for determining appropriate levels of DSM investment and activities, and to frame for policy-makers the major unresolved policy issues surrounding the integration of DSM into utilities' resource and investment plan.

The Collaborative typically met bi-weekly over a six month period (August 1989 - January 1990) and more frequently as the January deadline approached. Some organizations (e.g., utilities) had more than one representative at the meetings; others occasionally rotated representatives. The CPUC's Division of Strategic Planning acted as facilitator.

The Collaborative adopted the following operating principles in conducting its discussions:

1. All stakeholders must agree for there to be a consensus;
2. When differences arise, those who differ will frame alternative proposals;
3. There will be no majority/minority reports; and
4. Silence is affirmation. Stakeholders will be responsible for dissenting or noting that they are not authorized to commit to a particular position.

These principles had several effects. First, they encouraged parties to seek consensus where possible and forced parties to decide which issues were truly important and which were minor. This was in contrast to previous regulatory proceedings where parties staked out extreme bargaining positions for strategic reasons. Second, they created an environment in which parties came to realize that they shared a common ground on many DSM policy issues. Although parties expressed their positions differently, they were, in fact, often in good agreement on many key issues.

The Collaborative structured its work in three phases: 1. fact-finding on DSM technologies and programs; 2. developing policy options; and 3. synthesis and report writing. During the fact-finding phase, the Collaborative brought in outside experts from around the U.S. to describe the status and development of energy efficient technologies in various sectors and end uses and introduce innovative program delivery mechanisms and concepts that were being tested by utilities to deploy these technologies. On the basis of these presentations and the ensuing

discussions, the California utilities agreed to re-assess their own programs and, working with the other parties, propose improvements. During the second phase, participants identified their DSM policy concerns and attempted to build consensus for particular positions. During the third phase, discussions focussed on building consensus in three areas: 1. DSM program concepts and spending levels for new and expanded energy efficiency programs; 2. the design of financial incentives for utility DSM programs; and 3. DSM policy issues.

3.2 An Energy Efficiency Blueprint for California

In January 1990, the Collaborative submitted the results of its activities in a report titled, "An Energy Efficiency Blueprint for California." To the surprise of many, the Collaborative had reached consensus in many areas: First, the utilities agreed to double their spending on energy efficiency programs by the end of 1991. In doing so, they also agreed to develop programs that would improve the efficiency of new construction in both the residential and commercial sectors.[2] Second, each of the four utilities proposed financial incentives for their DSM programs. PG&E and SDG&E proposed the use of shared savings; SCE proposed to ratebase DSM activities, and SCG proposed a bonus based on program costs. We will describe PG&E's incentive in detail in section 4.3. Third, of the 15 DSM policy issues that had been identified, consensus had been reached on 12 (see Table 3). The most important of these issues was agreement to use the Total Resource Cost test (which is essentially a societal benefit-cost perspective) as the primary determinant of DSM program cost-effectiveness. At the same time, agreements were also reached to consider the rate impacts of DSM programs as well as equity considerations for low-income programs. Fourth, guidelines for measurement and monitoring protocols to be used by the utilities in evaluating energy efficiency programs that were eligible for incentives were described. These guidelines sent a clear message that regulatory staff and non-utility parties expected the utilities to devote substantial resources towards improving assessments of the impacts from energy efficiency programs both in terms of net savings and ultimate costs to society.

Between January and April 1990, the consensus described in the Blueprint was translated into action plans by each utility. Negotiations on implementation details continued among several of the key parties. The utilities filed formal applications in April 1990 that described the details of their DSM program expansions, requested increased funding to carry out these activities, and requested approval for the incentive mechanisms they had proposed. In August 1990, the CPUC issued a decision which approved the utility's applications for increased expenditures during 1990-92 and concluded that "the time has come to try this incentive-based approach."

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[2] The rationale for these programs is that new construction programs are necessary to capture what will otherwise become "lost opportunities." Since it is always much less expensive to make buildings energy-efficient through better design and construction techniques (as opposed to retrofitting them after they have been built), the opportunities to save energy may be lost (or made much more expensive), if they are not acquired prior to construction.

Table 3. Summary of Consensus on Utility DSM Policy Issues

1. DSM program cost-effectiveness should be evaluated using the definitions set forth in the CPUC/CEC Standard Practice Manual for Economic Analysis of Demand-Side Management Programs - **CONSENSUS**

2. All DSM program costs, including shareholder incentives, should be included in cost-effectiveness evaluations - **CONSENSUS**

3. The goal of utilities' resource planning and investment is to minimize the cost to customers of reliable energy services in which energy efficiency is to be treated as a resource alternative to additional energy supply - **CONSENSUS**

4. DSM program cost-effectiveness is defined by the Total Resource Cost test, as defined by the CPUC/CEC Standard Practice Manual - **CONSENSUS**

5. DSM programs identified as cost-effective using the Total Resource Cost test should be pursued without explicit consideration of their potential rate impacts - **NONCONSENSUS**

6. Indirect social and customer benefits and costs should be included in determining DSM program cost-effectiveness - **NONCONSENSUS**

7. The environmental benefits of energy efficiency, as defined by CEC, should be included in evaluating DSM program cost-effectiveness - **NONCONSENSUS**

8. California should promptly develop and regularly update a full inventory of currently and potentially cost-effective DSM opportunities for both electricity and natural gas - **CONSENSUS**

9. California utilities should work closely with the CEC in the development of the next generation of building standards, which remain the primary means for capturing lost energy efficiency opportunities in new construction - **CONSENSUS**

10. Consistent with principle 9., California utility programs should also support CEC appliance efficiency standards - **CONSENSUS**

11. California utilities should continue to offer direct assistance programs whose primary purpose is to help low-income and otherwise disadvantaged customers, which may not be cost-effective, strictly speaking - **CONSENSUS**

12. California utilities should explore various means to reduce the cost of providing DSM to their customers including the development of a pilot program for DSM bidding - **CONSENSUS**

13. Current regulatory procedures for establishing DSM funding levels should be better coordinated with the resource planning process - **CONSENSUS**

14. CPUC and CEC should resolve uncertainties regarding their respective roles in determining optimal levels of utility DSM spending - **CONSENSUS**

15. The impacts of DSM on traditional methods for evaluating utility productivity should be re-evaluated - **CONSENSUS**

Source: California Collaborative. 1990. "An Energy Efficiency Blueprint for California."

3.3. The Legacy of the Collaborative Process for California Energy Policy

The charge to the Collaborative was simple: develop a consensus on the expansion of utility customer energy efficiency programs and on financial incentives to make these activities profitable for utilities. However, the process of reaching that consensus represented an unprecedented method for establishing policies to govern utility business practices (i.e., outside the traditional framework of the rate case). As a result, the California Collaborative Process and similar efforts in a number of other states have become new models for public participation in utility resource planning and policy making.

Advocates of this new model for policy-making (as well as all alternate dispute resolution techniques) claim that it will save both time and money compared to the traditional and often adversarial approaches it replaces. The experience in California appears to support this claim for the case of utility DSM policies. For example, without the Collaborative the design of workable financial incentives that both balances risks and rewards for utility shareholders, and addresses the concerns of ratepayer groups, would have been extremely difficult. Similarly, by working directly with non-utility parties, the Collaborative made it possible to develop DSM programs that will provide opportunities for participation by all customer classes and groups, and thereby address important equity concerns.

The basic idea behind the California Collaborative Process was to increase the involvement of non-utility parties in the utilities' DSM planning and implementation processes. In retrospect, this involvement will be crucial to the success of the utilities DSM programs for several reasons: First and most obviously, involving non-utility parties makes them participants to the decision making. It will be very difficult for these parties to criticize utility DSM policies and activities in the future, because they have now become partially responsible for them.

