Central Maine Power

Pilot Efficiency Buy-Back Program

Profile #60

Executive Summary

Central Maine Power's Pilot Efficiency Buy-Back program (EBB) was implemented in the spring of 1987. CMP hoped to quickly achieve large energy savings by targeting its major commercial and industrial customers. Interested customers submitted proposals for improving the electric efficiency of their facilities. There were no requirements as to the types of measures installed. Savings requirements were very high. Proposed projects had to save a minimum of 500,000 kWh per year and shift (or reduce) winter on-peak demand by 500 kW. Qualifying projects received funding from CMP which could reach a maximum of half the project cost.

A total of ten projects qualified for the program. To date, eight projects have been completed, one participant went out of business, and one project is still underway. Three projects were completed in 1989, two projects were completed in 1990, and three projects were completed in 1991. The program formally ended in March 1992. The EBB program was terminated because CMP believed that the services offered by the program could be provided through a combination of the Power Partners program and a revised Retrofit Rebate program.

Participants with completed projects are Bates College; Data General computer components company; Boise Cascade pulp and paper company; Statler Tissue Company; Sugarloaf ski area; Champion Paper; and Sunday River ski area. The ongoing project is a Veterans Administration Hospital.

Measures installed through the program included compact fluorescent lamps, variable frequency drives, high intensity discharge lamps, refiner replacements, central controls for heating and cooling, cogeneration, compressors, ground wood storage tanks, snow gun nozzles, energy control systems, and energy monitors.

Annual energy savings for the program total 33,162 MWh, and winter peak demand savings for the program total 4,849 kW. Energy savings per participant average 4,145 MWh.

CMP program costs total $5,630,600 for 1988 through 1992. Customer incentives made up 90% of the total program cost. The utility paid an average of $703,825 per participant and program participants paid an average of $614,441 each. The Results Center calculated an average cost of saved energy for the program from 1988 through 1992 at a 5% discount rate of 1.64¢/kWh.

Pilot Efficiency Buy-Back Program

Utility:	Central Maine Power
Sector:	Commercial and industrial retrofits
Measures:	CFLs, variable frequency drives, HIDs, refiner replacements, central controls for heating and cooling, cogeneration, compressors, snow gun nozzles, energy control systems, and energy monitors
Mechanism:	CMP offered funding up to half of the project cost for qualifying energy-efficiency improvements
History:	Started in spring 1987, ended March 1992

1991 Program Data

Energy savings:	17.9 GWh
Lifecycle energy savings:	269.7 GWh
Peak demand savings:	3.2 MW
Cost:	$274,900

Cumulative Data (1988 - 1992)

Energy savings:	96.4 GWh
Lifecycle energy savings:	497.4 GWh
Peak demand Savings:	11.9 MW
Cost:	$5,630,600

Conventions

For the entire 1993 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the International Monetary Fund's International Financial Statistics Yearbook: 1991.

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

Central Maine Power Company (CMP) is an investor owned utility located in Augusta, Maine. CMP began in 1899 as a water powered, village lighting company with a total capacity of 22.5 kW, enough to power only 10 homes by today's standards! Today CMP has close to 500,000 customers within an 11,000 square mile service area. CMP's service area contains more than 100 cities and towns, the majority of which have populations of less than 10,000. Maine is a largely rural state, with 90% of the state forested.[R#1]

There are many large industries located in the CMP service area, with pulp-and-paper industry customers purchasing more than 2,400 GWh in 1992. Other industries include shipbuilding, chemicals and allied products, electrical and electronic machinery, textile mills, lumber and wood products, food products, and leather products. There are also several colleges and universities in CMP's service area.[R#1]

The biggest challenge facing CMP in 1992 was the persistent weakness in the Maine economy, as the effects of the recession that first hit New England in late 1989 continued to linger. Energy sales increased by only 0.8% for the year. In 1991 CMP's sales actually decreased slightly for the first time since 1949.[R#1]

At the end of 1992, CMP had 2,376 employees. One way that CMP has battled the recession is a 10% workforce reduction since 1991, which happened through attrition, early retirement, and outright layoffs. In 1991 more than 200 employees accepted the company's early retirement offer.[R#1]

In 1992 CMP's energy sales totaled 9,182 GWh. The industrial sector accounted for 3,672 GWh (40%) of sales, the commercial sector purchased 2,366 GWh (26%) of energy, the residential sector had energy sales of 2,990 GWh (33%), and wholesale and lighting sales totaled 154 GWh (1%). Large pulp-and-paper industry customers accounted for 66% of energy sales in the industrial sector and approximately 27% of all energy sales. Residential sales increased for the first time since 1989, and on average each residential customer used 6,692 kWh. CMP service area revenues totaled $752 million for the year.[R#1]

CMP 1992 STATISTICS

Number of Customers	496,669
Energy Sales	9,182 GWh
Energy Sales Revenues	$752.49 million
System Peak Demand	1,400 MW
Generating Capacity	1,855 MW
Reserve Margin	33 %
Average Electric Rates	
Residential	10.41 ¢/kWh
Commercial	8.47 ¢/kWh
Industrial	6.12 ¢/kWh

CMP had 496,669 customers in 1992, with 446,696 customers in the residential sector. Commercial and industrial customers totaled 49,529. CMP also had 3 electric utility customers, and 441 lighting customers.[R#1]

CMP had a generating capacity of 1,855 MW in 1992, and the system peak demand was 1,400 MW, creating a reserve margin of 33%.[R#1]

In terms of fuel mix, purchases from non-utility generators account for 38% of energy generation, nuclear fuel accounts for 26%, oil accounts for 19%, hydro accounts for 15%, and Canadian purchased power accounts for 2% of energy generation.[R#1] ■

Utility DSM Overview

In 1992, CMP spent $16.1 million or 2% of total energy revenues on DSM programs. The State of Maine has a progressive energy policy that requires reduction in oil-fired power generation and increased diversity of energy resources, including enhanced development of renewable resources and the prioritization of conservation as a resource. CMP has been supporting the State's policies through its diverse and comprehensive DSM programs, many of which have been active for five years or more.

