Green Mountain Power

Small Commercial & Industrial Retrofit

Profile #48

Executive Summary

Green Mountain Power launched its Small Commercial and Industrial Retrofit Program at an opportune time, just after an ice dam on the Winooski River caused the river to spill over its banks in the state capitol of Montpelier, flooding the town and causing severe hardship for small business owners. GMP's door-to-door campaign promoting the Small C/I Retrofit program was most welcome, and the program quickly had its first 65 participants. By the end of 1992 the program had exceeded its participation goal for the year of 500 customers.

The Small C&I Retrofit program is available to any non-residential, non-agricultural GMP customer having an average monthly electrical energy use of more than 300 kWh, but less than 12,500 kWh during the winter season. (Note that GMP's eligibility criteria is quite different than the criteria used by New England Electric System, Profile #1, and Boston Edison, Profile #31.) GMP provides eligible customers with a free walk-through survey of their facilities. After the survey, the customer is provided with a written list of recommended energy-efficiency measures. Typically, customers elect to have all recommended "base measures" installed as the entire cost is covered by GMP. Base package measures include lighting upgrades, lighting controls, HVAC controls, electrically-heated domestic water tank and pipe insulation, and water conservation hardware.

Site specific energy conservation measures (what GMP calls "custom package" measures) meeting a set of screening criteria are also available to small C&I customers. In this track of the program, GMP "buys down" the customer's cost for custom measures to a one-year payback. (See New York Power Authority's High Efficiency Lighting Program, Profile #17, for another example of a customer payback buydown.)

In 1992 the Small C&I Retrofit program accounted for 3,982 MWh in annual energy savings and 0.826 MW in coincident peak capacity savings. All of these savings can be attributed solely to lighting measures (3,881 MWh and 0.803 MW) and insulation of hot water tanks (102 MWh and 0.023 MW).

Costs for the Small C&I Retrofit program have totalled $1,267,900 to date. In 1992 the cost per participant for the program was $2,184. Because only base measure packages have been installed so far, there are currently no customer contribution costs for the program.

The Small C&I Retrofit program achieved an impressive participation rate of 8% during its first year especially when one considers that the program was only available to the public starting in May 1992. The program also greatly exceeded its first year projected energy and capacity savings. Thus the key lesson learned is that well-designed, well-implemented programs can have marked success from their start!

Small C&I Retrofit

Utility:	Green Mountain Power Corp.
Sector:	Commercial and Industrial
Measures:	Installation of energy-efficient measures including lighting improvements, HVAC controls, hot water efficiency improvements, refrigeration, and motors.
Mechanism:	GMP covers 100% of cost for base package installations, arranges funding for custom package installations.
History:	Started in May 1992. Through December 1992 507 installations have been completed.

1992 Program Data

Energy savings:	3.9 GWh
Lifecycle energy savings:	23.9 GWh
Capacity savings:	0.826 MW
Incentive cost:	$824,900
Participation rate:	8%

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.

Green Mountain Power Corp. (GMP) is an electricity generation and distribution company based in South Burlington, Vermont which has provided service for 99 years. GMP currently supplies electricity to one-third of the population of Vermont and sells wholesale electricity to other utilities, three of which receive almost all of their power requirements from the company. GMP also transmits power for the State of Vermont, which distributes the power using GMP facilities leased to the State to residential and farm customers in the Company's service territory. At 6.79 ¢/kWh in 1990, average electricity rates (based on revenue per kWh) at GMP were the lowest of all the major investor owned New England utilities.[R#1]

GMP has an ownership interest in generation facilities that supply 40% of its total capacity. Of these generation facilities, GMP has outright ownership of several hydro plants along with diesel and gas turbine plants which together generated roughly 27% of the 1991 average monthly net capacity. The remainder of the generating capacity, fully 60% of the energy GMP distributes, is purchased from other utilities.

GMP has the distinction of serving one of the most rural and least populated states in the country. Vermont is mostly mountainous, dominated by the Green Mountains, an extension of the Appalachian range. GMP is based in South Burlington, which along with Burlington (which is served by Burlington Electric Department) is one of the largest metropolitan areas in the state. Economically, Vermont's tradition is based in dairy farming. In the past decades, however, Vermont has seen an influx of new industry such as the manufacture of computer chips. The IBM semiconductor plant in Essex Junction is the country's premier manufacturing facility for the 16-megabit chip. In contrast, the state is still well known for granite and marble production, as well as wood and paper products. Tourism has become increasingly important to the state economy and is currently Vermont's second largest industry with more than four million skier day visits in 1991.[R#1]

Green Mountain Power serves customers in a cold and cloudy part of the United States. The mean annual temperature in 1991 in the Burlington area was 44.1°F, with average snowfall of 77.1 inches and a total of 156 days when temperatures dropped below freezing. In 1991, the area averaged 7,953 heating degree days and only 379 cooling degree days.[R#2]

GREEN MOUNTAIN POWER 1991 STATISTICS

Number of Customers	77,716	
Energy Sales (including lease transmissions)	2,190	GWh
Energy Sales $ (x1000)	$137,514	
Peak Demand	309	MW
Generating Capacity	415	MW
Reserve Margin	35	%
Average Electric Rates		
Res. (including lease $)	7.97	¢/kWh
Small C/I	7.21	¢/kWh
Large C/I	5.48	¢/kWh

[R#1]