Second, and of equal importance, the Collaborative gave the utilities a new and better appreciation of the roles their customers and regulators must play if the utilities are to succeed in becoming energy service companies. By their very nature, DSM resources are diverse, diffuse, and decentralized; acquiring them requires the active participation of customers. The Collaborative gave all parties, especially the utilities, new insights into what customers expected from their utility, how the utility could fulfill these expectations, and what it could be worth in monetary terms to the utility.

The Collaborative demonstrated that significant input from and dialogue with non-utility parties was required in order to build consensus on DSM policies. Since the Collaborative, each of the utilities has established standing Policy Advisory Committees, composed of representatives from customer groups, regulatory staff, and energy experts, to provide a continuing source of recommendations on the policies for and the direction of customer energy efficiency programs. Where appropriate, the utilities have also established technical advisory groups for specific DSM programs.

4. THE BUSINESS OF DELIVERING ENERGY EFFICIENCY IN CALIFORNIA AFTER THE COLLABORATIVE PROCESS

The Collaborative made it clear to the utilities that Californians wanted them to become full-scale energy service providers. That is, Californians did not expect their utilities to provide energy conservation programs for only short-term economic or political reasons, but instead were willing to pay a reasonable price for sustained utility involvement in the acquisition of cost-effective demand-side resources. The Collaborative stressed that the utilities should view these changes as an increasingly important component of their business activities in California. Although it is too early to determine how exactly the energy service industry will evolve ultimately in California, PG&E and SCE have made it clear that they plan to remain at its center.

Due to recent changes in SCE's DSM policies, we believe PG&E's DSM activities provide a better guide to the future of California utility DSM activities. SCE has recently announced that it will drop its current proposal for financial incentives for DSM activities and, in its place, propose a shared-savings incentive that is similar to PG&E's. Accordingly, we will focus exclusively on PG&E's programs for the remainder of our discussions.

It is useful to distinguish three aspects of the transformation taking place at PG&E: The first concerns basic changes to the relationships between the utility, its customers, and the entire infrastructure of the markets that deliver energy services. These changes start with the re-organization of PG&E's business activities to promote energy efficiency as just one part of the total package of energy services offered by the company. We then link these organizational changes to the design, implementation, and, most important of all, magnitude of PG&E's DSM activities. We conclude by examining, in detail, three of PG&E's DSM programs to illustrate how they work to systematically address market and institutional barriers to customer energy efficiency.

The second aspect of the transformation concerns the new profit-making incentives developed through the Collaborative to provide the utilities with financial incentives for their DSM activities. It is quite clear that these financial incentives have been instrumental to PG&E's dramatically increased DSM activities. After describing the basic idea behind shared savings, we focus in detail on the design of the incentives. We conclude by presenting initial results on the profitability of PG&E's 1990 DSM activities.

The third, and perhaps most significant, aspect of the transformation at PG&E is the emerging role of DSM as part of PG&E's strategic business plan for the 1990s. PG&E has made a commitment to environmental quality and to being a leader in conducting business in an environmentally sound manner. The analysis leading to this position reveals clearly the importance of, and reliance the company is placing on, its DSM programs.

4.1 Organizing to Deliver Energy Efficiency

After the Collaborative, PG&E re-organized and consolidated the organization of its customer energy efficiency activities. A new department of energy efficiency services was created within the Distribution business unit (see Figure 5). The Energy Efficiency Services (EES) department, which reports to the Vice-President of Marketing and Customer Services, plans, designs, implements, and evaluates all of PG&E's DSM programs. Within the EES department, functional activities are organized by customer class or market sector (residential and nonresidential new construction, residential retrofit, and commercial/industrial/agricultural). In addition, EES has a separate planning and evaluation group which coordinates efforts of the three groups.

DSM program managers from Energy Efficiency Services work closely with PG&E field representatives located in PG&E's 25 division offices. These field representatives include customer service and energy efficiency specialists, large account representatives, and multiple account representatives - a workforce of almost 400 people that devote a significant portion of their time to delivering the company's DSM programs.

Finally, DSM planning and program results from the Energy Efficiency Services department are coordinated with PG&E's overall Resource Planning department in the Electric Supply business unit. Resource Planning has responsibility for assessment and integration of both supply- and demand-side planning options. PG&E also has a R&D department, located in the Electric Supply business unit, that conducts research and demonstration projects on promising demand-side and supply-side technologies.

The key features of the organization of PG&E's DSM activities include: 1. DSM programs are implemented by staff that often have broader customer service responsibilities; 2. while the utilities have large staffs available to acquire DSM resources in principle, in fact, because of its size, PG&E confronts significant internal organizational and logistical problems; and 3. irrespective of their internal staff resources, PG&E energy efficiency managers must also rely on third party energy service providers to deliver many aspects of their DSM programs.

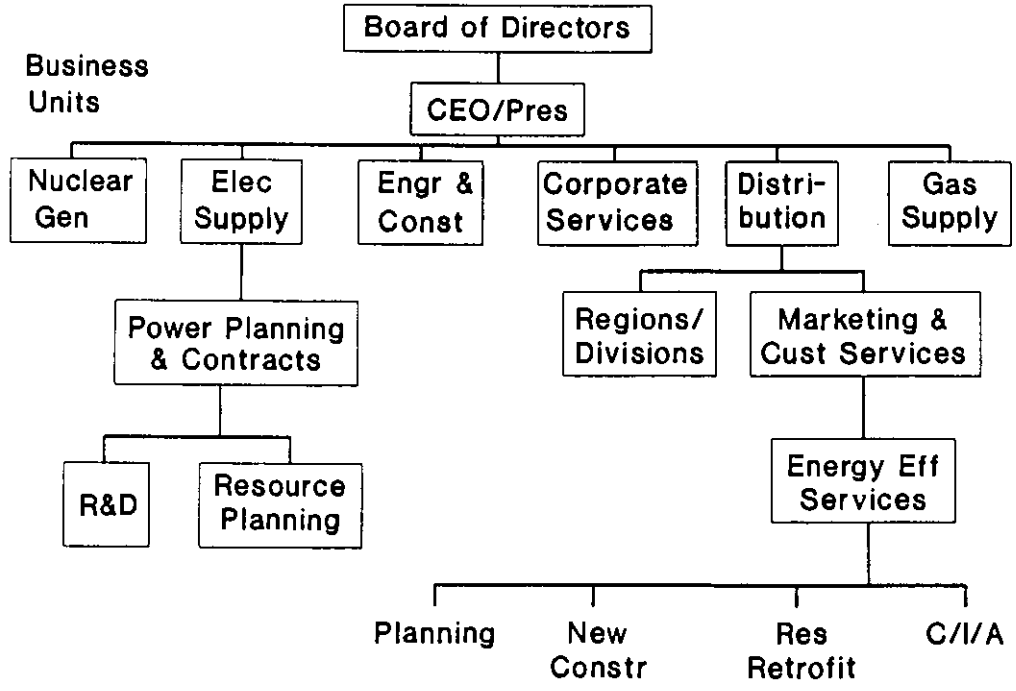
Consistent with the management practices of many U.S. utilities, PG&E employees earn a certain portion of their salary through bonuses, which are linked to their, and the company's, performance. PG&E's Performance Incentive Plan (PIP) covers all company employees, both management and salaried workers. The PIP gives staff opportunity to earn bonuses which range from about 5-15 % of their base salary based on the achievement of annual goals. The goals include overall corporate objectives as well as goals that are defined specifically for individual departments or field divisions. Roughly 50% of the PIP is linked to achievement of the corporate goal, which is typically defined in terms of a target earnings per share for shareholders. The corporate goal is thus related to overall company profitability.