Like many utilities, CMP first entered DSM with a load management program. Kilowatt Savings Time was introduced in 1975 to help minimize peak demand by asking all customers to avoid using non-essential electrical equipment during occasionally declared periods. Since then, CMP's programs have become more focused on efficiency. Significant energy savings are realized through the residential Bundle-up Program, a water heater efficiency improvement program that includes a water heater wrap, pipe insulation, sediment removal, thermostat adjustment, and flow restrictor installation for a nominal fee. This program has accumulated over 36,000 MWh in annual energy savings and 5.8 MW in annual capacity savings since its introduction in 1984.

Other residential programs include a free energy audit program, and the Residential Lighting Efficiency program had 171,275 installations in 1992 (see Results Center Profile #19). CMP's weatherization and insulation services program was suspended, as it was believed to be less cost-effective than a similar program being implemented through the Power Partners program.[R#5]

CMP DSM PROGRAMS

- A) Residential
  - Energy Audits
  - Bundle-Up
  - Energy Efficient New Home Design
  - Operation Lightswitch
- B) Commercial/Industrial
  - Bundle-Up
  - Energy Audits
  - Loan Program
  - Retrofit and New Construction Programs
    - Motor Rebates
    - Lighting Rebates
    - Custom Rebates
  - **Efficiency Buy-Back**
  - Design Assistance
- C) Other
  - Power Partners

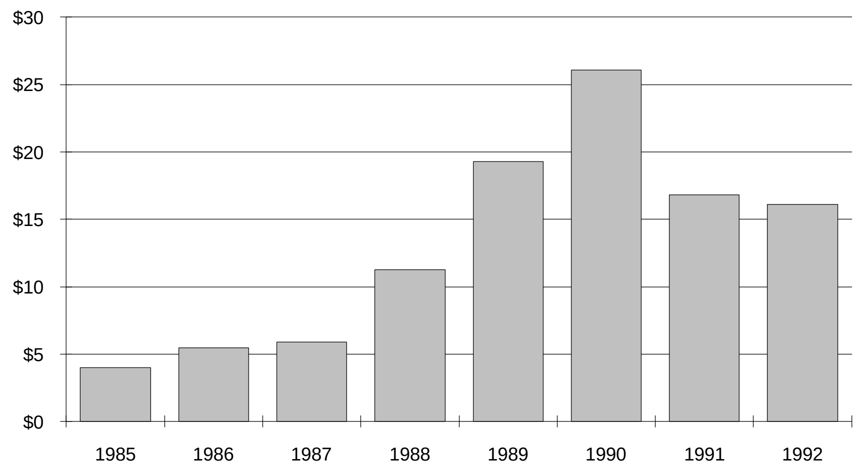
DSM Overview Table	*Annual DSM Expenditure (x1000)*	*Annual Energy Savings (GWh)*	*Winter Peak Capacity Savings (MW)*
1985	$4,000	12	6
1986	$5,500	10	1
1987	$5,900	23	4
1988	$11,300	32	6
1989	$19,300	69	12
1990	$26,100	107	20
1991	$16,800	91	17
1992	$16,100	62	14
Total	$105,000	406	80

The Power Partners program represents a strong commitment by CMP to treat conservation on the same ground as supply-side resources. Through a competitive bidding process, energy service companies can propose energy saving projects which are then compared side-by-side with other conservation projects and supply-side options. Nine contracts have been signed with the potential to save approximately 262,000 MWh/year. So far four projects have been completed and, combined with the five ongoing projects, annual energy savings of 118,843 MWh/year are achieved.[R#5]

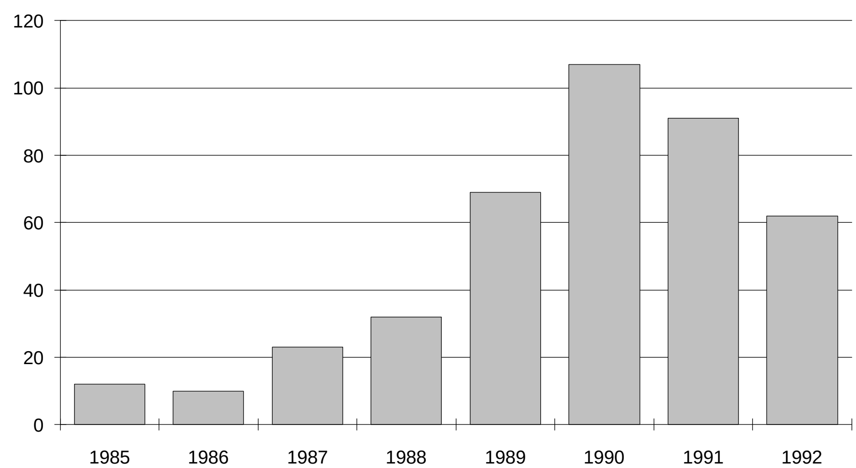
CMP's DSM programs for commercial customers include energy audits, a loan program, and rebates for retrofitting motors, lights, and other equipment with efficient replacements. Since 1986, the commercial lighting rebate program alone has accumulated over 75,000 MWh in annual savings. CMP offers similar programs for commercial customers who are constructing new facilities and want to include efficient motors, lights, or other equipment.

