
Western Massachusetts Electric Neighborhood Program Profile #22, 1992

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Executive Summary

The Spectrum Neighborhood Program is a residential direct installation program that began in June of 1991 and provides free, cost-effective electricity conservation services to Northeast Utilities' Western Massachusetts Electric Company (WMECO) residential customers, with a special focus on low income customers. The program is currently offered in urban areas where, in a single visit, technicians install energy-efficient lighting, water heater tank wraps, pipe insulation, faucet aerators, and high-efficiency showerheads. In addition, refrigerator coils are cleaned, air conditioning filters are replaced, and hot water tank thermostat settings are lowered. Each customer is also provided with information on energy conservation.

The Neighborhood program is marketed aggressively to targeted neighborhoods. One to two days after a promotional mailer has arrived, program crews distribute brochures throughout the neighborhood describing the program, repeating the phone number that customers can use to sign up for the service, and informing customers of the time period that the program will be offered. One day after the brochures are distributed, a canvasser travels door-to-door, making appointments with those customers who have not responded by telephone. If possible, the canvasser will make the appointment for the same day. The program van is parked on the street receiving service and a sign is placed next to it informing passers-by of the program and soliciting walk-up appointments.

All crew members carry two-way radios and work within each neighborhood as a team. The radios facilitate communication among installers, and improve the overall efficiency of the installment process, allowing for rescheduling of appointments and requests for replacement supplies. The radios are also helpful in neighborhoods where safety concerns are an issue.

Northeast Utilities estimates that annual savings in 1991 were 564 kWh per participant. With over 4,500 participants, the program saved a total of 2,580 MWh in its first year of implementation. Lifecycle energy savings for the measures installed between the program start in mid-1991 and September, 1992 total approximately 30.7 GWh. To date installers have performed 45 retrofits per day, with each visit taking about 45 minutes. As of September, 1992, 9,144 installations have been completed in the WMECO service territory.

One of the biggest assets of the program is that it takes advantage of the educational opportunity presented to installers. Each time installers enter a home they raise awareness of the value of the energy efficiency measures to both the customer and the utility. In turn, the customers pass along their positive experiences and new-found knowledge to friends and acquaintances in their own and other communities, making the reach of the program extend beyond just the participant group.

Neighborhood Program

Utility: Western Massachusetts Electric

Sector: Residential

Measures: Lighting, water heating, other home energy-efficiency improvements

Mechanism: Direct installation

History: Started in June, 1991.

1992 Program Data

Energy savings: 2.74 GWh

Lifecycle energy savings: 15.9 GWh

Cost: \$461,500

Cumulative Data (1991 - 1992)

Cumulative energy savings: 7.90 GWh

Lifecycle energy savings: 30.69 GWh

Cost: \$891,100

Conventions

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

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

Utility Overview

In June and July of 1992 Northeast Utilities (NU) greatly expanded its role in New England as an electricity supplier when it successfully completed a buyout/merger of the bankrupt Public Service Company of New Hampshire. The acquisition has added 5,445 square miles to NU's prior service territory of 5,890 square miles (4,400 square miles in Connecticut and 1,490 square miles in Massachusetts). For the sake of this section and the next, data is reported that reflects NU prior to the addition of PSNH's service territory and assets.

Prior to July of 1992 NU was a holding company which maintained three electric operating subsidiaries:

The Connecticut Light and Power Company (CL&P),

Western Massachusetts Electric Company (WMECO),

Holyoke Water Power Company.

The service territory of these three subsidiaries is divided into six operating regions, five in Connecticut and one in Massachusetts. Generally, each region is further subdivided into three districts. Each of which has its own management office and personnel. Districts generally contain between three and twenty towns, with a total of 25,000 to 120,000 customers in each district.[R#1] Most of these divisions existed as the service territories of NU's predecessor utilities. In the next few years, the regions and possibly the districts will be restructured.

NU 1991 STATISTICS

Number of Customers	1,264,928
Energy Sales	29,300 GWh
Revenue from Energy Sales	\$2.753 billion
Summer Peak Demand	5,000 MW
Net Capacity Available	5,941 MW
Reserve Margin	18.81%
Average Electric Rates	
Residential	10.45 ¢/kWh
Commercial	9.3 ¢/kWh
Industrial	8.5 ¢/kWh

NU's service territory is undergoing a transition from a heavy manufacturing base to a high-tech and service-related base. The commercial sector is thus becoming NU's fastest growing load component, both in numbers of customers and in demand per facility. While the commercial sector represents less than 10% of NU's total customers, it accounts for more than 30% of total electric sales. Data from 1990 illustrates the large growth of the commercial sector. Commercial electricity consumption rose 2.5% in 1990, much larger than the rise in total electric sales which was a modest one-fifth of one percent.[R#2] In 1991, however, commercial and total electric sales dropped by .9% and 1.1% respectively.[R#3]

Utility DSM Overview

In 1980, NU began offering conservation services under an umbrella DSM program called, The 80's and 90's Program. The program was mostly informational and geared to the residential sector. In 1986 NU shifted the focus of its umbrella DSM program from the residential sector to the commercial and industrial sectors and changed its name to Energy Alliance. The utility came to understand that the C/I sectors had the potential for achieving greater energy savings with fewer buildings (customers) and at lower cost per kWh than did the residential sector. Later, during the Connecticut rate case proceedings of 1987, the now famous New England Collaborative Process was born. In its Western Massachusetts Electric Company, (WMECO) service territory, NU entered into an ongoing, collaborative DSM program planning process with the following organizations:

the Attorney General of the Commonwealth;
 Massachusetts Public Interest Research Group;
 the Executive Office of Energy Resources; and
 the Conservation Law Foundation of New England.