GMP and its subsidiaries employed 465 workers in 1991 on a full or part time basis. In the same year, there were 77,716 electric customers made up of 66,406 residential customers (85.5%), 11,215 small commercial and industrial (14.4%), 24 large commercial and industrial, and 71 others. (The latter two customer groups account for only 0.1% of the GMP electricity market.) GMP sold 483,998 MWh to residential customers and lease transmitted 67,600 MWh to residential customers, while sales to small commercial and industrial customers totaled 571,818 MWh, and sales to large commercial and industrial customers were 519,201 MWh. GMP 1991 sales to municipals and cooperatives totaled 96,921 MWh, sales to other customers totaled 2,770 MWh, and other sales for resale were 448,110 MWh, for total 1991 sales and lease transmissions of 2,190,418 MWh.[R#1]

GMP derives most of its energy from hydroelectric sources (41% in 1991), with the remainder coming from nuclear (26.5%), coal (16.5%), gas (3.6%), wood (1.2%), oil (1.4%) and "opportunity purchases" from the New England Power Pool (9.8%). Beginning in August of 1991, GMP signed a 30-year contract to buy electricity from Hydro-Quebec and by 1996 Hydro-Quebec will be supplying 38% of GMP's electricity.[R#1] GMP has a peak generating capacity of 415 MW and a peak demand (which occurred in December of 1991) of 309 MW, creating a reserve margin of 35%. GMP's projected retail sales growth rate for the next five years is 1.2% annually.

Utility DSM Overview

HISTORY OF DSM PROGRAMS AT GMP

Transmission & Distribution	Ongoing
Storage Heat	1975
Ripple Water Heater Control	1975
Power Factor Incentive	NA
Voluntary Time-Of-Use Rate Codes	1976
RCS Audit Program	1978
"Widget" Flow Restrictions	1978
Water Heater Setback	1978
"Wrap It Up" Water Heater Jacket	1979
"Gidget" Outlet and Switch Gaskets	1979
Energy Shaver Window Wedges	1980
Rate 14- Removal of Block Rate	1981
Seasonal Rates	1982
Common Sensor Heating Cost Monitor	1982
"Watt a Lite" Efficient Nite Light	1982
Energy Watt Electricity Cost Estimator	1983
Power Factor Incentive - Improved	1984
Commercial Energy Audit Program	1984
Incandescent Street Lighting	1984
Do It Yourself Calculator	1984
Flow Restrictor Program (New)	1984
GMP Merchant Co-op Networks (EEN)	1984
Appliance Efficiency Program	1984
Seal It Up	1984
Plumbing Supply Wholesales	1984
HVAC Dealers	1984
Building Materials Contractors	1984
Energy Management Action Seminar	1984
Bill Enclosures with Efficiency Info	1984
Welcome Aboard Packet	1984
Direct Load Control	1984
Residential Lighting Program	1984
Residential Energy Audit Program	1985
Electric Studio	1985
Dual Fuel Program	1985
Highgate Housing Efficiency Project	1987
Demand Analysis Service	1987
Efficient Water Heater Rental Program	1987
Mandatory Time of Use Rate	1989

[R#7]

GMP has provided various energy conservation services since the mid 1970s although planning for a comprehensive package of DSM programs did not take place until 1991, and GMP's full-scale DSM initiative began in earnest in 1992. The accompanying list serves as a chronology of programs, rate schedules, and customer information campaigns that GMP has offered over the years.

GMP has used a unique methodology to determine the savings that it can attribute to these ad hoc DSM efforts. By comparing GMP's customers' energy uses (residential, commercial, and industrial) with average aggregate values for the entire state, and then weather normalizing the data, GMP's staff has attempted to determine what they call the "embedded DSM," or energy savings, within GMP's service territory.

For example, GMP estimates that in 1991 each of its residential customers was saving on the order of 745 kWh. This "saving," or "negawatt" value, represents an approximation of the amount of annual energy saved as a result of GMP's long history with DSM programs, and is equal to about 9% of the average annual residential consump-

GMP 1992 DSM PROGRAMS

Commercial/Industrial

- New Construction
- Remodeling/Equipment Replacement
- Large C & I Retrofit
- **Small C & I Retrofit**

Farm

- Farm Energy Efficiency

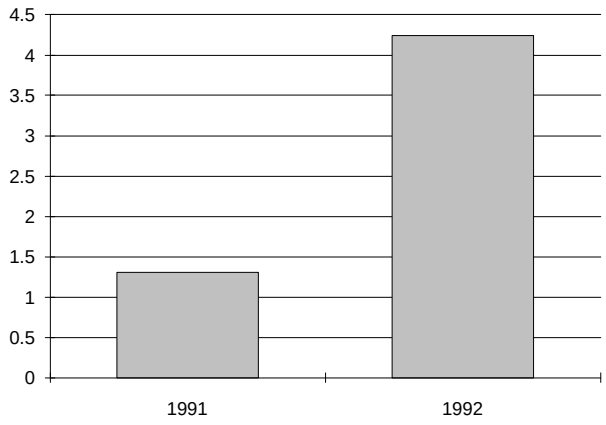
Residential

- Residential Retrofit
- Residential New Construction
- Energy Efficient Major Appliance & Lighting
  - Mail Order Lighting
  - Trade Ally Lighting
  - Refrigerator Recycling
  - Blue Ribbon Appliance

[R#8]

DSM Overview Table	Annual DSM Expenditure (x1000)	Annual Energy Savings (GWh)	Coincident Peak Savings (MW)
1991	$1,303	0.08	0.01
1992	$4,245	9.70	2.38
Total	$5,548	9.78	2.39

ANNUAL DSM EXPENDITURE ($1,000,000)



tion. For commercial customers, GMP estimates that each customer similarly saved approximately 3,243 kWh in 1991, or 6% of the annual energy use for the sector. For GMP's large commercial and industrial customers, the embedded DSM value in 1991 was 6,731 kWh, or approximately 4% of the weather-adjusted, total energy used in that sector.