The Pilot Efficiency Buy-Back program is the subject of this profile and was aimed at larger commercial and industrial customers who wanted to upgrade the efficiency of their facilities or manufacturing processes. CMP contributed up to half the installed cost of an approved efficiency project, usually reducing the pay back period to two years. More than 33,000 MWh in total annual energy savings have been achieved through this program since 1989. ■

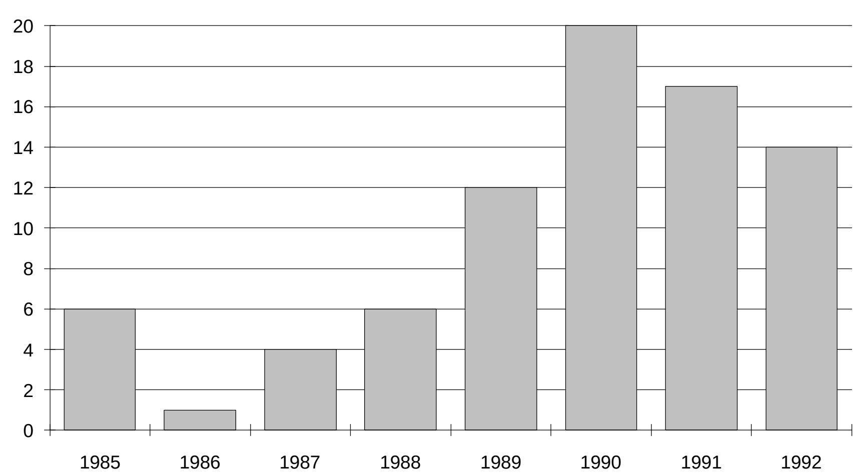
ANNUAL DSM EXPENDITURE ($1,000,000)



ANNUAL ENERGY SAVINGS (GWH)



WINTER PEAK CAPACITY SAVINGS (MW)



Program Overview

Central Maine Power's Pilot Efficiency Buy-Back (EBB) program was officially implemented in the spring of 1987. The stated goal of the program was "to encourage commercial and industrial customers to improve the efficiency of their use of electricity." CMP hoped to quickly achieve large energy savings by targeting its largest commercial and industrial customers. All of CMP's commercial and industrial customers were eligible for the program, but projects had to save a minimum of 500,000 kWh per year and shift (or reduce) winter on-peak demand by 500 kW to qualify. Qualifying projects also had to have a simple payback of at least two years in order to receive CMP funding, which could reach a maximum of half the project cost. In addition early projects had to meet CMP's cost effectiveness test, achieving a positive value within the lifetime of the equipment. Later projects were subjected to the All Ratepayers Test.[R#5,6,8,10]

In the fall of 1985 CMP approached the Maine PUC with the idea of establishing an energy service company (ESCO) which would be an unregulated subsidiary of CMP. This ESCO would have provided energy services to large commercial and industrial customers through a shared savings approach for financing. CMP hoped that such a company could operate initially in CMP's service territory and then expand to other locations. The Maine PUC said that the Maine Office of Energy Resources did not want CMP to have an unregulated subsidiary and recommended a more traditional incentive program for large commercial and industrial customers. The Office of Energy Resources was concerned that a CMP ESCO might shift CMP's focus away from customers' needs. After a great deal of negotiation with Commission staff, the Pilot Efficiency Buy-Back program finally emerged as a compromise between the two parties' plans.[R#6,10]

Completed Projects	*Project Type*	*Completion Date*	*Annual Energy Savings (kWh)*	*Annual Winter Peak Demand Savings (kW)*
Industrial	Lighting/Energy Mgmt.	10/13/89	1,980,088	256
Industrial	Pulp Process Improvements	11/28/89	11,696,390	5,660
Commercial	Compressor Efficiency	12/1/89	1,195,049	487
Industrial	Pulp Storage	1/19/90	-478,225	2,145
Institutional	Lighting/Energy Mgmt.	6/1/90	790,990	105
Commercial	Snow-Making	2/1/91	1,787,609	1,192
Industrial	Steam Cogeneration	2/6/91	12,278,000	1,400
Commercial	Snow-Making	2/21/91	3,912,545	653
Total			33,162,446	11,898

The first contract was signed in February 1988, the first three projects were completed in late 1989, and the program ended in March 1992. CMP estimated that a total of 350 customers were eligible to participate with a likely response from 35 customers. A total of ten projects qualified for the program, but only eight projects have been completed. There is one additional cogeneration project still underway at a VA hospital. The EBB program was terminated because the CMP believed that the services being offered by the program could be provided through a combination of the Power Partners program and a revised Retrofit Rebate program.[R#5,6,8]

Participants with completed projects are Bates College; Boise Cascade pulp and paper company; Data General a computer components company; Statler Tissue Company; Sugarloaf ski area (which actually completed two EBB projects); Champion Paper; and Sunday River ski area. The ongoing project is a Veterans Administration Hospital.[R#10]

The accompanying table reflects the impacts of completed EBB projects. Please note that the figures in the column titled "Annual Winter Peak Demand Savings" were calculated by combining CMP's distinction between each project's winter peak demand savings and winter peak demand shifted. Of the eight completed projects, only three shifted demand while the others were able to reduce peak demand through energy efficiency measures. One of the three projects in which demand was shifted involved snow-making. For this project, nearly an equal amount of demand was shifted from on-peak periods as the amount of peak demand that was actually saved. The other two projects which shifted demand involved pulp process improvements and pulp storage. In both instances the shifted kW greatly exceeded the peak demand savings. In one instance, an industry was increasing its line, and thus the EBB involvement actually resulted in slightly higher peak demand use (55 kW), but this was offset by 2,200 kW of shifted demand that would have otherwise taxed the company's energy bills and the utility's ability to serve. ■

CASE STUDY OF THE SUNDAY RIVER AND SUGARLOAF EBB SNOW-MAKING PROJECTS

Most of the major ski resorts in the eastern United States make “artificial” snow to improve ski conditions and lengthen the ski season. While ski areas have been making snow for more than two decades, advances in equipment energy efficiency have been relatively recent. By improving the efficiency of their snow-making facilities, the Sunday River and Sugarloaf ski areas were able to participate in CMP’s EBB program, completing projects in 1991.[R#8]

At the ski areas snow is produced by spraying fine water droplets into sufficiently cold ambient air. As the droplets travel through the air, they freeze into crystals and fall onto the ski trails. As part of this process water must be transported from a source such as a river or pond up the mountain to the location of the snow gun. The water is moved by pumps that are typically driven by electric motors. These drive motors are quite large by necessity in order to pump large quantities of water (thousands of gallons per minute) over lengths of one mile or more and up elevation gains as high as 3,000 feet. Since snow is frozen water, water consumption and therefore pumping energy, is a function of the volume of snow produced and its density. Strategies for improving the energy efficiency of the water-supply system for snow-making are limited to those for any pumping system: efficient motors, efficient pumps, and maximizing part load efficiency with a split system or variable speed drive.[R#8]