In addition, about 50% of the Incentive Plan payments are linked to objectives which are important for the business unit (e.g., Distribution). For example, criteria for one of the regional

Divisions could include asset utilization targets, achievement of affirmative action objectives, health & safety goals, and now, after the Collaborative, achievement of customer energy efficiency (CEE) goals. Specifically, the goals agreed to by PG&E in the Collaborative, which include peak and energy savings as well as expected shareholder earnings if the programs are successfully implemented, have been included as one of the employee goals in the Performance Incentive Plan.

Inclusion of CEE goals as objectives for all affected employees and managers sends a strong signal that top management believes energy efficiency is a serious priority for the utility. During the heyday of the first generation of utility DSM programs in California, these type of employee and management incentive approaches proved quite successful, although they were much less sophisticated than the current PIP. We believe, in particular, that the idea of providing employee incentives is equally applicable to publicly-owned utilities.

Figure 5. Organization of the Pacific Gas and Electric Company



Source: Pacific Gas and Electric Company. 1991.

4.2 PG&E's DSM Programs

PG&E's demand-side management programs are grouped into seven major categories for reporting and analysis purposes (see Table 4). In 1990, PG&E's spent about $141 million on its electric and gas DSM program.[3] Conservation and Energy Efficiency (C/EE) programs targeted to both the residential and nonresidential sectors accounted for the largest share of total spending (47% and 22% respectively; see Figure 6).[4] Overall, PG&E estimates that its CEE programs will decrease peak demands by about 113 MW, while producing 393 GWh of savings in the first year. It is important to note that about 75-80% of the energy and peak demand savings come from the nonresidential sector programs, as shown in Figure 7. Among the nonresidential sector programs, the direct and customized rebate programs are the most significant.

About 13% of PG&E's 1990 DSM expenditures went toward load management, which includes both dispatchable and non-dispatchable programs. Dispatchable programs are regarded as short-lead time, reliable resources. An example is PG&E's non-firm rates which provide lower electricity rates to large nonresidential customers that agree to reduce their electric load to a predetermined level when requested by PG&E. PG&E estimates that it can reduce its peak load by 543 MW if necessary in the event of a potential or expected shortage of electricity. Non-dispatchable programs include optional time-of-use rates to residential, commercial, and agricultural customers[5] and a thermal energy storage program that provides incentives for installing an energy storage and control system to meet a building's cooling requirements.

After the Collaborative, PG&E increased its measurement and evaluation efforts significantly. This was a direct result of the agreements made in the Collaborative to make financial incentives to utility shareholders contingent on the utility's efforts to increase the reliability of its impact assessments of DSM programs. PG&E has also de-emphasized its load building and retention, and fuel substitution programs; they now account for only about 9% of total DSM expenditures.

PG&E has also significantly increased its R&D efforts for energy efficiency. In 1990, the Company started five new R&D projects to demonstrate and accelerate market penetration of new advanced energy efficient technologies (see Table 5). The Company spent about $1.4 million on these projects in 1990 and is planning to spend about $18-20 million in 1991 as the projects move from the planning/design phase to implementation. The goal of these R&D projects is to demonstrate advanced energy efficient technologies, which are not yet

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[3] PG&E spent $99.6 million on electric DSM and $41.7 million on gas DSM programs.

[4] These figures include both spent and committed funds. Committed funds represent contracts with customers that have signed commitments to improve energy efficiency but did not complete all their planned actions in 1990.

[5] PG&E has about 95,000 customers on these time-of-use meters, of which about 50,000 are residential customers.

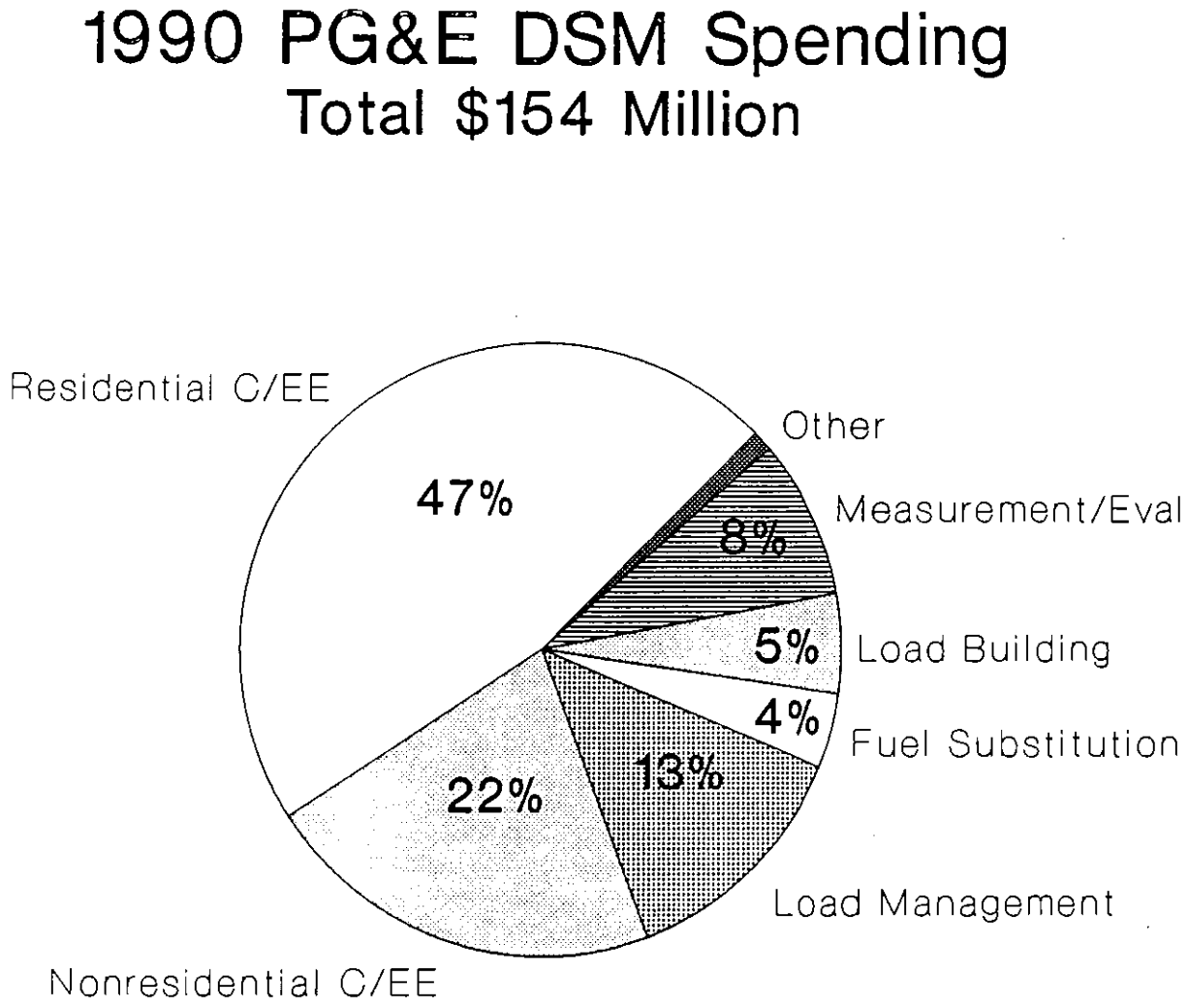
commercially available or widely accepted in the market.