THE COLLABORATIVE AND THE CURRENT SITUATION

In 1991 GMP was a part of the Vermont collaborative planning process that included the Conservation Law Foundation, the Vermont Department of Public Service, the Vermont Natural Resources Council, and the Vermont Public Research interest group. GMP agreed to the collaborative process as part of a rate settlement. As a result of the collaborative, GMP launched a comprehensive group of DSM programs.

GMP offered its customers 8 DSM programs in 1992 under the Power$avers umbrella. The Small C&I Retrofit program, the subject of this profile, is one of these programs. All of these DSM programs were designed as a group with the intent of reaching as many GMP customers as possible. GMP spent $1,303,000 in 1991 planning this collection of DSM programs. Most of this money ($1,275,210) went towards administrative costs.

In 1992 GMP spent a total of $4,245,000 on its DSM programs. DSM expenditures in 1992 were equal to 3% of the utility's 1991 gross revenues. GMP's DSM programs accounted for 9,698 MWh in energy savings and 2,375 kW in coincident peak savings for the year. A strong majority of 1992 DSM savings were from lighting retrofits which accounted for 7,054 MWh in energy savings and 1,497 kW in coincident peak savings. Projected DSM expenditures for 1993 total $9,400,000 with major increases in effort focused on both the Small and Large C&I Retrofit programs.

The 8 DSM programs currently offered by GMP cover the commercial, industrial, residential, and agricultural sectors. DSM programs available to GMP customers include a C&I New Construction program, a Farm Energy Efficiency program, and an Energy-Efficient Appliance & Lighting program made up of four subprograms.

Program Overview

GMP's Small Commercial and Industrial (C&I) Retrofit program is designed to reduce energy use and costs, while improving operating efficiency. Any non-residential, non-agricultural GMP customer having an average monthly electrical energy use of more than 300 kWh, but less than 12,500 kWh during the winter season (December through March), can participate in the Small C&I Retrofit program. GMP offers technical assistance, including complete installation services for certain measures, and financial incentives to eligible customers.[R#4]

GMP provides eligible customers with a free walk-through survey of the customer's facilities. After the survey, the customer is provided with a written list of recommended energy-efficiency measures. Typically, customers elect to have all recommended base measures installed as the entire cost is covered by GMP. Customers, however, are not required to install all of the recommended measures in order to participate in the program.

Pre-screened, cost-effective, energy conservation measures (what GMP calls "base package" measures) are offered to all eligible customers at no cost to the customer. GMP has developed a protocol list for contractors that covers which base measures can be installed at the customer site. Base package measures include lighting upgrades, lighting controls, HVAC controls, electrically-heated domestic water tank and pipe insulation, and water conservation hardware. Site specific energy conservation measures (what GMP calls "custom package" measures) meeting a set of screening criteria are also available to small C&I customers. GMP "buys down" the customer's cost for custom measures to a one-year payback. (In other words if a measure has a five-year payback, the customer pays for one-fifth of the cost, equal to one year's worth of energy savings.)

In addition, the State of Vermont requires that GMP, like all of the state's utilities, advise its customers of the estimated benefits and costs of switching from electricity to alternative fuels for space heating and water heating, where appropriate, to promote thermodynamically-efficient heating. (See Profile #39, Burlington Electric Department's Heat Exchange Program) To complement this service, GMP provides its customers with lists of qualified contractors and companies that perform these conversions.[R#8]

The Small C&I Retrofit program became available to customers in May 1992 when the first walk-through evaluations were performed. The first installations took place in June 1992, and by the end of 1992 the program had exceeded its participation goal for the year of 500 customers. In 1992, 622 customer walk-through evaluations were performed by GMP and 507 installations were completed.[R#3,6]

The Small C&I Retrofit program will likely run until 1999, unless GMP judges that program saturation is achieved at an earlier date. GMP estimates that there are 6,500 customers eligible to participate in the program and the GMP participation goal for the program is 75% of eligible customers, or 4,875 customers. If this goal is met and it appears that additional participation is doubtful, the program will be discontinued.[R#3]

J.W. Ellis, a small retail store in downtown Montpelier, the state's picturesque capital, achieved annualized energy savings of 7,699 kWh and capacity savings of 2.53 kW after switching its standard fluorescent lighting to more efficient fluorescent lights, and its incandescent lighting to energy-saving compact fluorescent lighting as a result of Green Mountain Power's Small C&I Retrofit Program. GMP paid for the walk-through evaluation of the 1,600 square foot store, as well as the costs of the new energy-efficient equipment and its installation. The retrofit itself took approximately six hours. Specific measures installed included 15 four-foot fluorescents, 6 eight-foot fluorescents, 2 exit signs, 23 fifty-watt equivalent compact fluorescent floods, and 3 seventy-five watt equivalent compact fluorescent floods.[R#3,6]