Once at the correct location, the water must be atomized into droplets, transported into the cold ambient air, and exposed long enough to freeze before landing as snow. Compressed air is used for this process. Improvements to increase the efficiency of the air supply are the same as other compressed air applications: efficient motors, efficient compressors, and maximizing part-load efficiency.[R#8]

The snow gun is connected by hose to the water and air supply that mixes the two in a metal housing and then directs the resulting stream of water droplets and air into the ambient atmosphere. The snow gun has a critical impact on the energy consumed by the system as a whole because it governs how much air is required to atomize and transport water droplets of the necessary size into the ambient air. An efficient snow-gun design is one that requires a low air-to-water ratio for operation, thus minimizing the energy needed to supply compressed air to the gun.[R#8]

The snow-making system retrofits at Sunday River ski area included modifications to the water supply system, the control system, and the snow guns. As a result of these changes, approximately 35% less energy was required to produce a pound of snow, and energy savings of 3,912,545 kWh were realized in 1991. The snow-making system covered 450 acres of terrain.[R#8]

System improvements at Sugarloaf ski area consisted of replacing all existing snow-guns with a more efficient model and the installation of an additional pump and motor in order to shift snow production to off-peak hours. These improvements resulted in energy savings of 1,787,609 kWh in 1991. The 1989 Sugarloaf project consisted of air compressor replacements.[R#8,10]

While it is difficult to estimate the total snow-making acreage in the country and thus estimate the savings possible through similar retrofits, it is believed that there are many inefficient snow-making systems currently in use throughout the United States.

MARKETING

Marketing of the EBB program was primarily by mail solicitation. A study of the mailing list for the EBB showed that only 12% of customers on the mailing list were likely respondents. Reasons for not responding to CMP mailings included a lack of program applicability, program requirements that could not be met, and insufficient resources to prepare the required proposal. CMP's initial mailing list for the EBB program totaled 232 customers. In April 1987 CMP sent a mailing to 85% of its largest customers, and a second solicitation was mailed to all of CMP's largest customers in December 1987. These mailings consisted of a folder containing pull out materials such as a pre-application form, a proposal form, a standard contract, and a description of terms and conditions for the program. A bidder's conference for interested customers was held in conjunction with each mailing to explain the program and proposal requirements.[R#6]

DELIVERY

Proposal Presentation: To qualify for the Pilot Efficiency Buy-Back program, customers submitted a request form describing the project, and followed up with a formal proposal. The formal proposal included projected savings figures, an explanation of project cash flow, a description of how savings would be monitored or verified, expected environmental impacts, and the amount of CMP funding requested. CMP screened the proposals within 15 business days. Proposals that were not acceptable could be revised and resubmitted.

Project Requirements: The project had to be cost effective as defined by the All Ratepayers Test in Chapter 380 of the Maine Public Utilities Commission rules. Projects also had to provide at least 500 kW of winter peak demand savings or achieve 500,000 kWh of annual energy savings. There were no requirements or limitations as to the types of measures installed. Eligibility focused instead on total project savings. This accounts for the wide range of customers that participated in the program.

Certain cogeneration projects were eligible for a short window of time. These were either renewable fueled, or turbines installed to make use of existing over-capacity boilers. These projects appeared to conserve energy when "viewed" by the electric service meter (two of the projects were supply side).

CMP Proposal Evaluation: The project proposal was evaluated from an engineering standpoint by the DSM Sales and Services department. The CMP financial staff was also involved with evaluating the financial aspects of the project. If CMP accepted the proposal, the participant qualified for financial assistance and received a subsidy which was calculated to reduce the participant's payback to two years, with a funding maximum of half the project cost.

Contract Requirements: Program participation required the customer to achieve program savings at a location served by CMP. A formal contract was developed between CMP and the participant which included security provisions to ensure that expected savings were realized. Customers receiving funding through the program were required to maintain the project for a minimum of three years or long enough for the avoided cost-benefits to cover the utility's payment, and the project had to have a useful life of at least ten years. Projects had to begin within one calendar year of signing a contract.[R#5,6,8] ☞

Contract negotiations evolved from the project review and selection process. The contract negotiation process established the payment stream and formalized the agreement. This process generally took one month. CMP had a standard contract form which included a project description, the payment schedule, verification details, and in later projects the security agreement. The security agreement was an irrevocable letter of credit containing a dollar amount equal to the incentive offered by CMP. These funds were available to CMP in the event that the participant failed to meet its commitment. In general CMP got its money back if the customer failed to complete the project or if the project was completed but did not perform.[R#6]

The contract included expectations for the installations, but projects were controlled by the participants. The CMP program staff visited each project site two or three times during the installation process. After projects were completed, CMP DSM Sales and Service staff performed an inspection to make sure that measures were installed and functioning properly. Once the project received final approval, the customer invoiced CMP for the final payment installment, which was sent by CMP within 30 days.

MEASURES INSTALLED

Because program eligibility was determined by project savings with no regard to measure type, there was a wide range of installed measures. Measures included compact fluorescent lamps, variable frequency drives, HIDs, refiner replacements, central controls for heating and cooling, cogeneration, compressors, ground wood storage tanks, snow gun nozzles, energy control systems, and energy monitors.

STAFFING REQUIREMENTS

The EBB program was administered by CMP's DSM Sales and Services department with an industrial energy management engineer, his supervisor, and a contract administrator who worked on the program. The time requirement of this department was one full time equivalent (FTE). In addition, the evaluation and legal departments devoted a small fraction of their time to the program. ■

MONITORING

CMP program administrators from the DSM Sales and Services department visited project sites during the installation process (typically two or three times) to monitor which measures were being installed and how well these measures functioned. A final inspection was performed once the project was completed before the last incentive payment was made.