Table 4. Overview of PG&E's DSM Activities

- Residential Programs
  - New Construction
  - Appliance Efficiency Incentives
  - Direct Assistance
  - Energy Management Services
  - Information Programs
- Commercial/Industrial/Agricultural (C/I/A) Programs
  - Commercial New Construction
  - Energy Efficiency Incentive Program (Direct & Customized Rebate)
  - C/I/A Energy Management Services
  - Information Programs
- Load Management
  - Residential Air Conditioner Cycling
  - Time of Use Rates
  - Non-firm Rates
  - Thermal Energy Storage
  - Group Load Curtailment
- Fuel Substitution
  - Nautral Gas Homes
- Load Retention/Load Building
  - Nonresidential Gas Load Retention
  - Nonresidential Electric Load Retention
  - Economic Development
- Measurement & Evaluation
- Demonstration Projects (see Table 5)
  - Advanced Customer Technology Test for Energy Efficiency (ACT2)
  - Pacific Energy Center
  - Super Efficiency Homes
  - Super Efficiency Refrigerators ("Golden Carrots")
  - Food & Agricultural Technology Projects

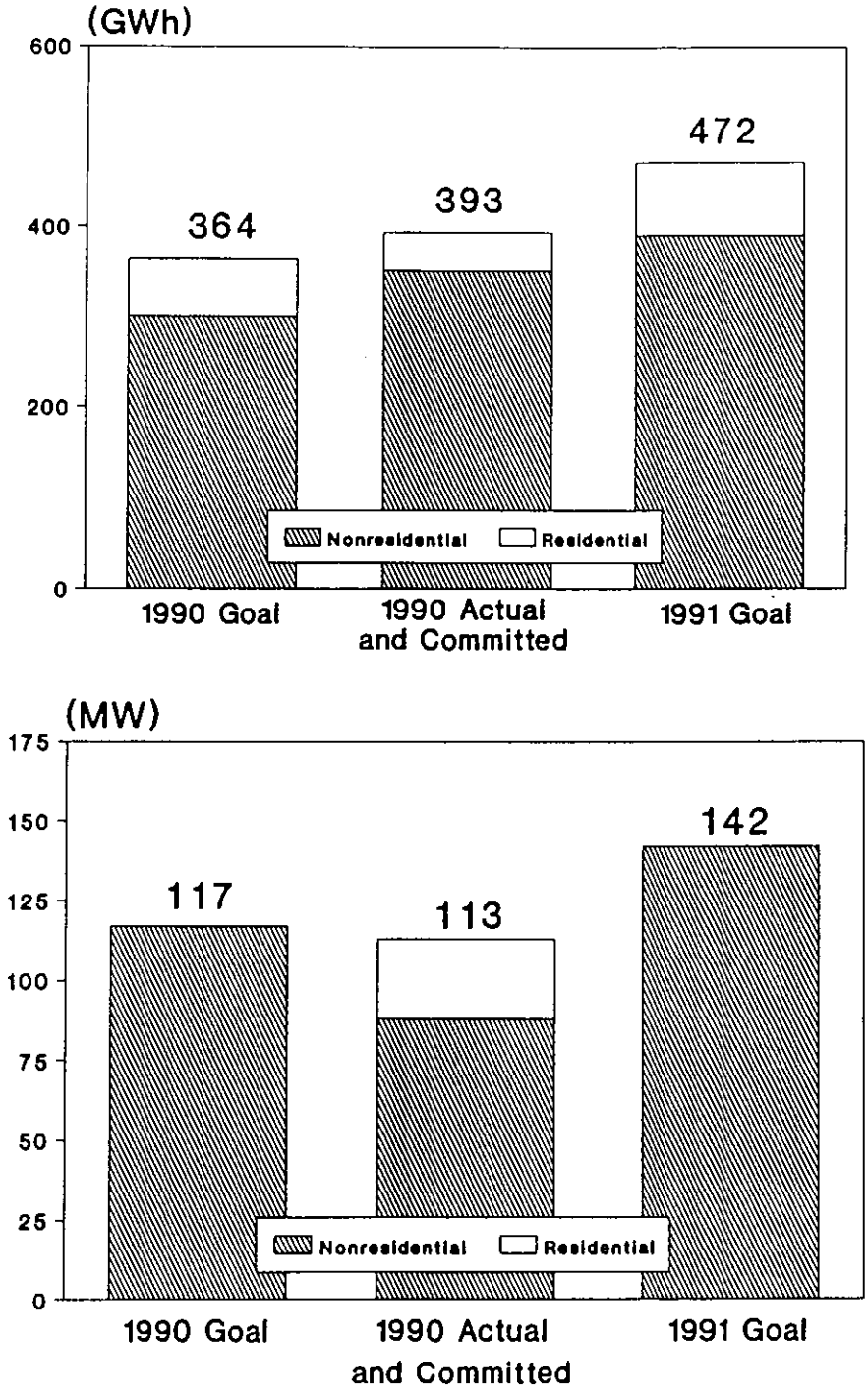
Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

Figure 6. 1990 PG&E DSM Spending



Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

Figure 7. PG&E Energy and Peak Demand Savings (1990 - 1991)



Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

Table 5. PG&E Customer Energy Efficiency Demonstration Projects

Project	Description
Advanced Customer Technology Test (ACT2)	The ACT2 project is testing the hypothesis that significant (potentially 50-75%) energy savings are possible, at or below projected competitive costs, by using modern high-efficiency end-use technologies in integrated packages acceptable to customers.
Pacific Energy Center	Acquaints architects, designers, and customers with the latest energy efficient technologies, designs and products
Super Efficient Homes	Showcases advanced energy efficient technologies in a limited number of new homes. Project is expected to stimulate demand for technologies that are currently marginally, cost-effective.
Super-Efficient Refrigerators ("Golden Carrot")	Encourage manufacturers to build super-efficient refrigerators by establishing consortium of utilities that will sponsor competitive procurement.
Food Service Technology Center	Unique concept in restaurant equipment research which integrates a high-tech laboratory with on-line production test kitchen; includes development of uniform test procedures.

Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

We turn now to a detailed examination of three PG&E's DSM programs: 1. expanded rebates for high efficiency refrigerators; 2. residential new construction programs for builders; and 3. commercial and industrial customized rebates. These programs illustrate how PG&E's demand-side planners estimate technical potentials for savings, analyze the market barriers preventing these savings from occurring naturally, and then overcome them through utility designed DSM programs. In addition, they also show how PG&E's programs utilize the existing energy service infrastructure or create it, when necessary, to delivery energy efficiency.

4.2.1 New Construction: "California Comfort Homes"

PG&E's Energy Efficient Homes Program, called California Comfort Homes, encourages builders to exceed State Building Energy Efficiency Standards by 10% or more. In designing the program, PG&E reviewed the CEC's standards for new residential construction and determined that a package of DSM options aimed at reducing cooling loads would be highly cost-effective from the utility's perspective. To achieve these reductions, the program encourages builders to install high-efficiency air conditioning (from SEER 8.9 to 12), high-performance glazing, increased ceiling (from R-30 to R-38), wall (from R-13 to R-19), and duct insulation, and the planting of deciduous trees.

In developing the program, PG&E's market research recognized that, in new construction, the most significant barrier to energy efficiency was the builder's incentive to minimize the first cost of construction, which is often in direct conflict with the eventual home-owners desire to have low energy bills. Thus, PG&E's program targets its incentives to the builders. The program takes advantage of existing energy performance standards for buildings by using the efficiency levels in the standard as the basis for setting incentive levels. The incentives for eligible measures typically cover about 50-70% of the incremental cost of installing measures that exceed those required to comply with the standards.

PG&E's goal in 1990 is to achieve 15% market penetration in the new residential construction market in their service territory (about 10,000 homes). PG&E projects that these homes will reduce their cooling loads by about 20% on average compared to the current building standards. In terms of program implementation, the California Comfort Homes relies mainly on PG&E division staff who are responsible for marketing the program to builders. PG&E has also found that several window manufacturers are also heavily involved in promoting the program because of the excellent sales opportunities it provides for their high-efficiency glazing products.