MARKETING

A wide range of marketing techniques have been employed with the Small C&I Retrofit program. Perhaps the most interesting approach occurred in March 1992 at the onset of the program and just after there was a flood in Montpelier. (An ice dam on the Winooski River caused the flooding which in turn caused widespread damage.) GMP had not originally planned to offer the program in the Montpelier area at that time, but decided that in the wake of the flood such a program would be very helpful. Shortly after the flood, GMP representatives went door-to-door promoting the program to potential customers. This approach attracted the first 65 program participants.[R#3]

Later, several hundred direct mailers were sent out to candidate customers. The direct mail campaign focused on specific geographic areas to facilitate GMP's ability to provide services on a cost-effective basis. GMP placed special emphasis on targeting areas with stressed transmission and distribution systems. The direct mailer that is still used contains an introductory letter and brochure which together briefly describe the program. Included in this package is a prepaid postcard that interested customers can return to GMP. Customers that are not interested in joining the program immediately are encouraged to return the postcard anyway so that GMP can keep them updated on program developments along with other energy-saving opportunities.

The list of mailer recipients who do not respond to the mail solicitation is passed on to the GMP contractor coordinator (Kemper Management Services) who telemarkets to these customers with the intent of enrolling them in the program. There have been very few customers who have refused the program. Some customers did not enroll in the program because they were already working with other GMP DSM programs.

Energy Today, GMP's newsletter for commercial and industrial customers, ran a cover story on the Small C&I Retrofit program in the Fall 1992 edition. Included in the article was a phone number that interested customers could call for further information and to sign up. The newsletter was mailed to half of GMP's C&I customers with their September 1992 bills and to the remaining C&I customers with their October 1992 bills. This split in the mailing was planned in order to get an idea of interest in the program while also controlling initial program participation. GMP hoped to avoid creating a large backlog of requests for evaluations.

GMP also sent representatives to various trade shows such as the Vermont Grocer's Association Show and the Vermont Lodging and Restaurant Association Show, to discuss and promote all of the Power$avers energy efficiency programs.[R#4,5,6]

In addition, both GMP and the GMP contractor performed on-site canvassing of customers to maximize program enrollment in specific geographic areas.

Referrals by program participants have also been a key to increasing program participation as GMP was getting ten program enrollments per week at the end of 1992 as a result of word of mouth recommendations.

DELIVERY

Eligible customers that are interested in the program receive a free walk-through survey of their facilities by the GMP contractor. The survey identifies energy-efficiency opportunities, both base package and custom package measures. This written evaluation provides a summary of opportunities for saving electricity in lighting, water heating, space heating, ventilation, refrigeration, and air conditioning. Also provided is a free analysis of potential costs and benefits for fuel conversion from electric space and water heating which includes a list of additional contractors, equipment suppliers, and fuel dealers. After examining the results of the contractor evaluation, the customer signs the terms and conditions form and requests installation of the measures they want. If the customer is not the building owner, the owner must sign the owner's consent form. Installations will not take place unless the terms and conditions form or owner's consent form has been signed.

Customers are welcome, but not required, to install all measures recommended by the GMP contractor. If a customer elects to install some but not all of the recommended measures, GMP will fund all of the installed measures. Sometimes recommended measures are not

installed either because they do not fit in the prescribed area, or the customer decides that they do not like the appearance of the proposed measure.

Customers electing to install base package measures (typically lighting, lighting controls, HVAC controls, electrically heated domestic water tank and pipe insulation and water conservation) approved by GMP receive 100% funding for all parts and labor. All such measures are installed by the GMP contractor.

In addition to the base measures identified during the initial evaluation, the contractor also identifies custom energy efficiency measures that the customer and utility might consider. These opportunities are usually identified by the contractor at the time of the initial evaluation and then either GMP or a GMP-contracted engineering firm follows up by running a cost effectiveness analysis of these measures after the site visit. Both GMP and the engineering firm use a GMP-designed, computer-driven, utility benefit to cost ratio test. If the proposed measures have a benefit/cost ratio exceeding one, GMP will buy the measures down to a one-year payback for the customer. GMP places a seven year cap on measure lifetimes. Typical measures installed with a custom package include large motors, refrigeration systems, and HVAC systems. Custom measures are installed by customer-selected contractors. (Note: Incentives are not available for "custom" measures already installed.)[R#3,4,6]

The entire process, from evaluation to installation, typically takes about 1 1/2 months to complete. With base measure packages, approximately 10% of all projects receive a post installation inspection by GMP representatives. Base measures inspections are usually performed within one month after installation. GMP's goal for custom measures is to perform the inspection within five days of notification from the customer that the installation is complete. Base installation packages have made up all of the installations through 1992. GMP is currently dealing with the first few custom installation packages, and plans to perform post installation inspections for all custom packages.

The GMP contractor coordinator (Kemper) is paid on a monthly basis. Their check for the installation work is not cut until all work order data has been uploaded into GMP's tracking system and reconciled against the field work orders.

MEASURES INSTALLED

Measures installed include, but are not limited to energy-efficient lighting, HVAC controls, refrigeration upgrades, fuel switching for water heating and space heating, motors, ventilation, and industrial process improvements.