Monitoring of project savings was done on an individual project basis. Within the program contract CMP and the customer agreed on how energy and or capacity savings would be monitored or calculated. With the earlier projects savings were based on engineering estimates. With most of the later projects the customers installed and monitored end use meters and reported this data to CMP. A total of four projects had end use meters, and the use of these meters increased as the program matured.[R#10]

CMP produces a "Demand-Side Management Quarterly Report" which contains brief summaries of all CMP DSM programs. The summary of the Pilot Efficiency Buy-Back program in the 1992 Quarter 4 report includes a program description, a program history, and a summary of program costs and savings for individual projects and the program as a whole.[R#5]

EVALUATION

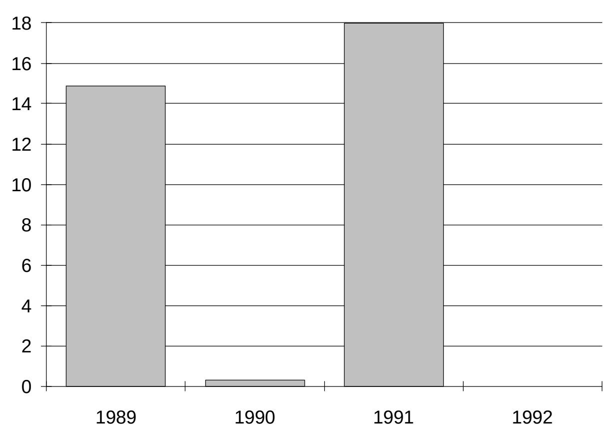
In February 1993 CMP published the "Impact Assessment of Projects Completed in 1991" for the program. This report summarizes three projects including two ski areas and one paper products plant. The ski resorts improved the efficiency of their snow-making systems, and the paper products plant installed a steam turbine cogeneration unit. The report contains an impact evaluation of each of the three projects along with an analysis of the program's overall economic performance. This analysis of 1991 activity was compiled through the use of empirical data, independent engineering analyses, and simulation.[R#8]

In 1989 ERC Environmental and Energy Services Co. of Portland, Oregon produced a report on three CMP DSM programs titled "Evaluation of Central Maine Power's Pilot Power Partners Program, Pilot Efficiency Buy-Back Program, and Pilot Commercial and Industrial Shared Savings Program." This report is a process evaluation which includes: an analysis of program design, delivery and administrative mechanisms; an examination of reasons for non-response to program solicitations; and calculations of program benefit/cost ratios. The economic analyses in this report were based on the engineering estimates submitted with each project proposal. At the time this study was completed, one project had been completed and five additional contracts had been signed.[R#6] ■

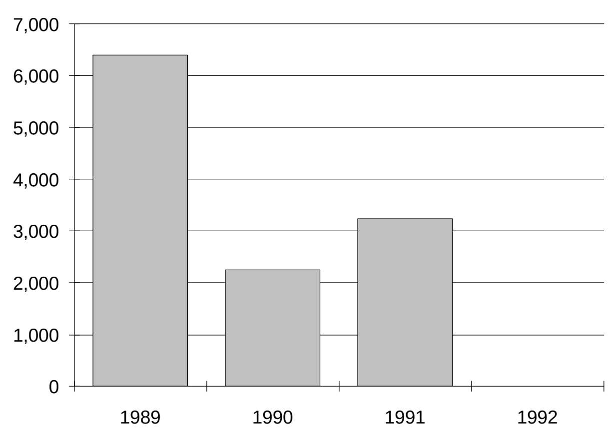
Program Savings

Savings Overview Table	*Annual Energy Savings (MWh)*	*Cumulative Energy Savings (MWh)*	*Lifecycle Energy Savings (MWh)*	*Annual Winter Peak Demand Savings (kW)*	*Cumulative Winter Peak Demand Savings (kW)*
1989	14,872	14,872	223,073	6,403	6,403
1990	313	15,184	4,691	2,250	8,653
1991	17,978	33,162	269,672	3,245	11,898
1992	0	33,162	0	0	11,898
Total	33,162	96,381	497,437	11,898	

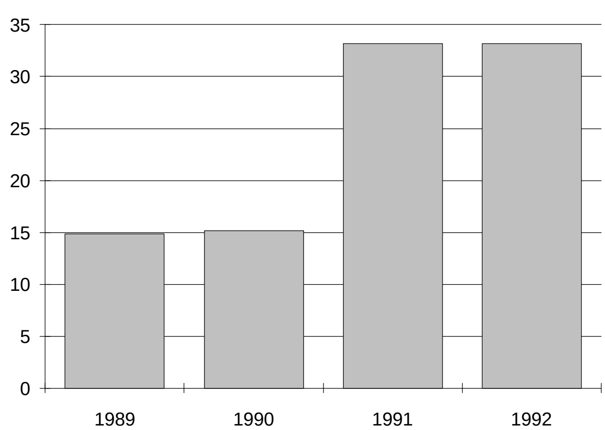
ANNUAL ENERGY SAVINGS (GWH)



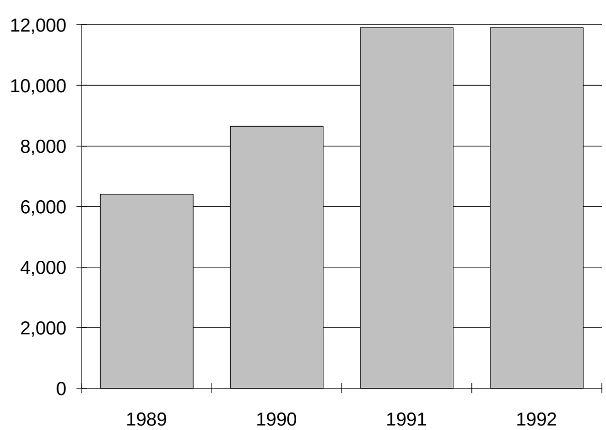
ANNUAL WINTER PEAK SAVINGS (KW)



CUMULATIVE ENERGY SAVINGS (GWH)



CUMULATIVE WINTER PEAK SAVINGS (KW)



Data Alert: The Results Center has assigned energy savings to individual projects based on the completion date of the project. Program incentive payments were not based on actual savings. CMP required customers to provide project verification plans, and savings data had to be presented to CMP for review until the program contract expired. CMP relied on the customer's commitment to achieve savings because CMP only provided a maximum of 50% of project costs.[R#6]