4.2.2. Appliance Efficiency Incentives: Refrigerators

Refrigerators have long been recognized as one of the largest consumers of electricity in the U.S. residential sector, often using about 1,000-2,000 kWh/year, or roughly 10-20% of average annual residential electricity use. However, market research of consumer decision-making on refrigerator purchases suggests that energy efficiency is not a dominant consideration; customers are mainly concerned with color, size, and other features. As a result, most utility rebate program employ a "market pull" strategy: provide incentives for customers to purchase refrigerators that exceed existing standards in order to overcome the higher initial cost of these products. PG&E currently offers rebates to customers of $50, $100, and $150 for refrigerators that exceed current DOE standards by 10%, 15%, and 20% respectively.

In 1990, PG&E expanded the design of the program in an effort to increase market penetration. PG&E created a salesperson/dealer incentive program to provide $10-15 per unit incentives for salespersons and $3-5 per unit incentive for the dealer. PG&E's market analysis had suggested that the replacement market for refrigerator purchases was influenced by not only consumer preferences, but also by dealer inventory practices and decisions, and by the actions of salesman; yet PG&E's existing rebate programs had only affected the customer. The sellers are typically the point-of-contact for consumer purchases and have a tremendous influence on consumer's choices; the incentive is designed to encourage salesperson to emphasize energy efficiency in their sales pitch. The dealer incentive encourages dealers to stock efficient refrigerators. Thus, in addition to the customer, PG&E has incorporated the existing appliance distribution infrastructure into its own network for the delivery of energy efficiency. The program is coordinated through the Electric and Gas Industries Association (EGIA); dealers, retail stores and contractors that are EGIA members participate in the incentive programs.[6] The program, itself, is administered centrally at PG&E corporate headquarters to ensure uniformity in program implementation.

PG&E has established an ambitious goal of 110,000 high-efficiency refrigerators for 1991, which is significantly above its 1990 results (about 74,000 refrigerators). PG&E estimates that the 1991 goal represents about 30-40% of the market in Northern California. PG&E also estimates that its 1990 program will save about 3.4 MW and 6,222 MWh annually. Looking to the future, PG&E plans to increase synergies between this and its other residential programs (e.g., appliance replacement was not emphasized in early utility-sponsored home energy audits), offer additional incentives for new higher efficiency technologies, and develop a program that addresses concerns over the disposal or recycling of old appliances containing CFCs.

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[6] PG&E also played an instrumental role in the creation of EGIA in the late 1970s. PG&E recognized that a viable and well-organized trade ally network was an essential ingredient to the successful implementation of customer rebate programs.

4.2.3. Energy Efficiency Incentives for Commercial, Industrial, and Agricultural Customers

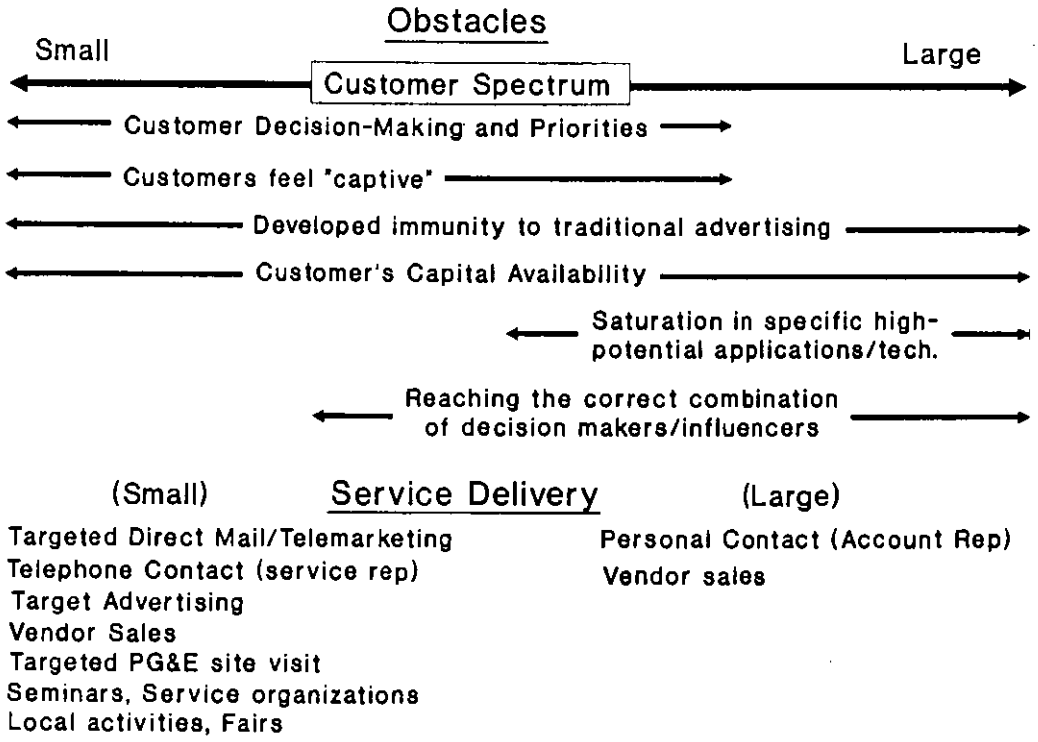
Commercial, industrial, and agricultural (C/I/A) customers present a tremendous opportunity and challenge for California utilities. Virtually all studies of the technical and market potential for DSM suggest that roughly two-thirds of the potential resides in this sector and that it is highly cost-effective (i.e., less than 3 cents/kWh). PG&E estimates that the technical potential in its C/I/A sector is over 4,000 MW. Despite this large potential resource, acquiring these resources presents many challenges for PG&E due to the diversity of this sector. There is tremendous diversity in the building stock, its energy-using characteristics, and services for which energy is required, as well as large differences in the institutional and decision-making environment.

PG&E's market research has identified multiple obstacles for energy efficiency investments in the C/I/A sector. Figure 8 summarizes these obstacles for small and large businesses in the commercial market sector. For example, in the small commercial market, the major barriers to energy efficiency measures are lack of capital, pressing "business" priorities, which often do not include energy issues, and lack of sophistication in investment and O&M practices. In contrast, owners of large commercial buildings are more likely to have trained energy managers on-site and a somewhat higher saturation of high-efficiency options for certain end uses. Yet, these customers use high internal rates of return in evaluating energy efficiency investments. Thus, energy efficiency measures must have short payback times. In addition, large commercial and industrial customers are not "captive" to the electric utility. Self-generation and cogeneration are viable options, which give these customers the option of leaving the utility system. This threat means that the utility must pay special attention to the needs of these customers. It partially explains, for example, why PG&E's customer service department dedicates company representatives to handle individual large accounts.

Figure 9 illustrates PG&E's market analysis of the commercial sector and the utility's response in terms of service delivery mechanisms. For small commercial customers, there is often a single decision-maker who decides on energy-efficiency investments. However, because there are over 120,000 of these customers, it is not feasible or economic for PG&E to have on-going, sustained contacts with these customers. Instead, these customers are contacted by local representatives on an as-needed basis (e.g., a complaint regarding high utility bills may lead to an energy audit).

Multiple account representatives are assigned to handle energy services for large chain stores (e.g., grocery stores, department stores). In addition, a local PG&E customer service representative will usually be assigned to handle large government facilities, large office buildings, refrigerated warehouses, and schools. A major obstacle to energy efficiency among these larger customers is that energy-efficiency investments typically require approval by multiple decision-makers in these facilities. In the case of a large chain of stores, the multiple account representative works directly with the central office of the chain, rather than the individual branches of the chain because energy efficiency decisions are made through the central office. In the case of individual large facilities, local representatives provide an on-going point of contact for these large customers.

Figure 8. PG&E Commercial Sector Market Analysis



Source: Pacific Gas & Electric Company, Energy Efficiency Services, "Commercial, Industrial, and Agricultural Retrofit Markets," presentation to the Policy Advisory Group, December 20, 1990.