Measures Installed 1992

Halogen Lamps	2,085
Compact Fluorescents	6,544
T 12 Lamps	10,435
T 8 Lamps	5,392
High Pressure Sodium Lamps	1
Exit Signs	476
Pin Socket Replacements	85
Water Heater Wraps	175
Pipe Insulation 1' x 3/4" (ft.)	424
Pipe Insulation 1' x 1/2" (ft.)	462
Low Flow Shower Heads	21
Low Flow Faucet Aerators	115

STAFFING REQUIREMENTS

The GMP Small C&I Retrofit program is administered by Howard Loso, who devotes all of his time to the program. There is also a program coordinator whose workload on the program is 1/3 full time equivalent (FTE). GMP's Commercial/Industrial Manager, Paul Barnett, spends 1/5 of his time on this particular program. GMP has several field service personnel (1 FTE) who perform post installation inspections and custom measure analyses. In addition, GMP has various support staff such as programmers and monitoring and evaluation specialists. In 1992, GMP's contractor (Kemper Management Services) had as many as 20 employees devoted to the program because the program had such heavy initial participation. The contractor scaled back its staff to approximately 15 employees as of January 1993, and it is likely the contract staff will settle at 13 full time equivalents.

MONITORING

The Small C&I Retrofit program is monitored by a database system which was developed internally at GMP. Database information includes measures installed, costs, and resulting energy and capacity savings. This information is collected by the GMP contractor at the time of the post-installation inspection. The GMP contractor gathers and inputs the database information, then transfers the information onto a floppy disk, which is given to GMP at the end of each month. Energy savings are based on engineering estimates performed by GMP.

A report of all of GMP's DSM programs titled the Demand-Side Management Programs 1992 Annual Report summarizes all of the DSM programs conducted by GMP in 1992.[R#8] This report, the first of its kind from GMP, was issued March 1, 1993. Within the report is a brief summary of the Small C&I Retrofit program that includes a description of marketing measures, eligible participants, program history, and program changes. Program expenditures, participation, and energy savings are also included.

EVALUATION

No formal process or impact evaluations have been completed for the Small C&I Retrofit program, although they are currently underway. These evaluations are being performed by Pacific Energy Associates (PEA) of Portland, Oregon. PEA is currently preparing a report outlining staff interview findings, followed by a report on program records. A trending analysis of billing history was conducted by PEA in December 1992. Presently PEA is performing a preliminary persistence of savings study.

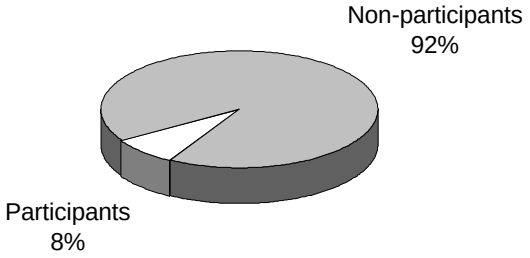
Engineering estimates are used for calculating energy savings based on a simple comparison between the measures that are removed and the new energy-efficient measures that replace them. GMP does not consider free ridership to be an issue with this program (as agreed to within the collaborative planning process), and therefore free riders are not factored into savings calculations. Though the savings are not derated for free ridership, they are presented by GMP as "net" savings. They have been derated for the penalty associated with avoided waste heat effects. Since most buildings in Vermont are heated for at least eight months, removing inefficient lamps, for example, results in a requirement for additional heating to compensate for the loss of the internal heat gain from the inefficient lamps. In this case, GMP's net savings reflect the HVAC "penalty." GMP applies this "penalty" to heat only buildings, but savings from buildings with both heating and cooling are not penalized.

Data Alert: Program savings are based on GMP's Lighting Rated Wattage Table and the facilities' stated hours of operation. Capacity savings reflect coincident peak savings. Savings presented are "net" savings, derated for the penalty associated with reduced waste heat.[R#3]

In 1992 the Small C&I Retrofit program accounted for 3,982 MWh in annual energy savings and 0.826 MW in coincident peak capacity savings. All of these savings can be attributed solely to lighting measures (3,881 MWh and 0.803 MW) and insulation of hot water tanks (102 MWh and 0.023 MW). The 1992 savings are limited to these particular measures because all of the program's initial participants were small retail stores best served by these two types of technology retrofits. Towards the end of 1992, some customers received recommendations for the installation of other types of measures, but these measures were not installed by the end of the year and savings from such measures will be reflected in 1993 program data.[R#3,8]

PARTICIPATION RATES

Program participants are defined as customers who have received installation of energy-efficient measures. Walk-through evaluations for the Small C&I Retrofit program began in May 1992, and the first 28 installations



took place in June 1992. From June 1992 through December 1992 a total of 622 evaluations and 507 installations were performed. The discrepancy between the number of evaluations and installations is a timing issue, virtually all (approximately 99%) of the 1992 evaluations that were not followed with retrofits in 1992 will have retrofits in early 1993. These numbers represent impressive first-year penetration rates as there are 6,500 customers in the GMP service area eligible to participate in the program, creating a first year participation rate of roughly 8%. Energy savings per participant in 1992 averaged 7.9 MWh and 1.6 kW. GMP expects to have 700 installations completed in 1993. If GMP achieves its program goal of 75% participation there will be 4,875 completed installations.[R#3,8]

FREE RIDERSHIP

As agreed to in the collaborative process, GMP does not consider free ridership to be an issue with the Small C&I Retrofit program. As a result program savings are not adjusted for free riders. While GMP did not perform a formal analysis of possible free riders, the utility reasons that their small C&I customers are on such a tight budget that extensive retrofits would not occur in the absence of such a program.