Participation Table	*Participants*	*Annual Energy Savings per Participant (kWh)*
1989	3	4,957,176
1990	2	156,383
1991	3	5,992,718
Total	8	

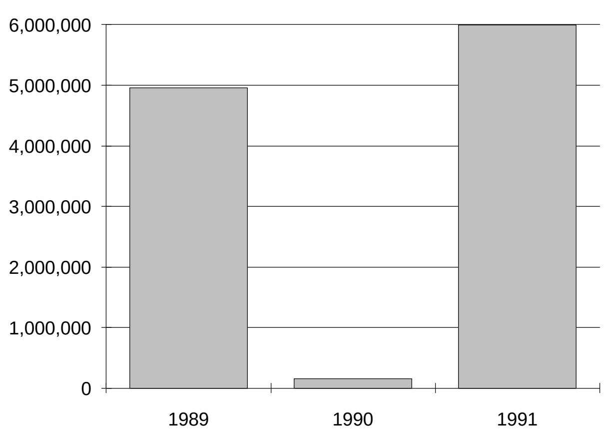
Annual energy savings for the Efficiency Buy-Back program total 33,162 MWh. In 1989 program energy savings were 14,872 MWh and dropped to 313 MWh in 1990. In 1991 program energy savings jumped back up to 17,978 MWh. No projects were completed in 1992.[R#9]

Winter peak demand savings for the program total 11,898 kW. Incremental program winter peak demand savings were highest in 1989 with 6,403 kW saved. In 1990 the program saved 2,250 kW, and savings increased to 3,245 kW in 1991.[R#9]

Participation Rates

Program participants are defined as projects that have been completed. A total of eight projects have been completed. One industrial customer signed a contract to participate in the program but went out of business before the project was finished. Currently there is one final project underway in which a contract has been signed, but the project has not been completed. This final project has projected annual energy savings of 800,000 kWh and demand savings of 91 kW.[R#5,10]

ANNUAL ENERGY SAVINGS PER PARTICIPANT (KWH)



In 1989 three projects were completed, in 1990 two projects were completed, and in 1991 three projects were completed. No projects were completed in 1992.

Annual energy savings per participant in 1989 were 4,957 MWh, dropped to 156 MWh in 1990, and increased to 5,992 MWh in 1991.

Free Ridership

Program savings are not derated for free ridership, and CMP does not consider free ridership to be an issue with the program. When surveyed all program participants indicated that they would not have made the energy management investments in the absence of the program. This is likely due to the fact that individual project costs were very expensive ranging from a low of $330,600 to a high of $4,251,366. It is interesting to note that ESCOs did not play a role in soliciting participation in the program.

Measure Lifetime

In order to calculate lifetime energy savings and the cost of saved energy, The Results Center used an average measure lifetime for all EBB projects of 15 years. The completed EBB projects have a wide range of measures installed which have a correspondingly wide range of lifetimes. The 15 year lifetime used is thought to be on the conservative side, with the full range being 15 to 30 years.[R#10]

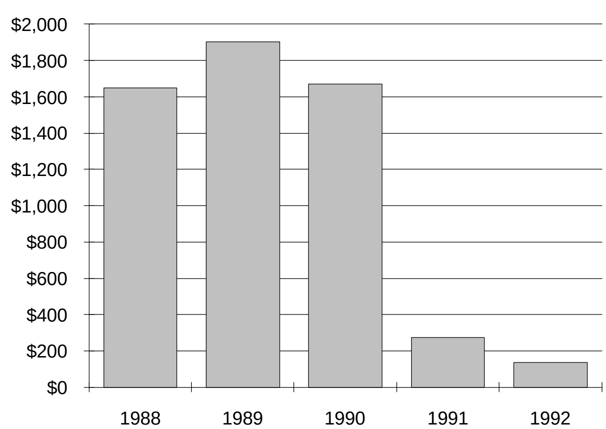
Projected Savings

The Results Center calculates lifecycle energy savings for the EBB program to total 497,437 MWh. So far all EBB projects have surpassed their projected savings. ■

Cost of the Program

Costs Overview Table	*Administration (x1000)*	*Incentives (x1000)*	*Evaluation (x1000)*	*Interest (x1000)*	*Total Program Cost (x1000)*
1988	$26.7	$1,499.2	$8.3	$113.5	$1,647.8
1989	$25.5	$1,759.8	$7.9	$108.3	$1,901.6
1990	$33.5	$1,485.5	$10.4	$142.4	$1,671.8
1991	$17.7	$237.0	$9.8	$10.4	$274.9
1992	$18.0	$79.0	$21.7	$15.8	$134.5
Total	$121.5	$5,060.5	$58.1	$390.5	$5,630.6

TOTAL PROGRAM COST (x1,000)



Data Alert: All cost figures for 1990, 1991, and 1992 are provided by CMP. CMP also provided incentive payments for 1988 and 1989, which make up the vast majority of program expenditures for all years of the program. Administrative, evaluation, and interest costs for 1988 and 1989 are calculated by subtracting total costs for 1990 through 1992 along with incentive costs for 1988 and 1989 from total program costs to date. This difference is split evenly between 1988 and 1989. This difference is then applied to administrative, evaluation, and interest costs. Dollar figures for each of these categories are based on the percentage of 1990 program expenditures (excluding incentive costs) allocated for administrative, evaluation, and interest costs.