Figure 9. PG&E Commercial Sector Delivery Mechanisms

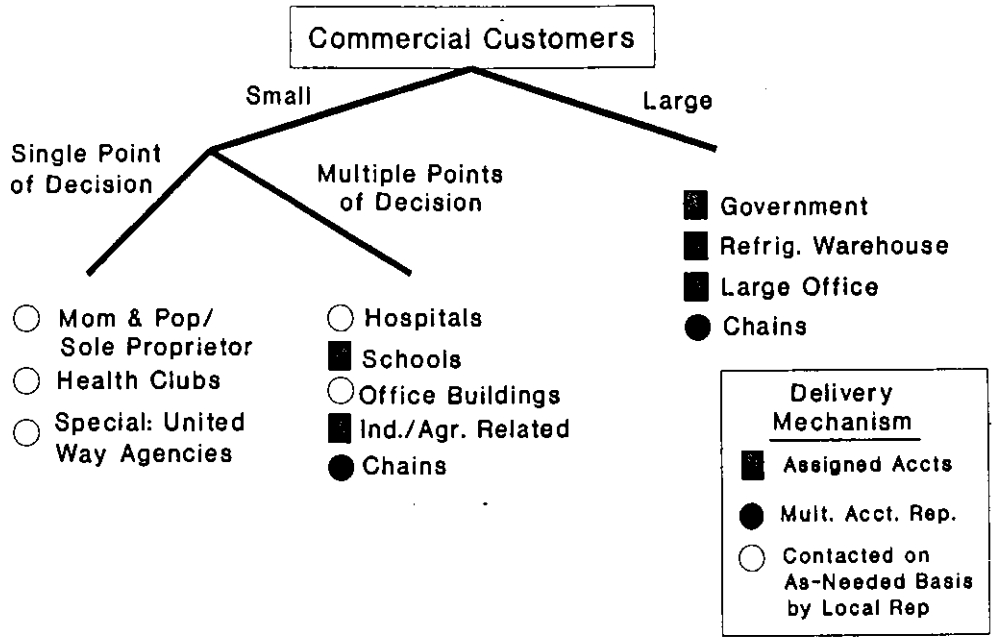
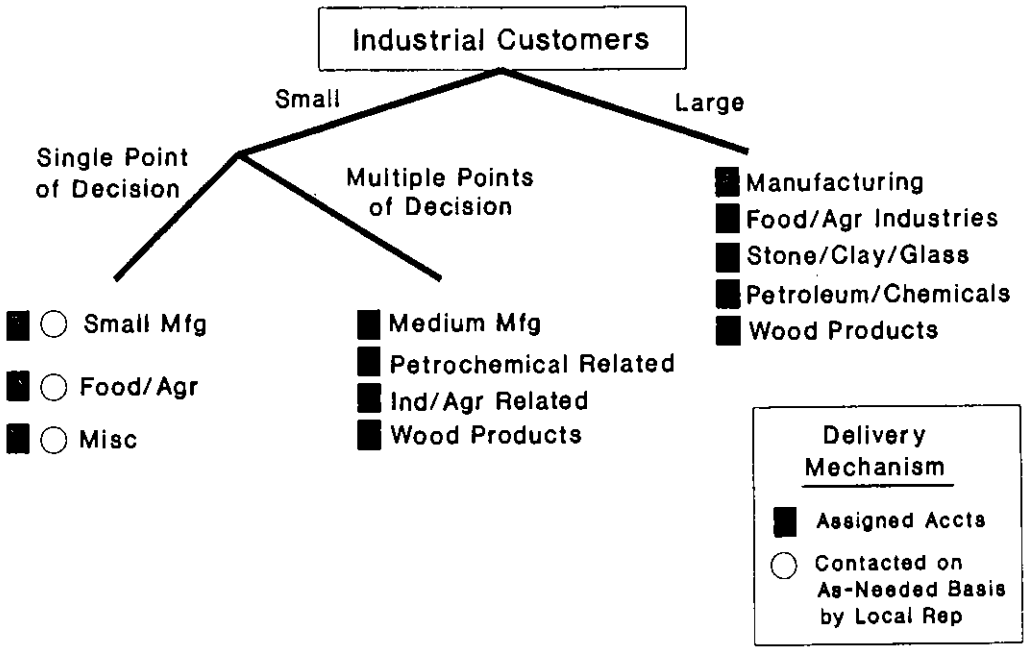


Figure 10. PG&E Industrial Sector Delivery Mechanisms



Source: Pacific Gas & Electric Company, Energy Efficiency Services, "Commercial, Industrial, and Agricultural Retrofit Markets," presentation to the Policy Advisory Group, December 20, 1990.

In the industrial sector, PG&E customer service representatives are often assigned to a particular industry group: manufacturing, petroleum/chemicals, food/agricultural industries, and wood products (see Figure 10). This reflects the technical complexity of the energy-using industrial processes and the need for specialized expertise to handle these type of facilities. However, in most cases, industrial customers have a good understanding of the ways in which energy is used in their processes and because of proprietary and competitive concerns are often reluctant to let the utility proscribe or suggest energy-efficiency investments. They much prefer to suggest projects that are developed internally by their own process engineers or consultants. For this reason, it is difficult to design a single, standardized program that will meet the needs of all large industrial customers.

Given the diversity among C/I/A customers and their varying needs, PG&E provides a wide range of information and evaluation services in addition to financial incentives. Energy Management services include "walk-through" energy audits, special consultant studies with written recommendations for energy efficiency investments, and informational seminars. Along with information on energy efficiency options, PG&E auditors provide details on the company's customer financial incentive programs.

PG&E offers two types of programs to C/I/A customers that want to retrofit with energy-efficient equipment: a direct rebate program and a customized rebate program. The Direct Rebate program provides a fixed rebate for the purchase of over 40 specific electric energy-saving items. Table 6 lists the items for which PG&E customers could receive rebates in 1990, including the amount of the rebate, the estimated annual savings and lifetime of the measure (which is used in calculating shareholder financial incentives). The Direct Rebate program is targeted to smaller C/I/A customers and is designed to be "easy" to participate in and administer.

The Customized Rebate program also offers financial incentives for customers that undertake large or more complex projects. The underlying approach in this program is "flexibility" in the sense that it is designed to rely on the customers to bring forward their own energy savings projects. In designing this program, PG&E recognized that: 1. PG&E auditors would not always be able to identify all cost-effective measures in complex energy using systems such as large commercial buildings and industrial operations; 2. a large commercial and industrial customer's in-house technical staff often has inherent advantages in identifying these opportunities; and 3. a capital budget constraint, which prevents many of these customers from taking advantage of these savings opportunities on their own, is the principal barrier to these investments.

Large customers submit proposals for various energy efficiency improvements directly to PG&E. PG&E evaluates the application, which must include documentation on the savings calculation, and, if approved, the customer becomes eligible to receive an incentive payment from the utility. In 1990, the rebate in this program was $0.06/kWh of the first-year savings, up to 50% of the cost of the project. The maximum rebate amount was set at $300,000 per account.

The program has been extremely successful in terms of market penetration, and projected cost-effectiveness and energy savings. In 1990, PG&E estimates that the customized rebate program reduced summer peak demand by 14 MW and saved over 82,000 MWh in electric energy annually. PG&E's 1991 goals are 63 MW of peak demand savings and 165,000 MWh of energy savings. The program is administered by customer service representatives operating locally at PG&E service divisions. The idea is to allow customers to work with a familiar and on-going contact person from the utility.