MEASURE LIFETIME

In 1992 GMP assigned a weighted measure lifetime (collaboratively based) of 6.1 years to the Small C&I Retrofit program. GMP purposely assigned what they consider to be a conservative measure lifetime because of the high turnover rate of businesses in the Small C&I sector, along with the tendency of small businesses to frequently remodel. For example a measure with a 6-year lifetime installed through the Small C&I Retrofit program might very well be replaced or removed before 6 years.

It is interesting to note that the measure lifetime used by GMP is much lower than the 15 year lifetime used by New England Power Service Company and Boston Edison Company (see The Results Center Profiles #1 and #31) for their Small C&I Retrofit programs.

PROJECTED SAVINGS

Projected annual savings for the program in 1993 are 2,266 MWh and 0.336 MW. GMP hopes that program savings will exceed the projected savings numbers as they did in 1992 by 1,861 MWh and 0.496 MW. GMP projects lifecycle savings for the program installations to date of 23,892 MWh.

Savings Overview Table	Annual Energy Savings (MWh)	Cumulative Energy Savings (MWh)	Lifecycle Energy Savings (MWh)	Coincident Peak Capacity Savings (MW)	Cumulative Coincident Peak Capacity Savings (MW)
1992	3,982	3,982	23,892	0.826	0.826

Cost of the Program

Costs Overview Table	Administrative (x1000)	Customer Incentives (x1000)	Audits (x1000)	Evaluation (x1000)	Total Program Cost (x1000)	Cost per Participant
1991	$157.1	$0	$0	$3.5	$160.7	$0.00
1992	$206.0	$824.9	$58.1	$18.2	$1,107.3	$2,183.96
Total	$363.2	$824.9	$58.1	$21.8	$1,267.9	$2,500.83

Costs for the Small C&I Retrofit program have totalled $1,267,900 to date. GMP spent $1,107,300 on the program in 1992, and $160,700 in 1991.

COST EFFECTIVENESS

GMP has not performed formal cost effectiveness calculations for the program based on 1992 results. Instead the utility has performed cursory evaluations by comparing actual costs and savings to the projected costs and savings. Cost effectiveness calculations will be performed as part of GMP's impact evaluation. In 1992 actual program expenditures exceeded projected figures by less than 1% while program energy savings almost doubled projections and coincident peak savings were more than 2 1/2 times their projected values.[R#8]

Cost effectiveness calculations were run for each measure individually that is included in the base package. GMP does not technically bundle measures together so that less than cost effective measures are "paid for" by the highly cost effective measures. However, on occasion exceptions are made. For example, if a room has 25 four lamp, four-foot fixtures that qualify for T8s and 3 two lamp, four foot fixtures that do not qualify for T8s, GMP will retrofit these fixtures with T8s to maintain the same technology in the room.

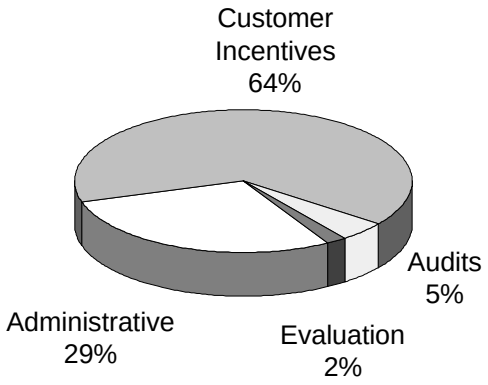
The Results Center calculates that in 1992 the Small C&I Retrofit program had a cost of saved energy, at a 5% discount rate, of 5.48 ¢/kWh.

COST PER PARTICIPANT

In 1991 there were program expenditures but no program participants. In 1992 the GMP cost per participant was $2,184. To date the cost per participant to GMP has been $2,501. Because only base measure packages have been installed so far, there are currently no customer contribution costs for the program.

COST COMPONENTS

The majority of GMP's program expenditures to date (through 1992) can be attributed to customer incentives which total $824,900 or 64% of total costs. Administrative costs total $363,200 (29%), audit costs are $58,100 (5%), and evaluation costs total $21,800 (2%). All 1991 expenditures went towards administrative ($157,100) and evaluation ($3,500) costs.



Cost of Saved Energy Table (¢/kWh)	Discount Rates						
	3%	4%	**5%**	6%	7%	8%	9%
1992	5.13	5.30	5.48	5.65	5.83	6.02	6.20
Total	5.88	6.07	6.27	6.48	6.68	6.89	7.10

Environmental Benefit Statement

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
Coal	**Uncontrolled Emissions**					
A	9,400	2.50%	8,585,000	204,000	41,000	4,000
B	10,000	1.20%	9,155,000	79,000	27,000	20,000
	Controlled Emissions					
A	9,400	2.50%	8,585,000	20,000	41,000	0
B	10,000	1.20%	9,155,000	8,000	27,000	1,000
C	10,000		9,155,000	53,000	26,000	1,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	9,155,000	24,000	13,000	7,000
B	9,400	2.50%	8,585,000	20,000	16,000	1,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	9,155,000	16,000	3,000	7,000
B	9,010		8,235,000	6,000	2,000	0
Gas	**Steam**					
A	10,400		4,993,000	0	11,000	0
B	9,224		4,336,000	0	27,000	1,000
	Combined Cycle					
1. Existing	9,000		4,336,000	0	17,000	0
2. NSPS*	9,000		4,336,000	0	8,000	0
3. BACT*	9,000		4,336,000	0	1,000	0
Oil	**Steam--#6 Oil**					
A	9,840	2.00%	7,227,000	110,000	13,000	12,000
B	10,400	2.20%	7,665,000	109,000	16,000	8,000
C	10,400	1.00%	7,665,000	16,000	13,000	4,000
D	10,400	0.50%	7,665,000	46,000	16,000	3,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	9,593,000	19,000	30,000	2,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	11,389,000	29,000	39,000	9,000