Cost of Saved Energy Table (¢/kWh)	*Discount Rates*						
	3%	4%	5%	6%	7%	8%	9%
1989	1.07	1.15	1.23	1.32	1.40	1.49	1.59
1990	44.78	48.08	51.50	55.04	58.69	62.45	66.31
1991	0.13	0.14	0.15	0.16	0.17	0.18	0.19
Prog. Average	1.42	1.53	1.64	1.75	1.86	1.98	2.11

Program costs total $5,630,600 for 1988 through 1992. Program costs dropped off greatly in 1991 and 1992, with $274,900 spent in 1991 and $134,500 spent in 1992. Program costs were highest in 1989 with expenditures of $1,901,600. In 1988 program expenditures were $1,647,800 and in 1990 program expenditures were $1,671,800.[R#5,11]

The drop off in expenditures in 1991 and 1992 is due to the fact that 90% of program expenditures were paid out as customer incentives. It is important to note that incentives were paid throughout the course of a project. When a project contract was signed the customer received 40% of the total incentive payment. As the project continued, 50% of the total project funds were disbursed on a schedule that coincided with the work schedule contained in the contract. Once the project was completed the final 10% of the total incentive was paid. This incentive payment schedule accounted for the high program costs in 1988 (when no projects had been completed) and the low program costs in 1991 (when three projects were completed during the year).[R#11]

COST EFFECTIVENESS

Based on the All Ratepayers Test CMP assigns a benefit/cost ratio of 2.10 to the entire EBB program.

The Results Center calculation of the cost of saved energy for the program at a 5% discount rate was 1.23 ¢/kWh in 1989, 51.50 ¢/kWh in 1990, and 0.15 ¢/kWh in 1992. This wide range is likely due to the fact that the majority of program costs were incentive payments which were made throughout the course of a project while project savings were attributed to the year that the project was completed. Thus there is a disconnect between the time that CMP dollars were spent and energy savings were achieved. The average cost of saved energy for the program from 1988 through 1992 at a 5% discount rate was 1.64 ¢/kWh.

COST PER PARTICIPANT

CMP's average cost per participant for the program from 1988 through 1992 was $703,825. The average cost per participant incurred by program participants was $614,441. In terms of customer incurred costs, the most expensive project cost $2,125,684 and the least expensive project cost $158,369.

COST COMPONENTS

Incentive costs made up 90% of the total program cost with $5,060,500 paid out. Incentive costs have ranged from a high of $1,759,800 in 1989 to a low of $79,000 in 1992. For each year of the program, CMP had a maximum of $3 million of funding available. Administrative costs totaled $121,500 (2% of program costs), evaluation costs totaled $58,100 (1% of program costs), and interest costs totaled $390,500 (7% of program costs). Interest costs equal the amount of lost interest on project incentive payments which are not yet recovered. ■

Environmental Benefit Statement

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

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

HOW TO USE THE TABLE

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

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

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

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

*** Acronyms used in the table**

TSP = Total Suspended Particulates
NSPS = New Source Performance Standards
BACT = Best Available Control Technology

AVOIDED EMISSIONS (Based on 96,380,711 kWh Saved 1989 - 1992)

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
Coal			**Uncontrolled Emissions**			
A	9,400	2.50%	207,797,000	4,930,000	997,000	100,000
B	10,000	1.20%	221,579,000	1,908,000	644,000	477,000
			Controlled Emissions			
A	9,400	2.50%	207,797,000	493,000	997,000	8,000
B	10,000	1.20%	221,579,000	191,000	644,000	32,000
C	10,000		221,579,000	1,272,000	636,000	32,000
			Atmospheric Fluidized Bed Combustion			
A	10,000	1.10%	221,579,000	583,000	318,000	159,000
B	9,400	2.50%	207,797,000	493,000	399,000	30,000
			Integrated Gasification Combined Cycle			
A	10,000	0.45%	221,579,000	392,000	64,000	159,000
B	9,010		199,315,000	142,000	48,000	10,000
Gas			**Steam**			
A	10,400		120,861,000	0	276,000	0
B	9,224		104,959,000	0	657,000	31,000
			Combined Cycle			
1. Existing	9,000		104,959,000	0	403,000	0
2. NSPS*	9,000		104,959,000	0	191,000	0
3. BACT*	9,000		104,959,000	0	27,000	0
Oil			**Steam--#6 Oil**			
A	9,840	2.00%	174,931,000	2,650,000	313,000	297,000
B	10,400	2.20%	185,533,000	2,629,000	393,000	191,000
C	10,400	1.00%	185,533,000	375,000	316,000	100,000
D	10,400	0.50%	185,533,000	1,103,000	393,000	61,000
			Combustion Turbine			
#2 Diesel	13,600	0.30%	232,181,000	462,000	718,000	39,000
			Refuse Derived Fuel			
Conventional	15,000	0.20%	275,649,000	710,000	935,000	208,000

LESSONS LEARNED

One important lesson learned from the Efficiency Buy-Back program is that while energy savings for each project are very large due to program requirements, the number of eligible customers in the CMP area was very low. One analysis of the program estimated that a maximum of 35 customers would be likely to submit a program proposal. Similarly, CMP realizes that they did not focus their marketing efforts solely on the customers most likely to participate.[R#6]

Another difficulty associated with the marketing of the program was that many customers had trouble differentiating between the EBB program and the similar Shared Savings and Power Partners programs. Customers also had difficulty understanding the different goals of each program.[R#6]

A strong point of the program was the flexibility on the part of CMP with regard to customer project designs. Typically there was a great deal of interaction between CMP and the customer before a final contract was signed. This flexibility and latitude in project design resulted in well planned projects. Participants expressed a great deal of satisfaction with the proposal submission and review process.[R#6]

A major issue initially with the program was ensuring that projects would be completed. CMP began the program by requiring a security interest in the project which allowed CMP to reclaim purchased equipment in the event that a customer defaulted on the project. The major drawback to this approach was that CMP would not likely recover all of its investment due to the difficulty of selling already installed equipment. CMP revised the security agreement, requiring an irrevocable letter of credit equal to the customer incentive.

CMP believes that it would have been more cost effective to make the customer's incentive payment more negotiable. As the program was designed, there was no motivation for the customer to accept less than the 50% project cost maximum allowed. Basing customer incentives on measured performance (in the form of a $/kW or $/kWh payment) might have been a solution to this issue.[R#10]

TRANSFERABILITY

For other utilities implementing a similar program it might be wise to carefully identify the customers who would be eligible to participate and focus all marketing efforts on these customers as opposed to marketing to all commercial and industrial customers. Another way to potentially improve program participation would be to lower the required savings levels. It is also important to note that CMP did very little marketing after the initial mailing efforts, and program participation could likely have been improved by a more sustained marketing effort. ■

Traditional utility ratemaking, where each and every kilowatt-hour sold provides profit, is a major barrier to utilities' implementation of energy efficiency programs. Several state regulatory commissions and their investor-owned utilities have been pioneers in reforming ratemaking to a) remove the disincentives in utility investment in DSM programs, and b) to provide direct and pronounced incentives so that every marginal dollar spent on DSM provides a more attractive return than the same dollar spent on supply-side resources.