Table 6. PG&E Direct Rebate List

1990 Direct Rebate Product List

	Rebate	Annual Savings	Lifecycle (Years)
Lighting			
Compact Fluorescent Lamps	$5/Lamp	228 kWh	10
Energy Saving Fluor. Lamps			
4 ft. Lamps	$1.00/Lamp	24 kWh	5
8 ft. Lamps	$2.00/Lamp	60 kWh	5
High Intensity Discharge Fixtures	$80/Fixture	1,600 kWh	20
Incandescent to Fluorescent Fixture Conversion	$20/Fixture	660 kWh	20
Fluorescent Current Limiters	$5 Each	53 kWh	10
Optical Reflectors			
4 ft. Fixtures	$5/Lamp Removed	192 kWh	20
8 ft. Fixtures	$8/Lamp Removed	368 kWh	20
Electronic Ballasts	$10/Ballast	80 kWh	20
Space Conditioning			
Reflective Window Film	$1.00/sq. ft.	4.4 kWh	8
Solar Shade Screen	$1.00/sq. ft.	4.6 kWh	5
Evaporative Cooler	$200 Each	7,879 kWh	12
Condenser Pre-Cooler	$100 Each	1,300 kWh	10
Cleaning Condenser Coil	$20/Condenser	1,125 kWh	1
Ceiling Insulation	$0.15/sq. ft.	0.12 kWh	20
Controls			
Time Clock	$40 Each	365 kWh	8
Time Clock with Battery Backup	$80 Each	368 kWh	8
Setback/Programmable Thermostat	$60 Each	184 Th	10
Bypass/Delay Timer	$10 Each	125 kWh	8
Motion Detector	$15 Each	312 kWh	10
Photocell	$10/cell	194 kWh	8
Refrigeration			
Strip Curtains/Strip Doors	$1.50/sq. ft.	120 kWh	3
Glass/Acrylic Doors	$20/Linear ft.	960 kWh	9
Refrigeration Door Gaskets	$1.00/Linear ft.	13 kWh	3
Cleaning Condenser Coil	$20/Condenser	1,125 kWh	1
Compact Refrigerator	$25/unit	63 kWh	25
Energy Efficient Motors: Category Limit — $2,000			
1/2-3/4 HP	$30 Each	268 kWh	17
1-3 HP	$40 Each	760 kWh	17
5-7.5 HP	$50 Each	1,118 kWh	17
10-200 HP	$7.50/HP	120 kWh/HP	13

Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

Table 6. PG&E Direct Rebate List, continued

1990 Direct Rebate Product List (continued)

	Rebate	Annual Savings	Lifecycle (Years)
Controls: Category Limit — $1,500			
Time Clock	$40/clock	2,064 kWh	5
Time Clock w/Battery Backup	$80/clock	8,255 kWh	5
Automatic Restarts	$100/item	6,600 kWh	13
Energy Efficient Motors: Category Limit — $5,000			
1/2 - 3/4 HP	$30/motor	268 kWh	17
1 - 3 HP	$40/motor	760 kWh	17
5 - 7.5 HP	$50/motor	1,118 kWh	17
10 - 300 HP	$7.60/HP	120 kWh	13
Heat Recovery & Hot Water: Category Limit — $3,000			
Heat Recovery for			
Boilers/Water Heaters	$2/1,000 Btu input	2,000 th	10
Refrigeration Systems	$150/compressor HP	500 th	10
Well Water Plate Coolers	$180/item	8,600 kWh	7
Agricultural Items: Category Limit — $2,000			
Pump Adjustments (Spring Tune-up)	$75/tune-up	8,900 kWh	3
Water Meters	$150/meter	8,000 kWh	10
Low Pressure Sprinkler Nozzles	$.85/nozzle	27 kWh	15
Low Pressure Sprinkler Heads	$3.75/head	13 kWh	8
Plastic Gated Pipe	$.50/foot	10 kWh	2

Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

4.3 Earning a Profit from Customer Energy Efficiency

Following the Collaborative, a variety of methods were proposed to make customer energy efficiency as, or even more, profitable than supply side activities. The most promising of these financial incentives was proposed by PG&E and is called shared savings.

Shared-savings incentives are promising because they can, in principle, reward the utility for the successful acquisition of cost-effective energy efficiency resources, not merely the expenditure of ratepayer monies. That is, other types of incentives (e.g., higher rate-of-return and bonus-type incentives) can certainly encourage utility efforts to promote energy efficiency, but these types of incentives are not necessarily related to the net benefits of the customer energy efficiency resource as an alternative to supply-side options.

The shared-savings incentive, by contrast, is directly tied to the size of this net benefit or "net resource value." When viewed as a resource, the value of an energy efficiency investment is the product of several components:

$$NRV = (LR \cdot AC) - C$$

where,

NRV = Net Resource Value ($)
LR = Load Reduction (kW or kWh)
AC = Avoided Cost ($/kW of $/kWh)
C = Cost of the Energy Efficiency Investment ($)

Net resource value is positive when an energy efficiency investment costs less than the supply-side resources it allows the utility to avoid. Under shared-savings, this net benefit is "shared" between ratepayers and the company according to a pre-determined percentage. For PG&E, this share is 15%. As a result, the incentives to the utility to help its customers save energy have been harmonized with society's desire for a least-cost energy system.

In the California Collaborative, discussions centered on how the load reductions should be measured, how program costs should be defined, and how the avoided cost benefits and the recovery of PG&E's share should be determined. Resolution of these issues led to the development of additional incentives to pursue the acquisition of energy efficiency resources aggressively and at the same time minimize program costs. An important final discussion addressed the criteria for DSM programs to be eligible for shared-savings incentives.

Measuring energy savings is an imperfect science. In principle, it should be performed after a demand-side program has been put in place and observed for some time. A particularly difficult measurement issue lies in properly accounting for effects that are not within the control of the utility but which affect energy savings (such as weather or occupant behavior). The Collaborative recommended that PG&E rely on pre-specified engineering estimates of savings for individual measures, but determine aggregate savings on the actual numbers of installations

made by the utility. This decision will protect PG&E from uncertainties in the performance of individual measures while providing an incentive to increase program participation. PG&E and the other utilities also agreed to initiate comprehensive measurement programs to improve future estimates of the performance of energy efficiency measures. However, these findings will only serve to modify savings estimates for future programs.

In a shared-savings arrangement, demand-side program costs can be based on utility costs, alone, or total costs to the utility and the participating customer. PG&E decided to base its incentive on only its DSM program costs (including any incentives paid to the participating customer) because they would be easier to measure and also provide a direct incentive to PG&E to minimize its administrative costs. However, the use of total costs is theoretically superior from the standpoint of cost-effectiveness to society. Thus, prior to implementation, PG&E is required to demonstrate that its programs will pass the total resource cost test (which relies on both PG&E's and the customer's costs). PG&E's costs, themselves, are first subject to caps that limit the maximum per unit costs for selected program elements (such as the cost of the energy conservation equipment). Note, finally, that use of PG&E program costs (as opposed to also including participating customer costs) will tend to increase the size of the net resource value and hence the size of PG&E's earnings from its programs.

Avoided costs include the long- and short-run generation and, in some cases, the transmission and distribution costs that DSM allows the utility to forego.[7] However, as with conservation program performance, they are subject to a large number of influences, only some of which are under the control of the utility. Furthermore, recovering the avoided cost benefits of demand-side programs over a time period that closely parallels the realization of savings, would have meant that PG&E would have to wait a considerable period of time before recovering all of its return. The Collaborative agreed to allow PG&E to recover the entire avoided cost benefits of a single year's program over an accelerated time period (3 years). This procedure, in turn, calls for a forecast of future avoided costs, which, for the generation component of avoided costs, will be determined in a separate, on-going regulatory proceeding to determine payments to non-utility electricity producers.