Avoided Emissions Based on 3,982,000 kWh Saved 1992

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

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

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

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

*** Acronyms used in the table**

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

LESSONS LEARNED

The Small C&I Retrofit program achieved a very impressive participation rate of 8% during its first year especially when one considers that the program was only available to the public starting in May 1992. The program also greatly exceeded its first year projected energy and capacity savings. Thus the prime lesson learned is that well-designed, well-implemented programs can have marked success from their start!

GMP has already implemented several changes in an attempt to refine the program. The first change involved "measure installation agreements." Initially, the program's implementation procedures required the use of measure installation agreements as part of the contracting process. This procedure was revised during the final pre-implementation stages to simplify the process. The owner's version of both the base measures installation agreement and the custom measure installation agreement were replaced by the owner's consent form. This change was made to simplify the process and make participation in the program less intimidating to the customer.[R#8]

The second major change involved the future interaction between GMP and the customer regarding the bidding of custom measures. Previously custom measures identified as cost-effective would be proposed to the customer separately from the base measure package. If the customer wanted to pursue a custom measure they were provided with a list of trade allies who could be contacted to provide bids. GMP is currently revising its role such that GMP will be much more aggressive in contacting trade allies to submit bids on custom measures. GMP will act as a facilitator with the involved trade allies to ensure bids are received and evaluated by the customer. These actions will ensure that follow-up is taken once the customer has shown interest in installing a specific custom measure.[R#8]

GMP has also developed Base Measure Minimum Criteria. Operating hour criteria have been finalized for both "conditioned" space (heated and air conditioned) and for "heated only" space. This was done to account for the waste heat effects of lighting on HVAC system loads. For "conditioned" spaces, the positive effects of lighting conversions were estimated to be offset by the negative effects on heating system loads. For "heated only" spaces, winter lighting savings were discounted by 80%. Spaces deemed "unconditioned" (no heating or cooling) have no waste heat adjustment applied.

Similarly GMP developed Custom Measure Identification Criteria. Recognizing that small fractional horsepower motors offer no cost-effective opportunity for savings as a retrofit, the Contractor Coordinator has been instructed to only include motors that are one horsepower or larger with a minimum of 1,000 annual operating hours. This threshold should give motor retrofits the greatest possibility for cost-effectiveness.[R#8]

In order to prevent a potential conflict of interest, GMP used one service contractor to perform installations and evaluations, while using a separate materials supplier. By using such a setup GMP insured that measures would not be sold or recommended based solely on profit margin.

TRANSFERABILITY

GMP feels that it faces some challenges that other utilities might not face when implementing a similar program. GMP is a small utility which simply does not have all of the resources of a large utility. In addition, GMP's service territory consists of small scattered pockets, while many utilities have consolidated service areas facilitating DSM program implementation. Thus it would probably be easier for most other utilities to implement such a program.

Small C&I programs fulfill a niche in a market segment that can rarely afford to perform retrofits in the absence of utility programs. Clearly a program of this nature is quite transferable as many other utilities have successfully implemented Small C&I retrofit programs. See The Results Center Profile #1 (New England Electric System's Small C&I Program), and Profile #31 (Boston Edison's Small C&I Program). These programs, while roughly similar in design have different eligibility requirements and participation scenarios. NEES, for example, requires a maximum demand of 50 kW; BECo requires a maximum demand of 150 kW. GMP, on the other hand, uses energy as the term of reference for eligibility.

Finally, GMP adds a new and innovative wrinkle to standard Small C&I programs in that it incorporates a custom measure buy-down clause. This is not done in either NEES or BECo's programs and seems to be a logical innovation for smaller utilities that cannot afford multiple programs and multiple visits to its customers. Note that PG&E for example (which does not offer a direct installation Small C&I program), offers two separate programs for prescriptive and custom efficiency measures, a position that GMP clearly must avoid in order to keep costs down.

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 we hope will provide useful snapshots of incentive mechanisms being used and tested across the United States.

VERMONT OVERVIEW

Many of the financial disincentives to investments in energy efficiency in Vermont have been removed by regulatory commission orders. The Public Service Board, referred to as the "Board," is the state's regulatory commission, similar to PUCs and PSCs in other states. A second agency, the Department of Public Service has several related functions, one of which is serving as the state's ratepayer advocate and as such intervening in regulatory proceedings before the Board.