The purpose of this section is to briefly present exciting and innovative incentive ratemaking mechanisms where they're applied. This we trust, will not only provide some understanding to the reader of the context within which the DSM program profiled herein is implemented, but the series of these sections will provide useful snapshots of incentive mechanisms being used and tested across the United States.

In the State of Maine most of the financial barriers to demand-side management have been effectively eliminated thanks in large part to Maine's forward thinking regulatory commissioners and staff, including such names as Bradford, Moskovitz, Harrington, and Parker, as well as utility staff. Utilities are allowed to recover DSM program costs, utility revenues have been decoupled from energy sales, and the Commission has used its statutory authority to approve a penalty/reward mechanism for Central Maine Power. (Much of the following discussion is derived from the National Association of Regulatory Commissioner's review of "Incentives for Demand-Side Management, Second Edition"[R#12] as well as personal communication with Hossein Haeri, Director of Evaluation for CMP.[R#13])

DSM PROGRAM COST RECOVERY

Special cost recovery for DSM was instituted in Maine in 1986. Utilities are allowed to ratebase with balancing account recovery over ten years for most DSM expenditures. Administrative costs for DSM, such as advertising and evaluation, are expensed on a current year basis with annual reconciliation.

DECOUPLING SALES AND REVENUES

After allowing Maine's utilities to recover their DSM costs, it became clear that it was also necessary to remove the disincentive created by DSM regarding lost revenues. (The more effective the DSM initiatives, the higher the utilities' lost revenues.) Decoupling total sales and total revenues has been addressed in Maine with the use of a special form of ERAM (Electric Revenue Adjustment Mechanism). Maine instituted an "ERAM per customer" mechanism which was approved by the commission in May 1991. The mechanism serves to adjust electric rates (up or down) to maintain a constant level on nonfuel revenue per customer as determined in the most recent electric rate case. As a result, if average electric use falls for any reason — including effective utility conservation activities — rates will be increased in the following year to assure that in the end the utility collects as much revenue per customer as it would in the absence of changes in consumption.

The Maine statutes, however, required that the MPUC adopt a mechanism that limits the rate impact of ERAM. Thus, on August 28, 1991, the MPUC issued an order that places a 1% cap (equivalent to about $9 million) on the ERAM-per-customer adjustment made at the end of the first year of the three-year trial period. Thus no single DSM program can have a rate impact of greater than 1%. Excess amounts are deferred for future recovery through rates. ☞

The provisions of this order were implemented in the first year, when sales revenues were lower than the allowed per customer amount. CMP thus filed with the MPUC to begin collecting $19.7 million of unbilled ERAM revenues, along with the energy-management incentives earned in 1991 that are discussed in the next paragraph.

THE TRIAL INCENTIVE MECHANISM

Central Maine Power's incentive mechanism was put in place in May 1991 on a three-year trial basis. CMP is eligible to earn a shared-savings incentive for a three-year trial period. The incentive, which is calculated on a uniform basis for all DSM programs, may not exceed the value of 1% of common equity. If the net benefits of DSM activity are negative, the utility will be assessed a penalty of 10% of the net benefit.

The incentive is calculated using two formulas. The first sets a maximum payment based on 50% of the difference between measured net program benefits and 80% of net program benefits achieved during the baseline year (approximately $13 million in 1990).

The second formula, put in place to address the equity issue among customer classes, calculates the "Y factor" which equals one less 50% of the utility cost/gross ratio. The utility then receives the value of the product of maximum payment and Y factor. The Y factor is intended to encourage the utility to keep its program costs low by shifting as many DSM costs to the program participants as possible without losing participation. This is done by providing declining portions of the maximum incentive payment, down to one-half, as the utility's own costs approach full avoided cost for all its achieved savings.

One of the unique features of the Maine incentive mechanism is that it is rooted in measurement and validation of persistent savings. All DSM programs run in 1991, 1992, and 1993 and their respective incentives will be reevaluated in 1997. This ties DSM performance to the durability of the savings achieved. ■

References

1. "Performance," Central Maine Power Company, Annual Report, 1992.

2. Central Maine Power Company, "1991 Energy Management Report," 1991.

3. Central Maine Power Company, "1992 Energy Management Report," 1992.

4. Central Maine Power Company, "Demand-Side Management Quarterly Report," Quarter 2, 1992.

5. Central Maine Power Company, "Demand-Side Management Quarterly Report," Quarter 4, 1992.

6. ERCE, "Evaluation of Central Maine Power's Pilot Power Partners Program, Pilot Efficiency Buy-Back Program, and Pilot Commercial and Industrial Shared Savings Program," 1989.

7. ERCE, "Second Round Power Partners Process Evaluation," May 20, 1991.

8. Central Maine Power, "Efficiency Buy-Back Program, Impact Assessment of Projects Completed in 1991," February 3, 1993.

9. Central Maine Power, "Efficiency Buy-Back Project Summary Sheets," prepared by CMP Evaluation Department, May 1992.

10. Jonathan Linn, P.E., Supervisor of DSM Sales and Services, Central Maine Power Company, personal communication, April - June 1993.

11. Anne Carter, Energy Management Engineer, Central Maine Power Company, personal communication, April - June 1993.

12. National Association of Regulatory Utility Commissioners, "Incentives for Demand-Side Management," Committee on Energy Conservation, 2nd edition prepared by Barakat & Chamberlin, Inc., March 1993.

13. Hossein Haeri, Director of Evaluation, Central Maine Power, personal communication, October 1992, June 1993.

14. Central Maine Power, Efficiency Buy-Back program application materials, 1990.

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