The participants in the Collaborative were concerned that, despite the incentives, PG&E would remain un-enthusiastic in its pursuit of customer energy efficiency in some sectors. Recall that in the years immediately preceding the Collaborative, PG&E actually returned authorized conservation program monies to ratepayers, rather than spend them on its programs. To address this concern, minimum performance thresholds were specified individually for each of PG&E programs. Failure to meet these goals, which are negotiated jointly by PG&E and the CPUC, can result in reduced earnings, or even penalties. The thresholds are based on customer participation goals, such as number of measures to be installed, homes to be weatherized, or audits to be completed, depending on the program (see Table 7).

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[7] In New York, at least one utility has proposed the inclusion of an environmental "adder" in the calculation of the avoided cost benefit of its DSM programs.

Table 7. Minimum Performance Standards for PG&E 1991 DSM Programs

1991 Programs	Minimum Performance Standard for Incentive Payments
Com., Ind., Agr. Energy Management Incentives	75%
Com. New Construction	25%
Res. New Construction	30%
Res. Appliance Efficiency	75%
Com., Ind., Agr. Energy Management Services	70% 75% for commercial
Res. Energy Management Services	80%
Super Efficient Homes	70%
Direct Assistance	70%

Source: California Public Utilities Commission. 1990. Decision 90-08-068, Appendix B.

Table 8. Incentives Available for PG&E DSM Programs

Program Category	Examples	Incentive Treatment
Resource	Residential, Commercial, Industrial and Agricultural Rebates; and Residential and Commercial New Construction	Shared Savings
Equity/ Service	Direct Assistance; Residential, Commercial, Industrial and Agricultural Audits; and Super Efficient Homes Pilot Program	Perform-ance-Based Earnings Adder
Other	Innovative Rate Design, Measurement and Evaluation; and General Administration	No Incentives

Source: California Collaborative. 1990. "An Energy Efficiency Blueprint for California."

Finally, the shared-savings formula indicates clearly when shared-savings incentives are not appropriate for utility demand-side programs. For example, when maximizing net resource value is not a primary objective of a DSM program (which is often the case for low-income assistance programs), there may be no benefits to share. In addition, there are many demand-side activities whose net resource value may be difficult to measure (such as information, rate design, and measurement and evaluation programs). For these reasons, PG&E's use of shared-savings incentives is limited to customer energy efficiency programs with measurable net resource benefits. Practically speaking, this requirement limits shared-savings incentives to utility programs that improve customer energy efficiency through the adoption of specific technologies or practices (such as rebates for lighting, HVAC, and other equipment).

For PG&E's other customer energy efficiency activities, which are not eligible for shared-savings incentives, a much simpler incentive based on program costs and participation goals is used (see Table 8). For these other programs, PG&E earns an incentive that is set at 5% of total expenditures or, for several programs, no incentive at all. In point of fact, PG&E's shared-saving incentive is but one component of PG&E's overall customer energy efficiency activities. That is, PG&E cannot ignore less lucrative customer energy efficiency activities and concentrate solely on those eligible for shared savings. It can, however, increase expenditures for programs that are eligible for shared-savings incentives by up to 30%, so long as it maintains its commitment to the other program areas.

Table 9 presents preliminary results from PG&E's 1990 customer energy efficiency activities. The first column reports results for just those programs eligible for shared-savings incentives. PG&E expects these programs will save $115.4 million in avoided supply costs, while costing PG&E $20.6 million and the participating customers $17.9 million. The net benefit is $94.8 million ($115.4 -$20.6) and PG&E's 15% share of this benefit will be $14.2 million or a 69% return on its program spending. From a societal perspective, it is also important to note that the effect of PG&E's incentive has been to increase the total cost of the customer energy efficiency programs by 37%.

As previously described, it is more appropriate to view PG&E's shared-savings program as part of the company's overall customer energy efficiency activities. Looking at the second column, PG&E spent $141 million on all its customer energy efficiency programs, but earns a very modest $1.8 million on the non-shared-savings activities. Therefore, the total return from PG&E's customer energy efficiency programs is $15.8 million or 11% of its total spending.

Shared-savings incentives represent a major departure from the traditional means of determining utility earnings and may be a forerunner of even more far-reaching utility incentives to stimulate other types of non-traditional utility activities.

Table 9. Financial Results from PG&E 1990 DSM Programs (millions of 1990$)

	Shared Savings	Total DSM Program
Avoided Utility Supply Costs	115.4	
Utility DSM Program Expenditures	20.6	141.0
Estimated Customer Contribution	17.9	
Net Resource Value	94.8	
Shared Savings Incentive	14.2	14.2
Other Incentives		1.6
Total Incentive	14.2	15.8
Total Incentive as a Percent of DSM Program Expenditures	69%	11%
Total Incentive as a Percent of Utility Program Cost and Customer Contribution	37%	

Source: Pacific Gas & Electric Company. 1991. "Annual Summary Report on Demand-side Management Programs in 1990 and 1991."

4.4 The Emerging Role of Energy Efficiency in PG&E's Utility Business

In the fall of 1990, PG&E announced plans to meet the bulk of its expected load growth in the 1990s with DSM resources (1800 MW of customer energy efficiency and 700 MW of load management out of 3400 MW of needed capacity). While the organizational and financial changes described in the previous two sections provide important necessary conditions for explaining this dramatic announcement, these conditions are insufficient by themselves. In this section, we attempt to locate PG&E's customer energy efficiency activities into the larger scheme of PG&E's strategic business plan for the 1990s. By understanding the overall direction of PG&E's business plans, it will become evident that the company's commitment to customer energy efficiency appears not to be transitory, but rather represents a central element of the company's plans for the 1990s.

PG&E's business plan is based on the following assessment of its current position: First, the costs of producing electricity will remain high due to the high fixed prices it must pay non-utility generators under existing contracts, the capital recovery of its nuclear capacity, and expectations for real price increases in the costs of fossil fuels (primarily, natural gas). Second, while there is sufficient capacity for the early 1990s, new capacity will be required by the mid-1990s. Third, the generation part of the utility business is under-going a basic re-structuring that will require the company to become more competitive in the future. Fourth, environmental concerns have increased significantly and can be expected to increase further in the future. Fifth, and most important of all, PG&E is committed to the energy business of northern California; the company cannot simply leave and relocate if business conditions turn bad.

In assessing its options for the future, PG&E has developed the following assumptions: The economies of scale in existing generating technologies are diminishing. New advanced supply technologies, which promise to be both more efficient and environmentally benign will not be ready for commercialization until the next decade. As a result, PG&E wants to avoid adding new generation until clean, cost-effective, high-efficiency gas and renewable technologies can be developed and commercialized.

At the same time, PG&E recognizes that there are currently available many end-use technologies in lighting, glazing, HVAC, motors, among others, that offer tremendous potential for improving customer energy efficiency. More importantly, the Collaborative process made it clear to the company that, in the future, it must take a much broader approach toward involving the community in its business planning.

These assessments have led PG&E to develop a "bridging strategy" for the 1990s. There are two elements to this strategy: First, the company plans to maximize reliance on customer energy efficiency. Second, the company plans to develop environmentally preferred, cost-effective high-efficiency gas and renewable supply options so that they can be commercially available in the next decade.

In summary, PG&E has recognized that, as a large and highly visible member of the California business community, an aggressive stand on environmental issues is a business necessity. Californians demand a high quality of living, which is reflected by increased emphasis on environmental quality. Moreover, they have also made it clear that they are willing to pay for it. In response, they have developed a supply bridging strategy for the 1990s that relies heavily on customer energy efficiency to meet the majority of expected resource needs. Thus, PG&E's energy efficiency programs are but one part of a comprehensive business plan, which has now been made all the more compelling because incentives are available to make these programs profitable to the utility.

From PG&E's standpoint, the time appears ripe for the energy service corporation of the future.