Utilities in Vermont are required to submit implementation plans every three years that include integrated resource plans, i.e. plans that consider both supply and demand-side resource acquisitions. In 1990 the Public Service Board made extensive adjustments and refinements to the IRP process and allowed cost recovery of DSM costs. The resulting April 1990 order also established the "ACE" mechanism (Account Correcting for Efficiency) which allowed for the recovery of lost revenues resulting from DSM activities. These costs, which like direct DSM costs are accounted for in an interest-bearing (AFUDC) deferred account until approved in a rate case, are ultimately ratebased and amortized over a five-year period. All program costs deemed by the Board to be "used and useful" are eligible for cost recovery and lost revenue recovery.[R#9,10]

In 1991 a collaborative effort, similar to the collaborative pioneered by the New England Electric System and the Conservation Law Foundation of New England, began in Vermont that included the state's major investor-owned utilities (GMP and Central Vermont Public Service), the Conservation Law Foundation of New England, the Vermont Public Interest Research Group, the Vermont Natural Resource Defense Council, and the Vermont Department of Public Service. The intent of the collaborative was to jointly design and implement comprehensive energy efficiency programs, and to jointly track their progress through careful monitoring and evaluation, and to make any necessary midcourse corrections. In addition, the collaborative would jointly address any regulatory barriers to energy efficiency.

Late in the collaborative process the issue of DSM incentives was raised. Several witnesses in the hearings proposed shared-savings mechanisms (see Profile #41 which presents Niagara Mohawk's shared-savings incentive in detail). Despite the fact that the Department of Public Service adamantly opposed incentives, the Board's sentiment was clearly in favor of incentives, although it stopped short of endorsing any particular mechanism.[R#9]

In September 1990, the state's largest utility, Central Vermont Public Service, filed a proposed shared savings incentive along with its DSM plan. The incentive mechanism was tabled by the Board, pending the submission of a more comprehensive DSM plan, and in the agreement that followed the mechanism was temporarily dropped.[R#10]

GREEN MOUNTAIN POWER OVERVIEW

Green Mountain Power entered the collaborative effort in Vermont with a high degree of caution. GMP was already proceeding with existing and planned demand-side management programs and was concerned that entering the collaborative planning process would slow down those efforts. As part of a rate case settlement in 1989, GMP did agree to join the collaborative and undertake a comprehensive demand-side management planning process. GMP wanted the assurance that if they moved forward in good faith with program plans that had been agreed upon in advance, that they would then indeed recover their costs and not face potential retroactive penalties.[R#9]

What GMP was able to achieve from the Department and the Board was an agreement for a pre-approval

process whereby cost recovery and lost revenue adjustments would be determined proactively, unlike many of the recovery mechanisms used around the United States. By getting all parties in the collaborative to agree up-front to the planned DSM programs and implementation plans (including program designs, incentive levels, free ridership, etc.), their costs, and projected savings, there would be no second-guessing of utility plans and projected savings and the utility could be assured of cost recovery and lost revenue adjustments based on the planned savings. (Naturally, GMP will still be reviewed for prudency to see whether the utility delivered the programs in a manner consistent with the approved program implementation plans or if there was fraud, misrepresentation, or gross mismanagement. While cost recovery is not a lock, the grounds upon which expenditures can be challenged are greatly narrowed.)[R#9]

Under the preapproval systems, even if savings were actually only half or double the planned savings, the cost recovery and lost revenue recovery will still be based on the planned and agreed upon levels. However, the plans are not static. GMP must file any changes in assumptions (for example changes in engineering estimates and thus savings value of a particular technology, or changes in methodology to determine savings), with the Department before being submitted to the Board for approval. Incidentally, parties such as the Department only have a limited time, typically two weeks, to comment or challenge those changes. Only when the Board has formally approved the change do the rules for cost recovery and lost revenue adjustment change, and from that point forward the utility recovers money based on the new rules. No retroactive accounting is conducted – eliminating the possibility of "gaming" with monitoring and evaluation results, protecting GMP and ratepayers from possible disallowances based on new evidence. This proactive approach made it possible for GMP to aggressively pursue DSM and to put 8 new programs "out on the street" in one year with ambitious goals for energy savings.[R#9]

Incidentally, the salaries of the DSM program staff are expensed annually, while the program costs including contractor payments, customer incentives, monitoring and evaluation, etc. are recovered and when approved by the Board are amortized over a five year period. The reason for the split between DSM salaries and other costs was to mitigate any future rate impacts and to lessen the total amount of money in the deferred account. When the DSM salaries were initially expensed, they represented about 25% of total DSM costs. Now, as the programs have been ramped up, the DSM salaries account for only about 10% of the total DSM costs and thus its mitigating effect is considerably less. The use of a five-year amortization period also will have the effect of lessening the annual impact of DSM program costs as they enter the ratebase.[R#9]

In 1991, in a regulatory hearing in which the Board approved GMP's 8 new DSM programs, Green Mountain Power opted to trade the ability to file an incentive mechanism and possibly reap the rewards of such an incentive for the assurance of cost recovery and lost revenue adjustments as described above. Ironically, GMP is now facing the unusual problem of having a rather large deferred account which will not be "emptied" until a rate case. The account currently stands at about $10 million and will grow to nearly $20 million by the end of 1993. Since there are no rate cases planned, staff at GMP are considering requesting that the Board convene a special DSM case to simply rectify the deferred account.[R#9,10]

GMP did not, however, permanently give up the right to file for an incentive, and may file for shareholder incentives in the future. But since GMP is a relatively small utility with limited resources for extensive monitoring and evaluation and for time-consuming regulatory hearings that could potentially be avoided, there is a question of whether an incentive would in fact be a good thing for the utility. Would the costs required to verify savings necessary to receive incentives outweigh the potential benefits of incentives? If so, then of course the quest for incentives would not be at all beneficial.

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