The first year of the collaborative process, 1988, was a very important transition year for DSM at WMECO, with the development and initiation of new planning tools for DSM.

Utility DSM Overview Table	DSM Expenditure (\$1000)	Annual Energy Savings (GWh)	Annual Summer Capacity Savings (MW)
1981	\$0	20.6	2.2
1982	\$8,775	54.1	9.7
1983	\$8,462	57.2	10.2
1984	\$9,816	60.8	11.3
1985	\$9,645	60.9	12.1
1986	\$16,344	58.7	12.3
1987	\$17,098	77.7	10.3
1988	\$18,047	62.8	108.7
1989	\$24,240	58.1	11.6
1990	\$49,351	148.5	29.4
Total	\$161,777	659.5	217.9

CURRENT DSM PROGRAMS AT WESTERN MASSACHUSETTS ELECTRIC COMPANY

RESIDENTIAL

Mass-Save Energy Conservation Services

Energy Value Water Heating

Energy Crafted Home

SPECTRUM

Electric Heat-Single Family

Electric Heat-Multifamily

Public Housing Authority

Domestic Hot Water

Neighborhood Program

Lighting Catalog

Appliance Pick-up

COMMERCIAL / INDUSTRIAL

Energy Saver Lighting Rebate Program

Energy Action Program

Energy Conscious Construction

Energy CHECK Conservation Services

Customer Initiated Program

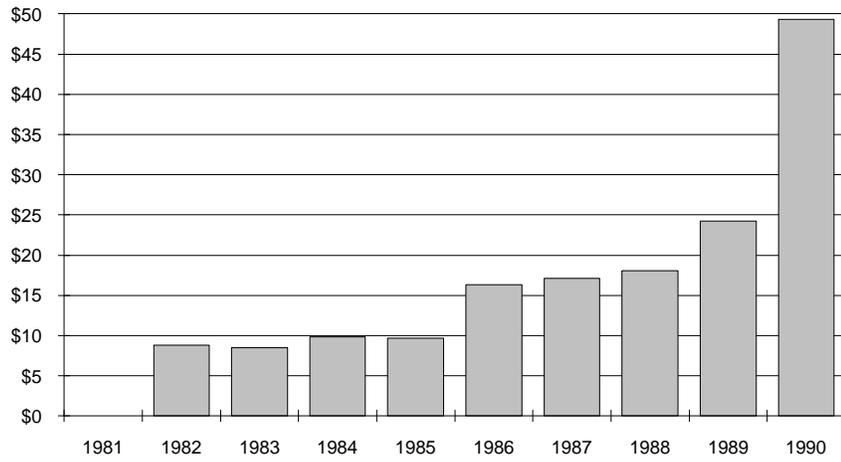
Streetlight Conversion

The collaborative's program planning concentrates on three large customer groups: 1) residential, 2) low-income residential, and 3) commercial/industrial. Services formerly offered under separate programs have, in many cases, been packaged into comprehensive programs aimed at specific target customer groups within each market sector. This approach allows for better target marketing of customers who have similar efficiency needs, barriers, and adoption requirements.

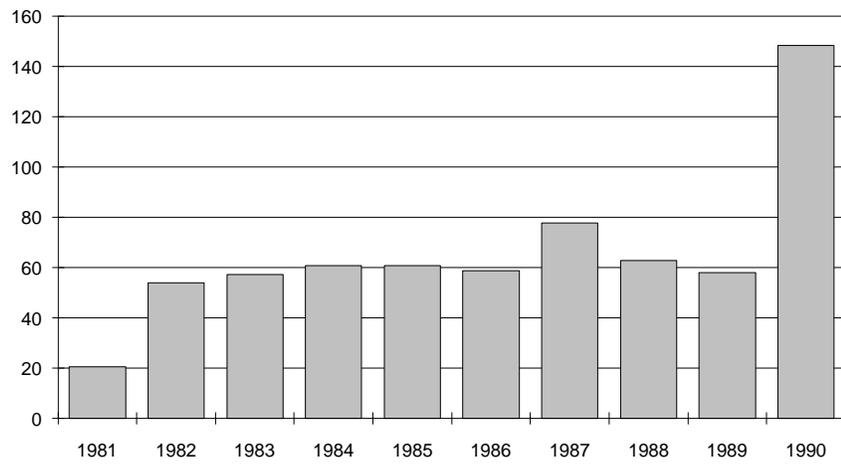
The primary issues addressed by the collaborative include DSM program design, implementation, cost effectiveness, recovery of DSM expenditures, program monitoring and evaluation, and resource planning.

NU is pursuing DSM from a position of surplus capacity. The need for new generating capacity is not projected to occur until 2005. By the summer of 2001 and the winter of 2001/02, NU's DSM resources are projected to provide 875 MW and 946 MW, respectively, 9.8% and 10.1% of the total required capacity. By the summer of 2011 and the winter of 2011/12, DSM resources are projected to provide 1,270 MW and 1,305 MW, respectively (11.3% and 11.2% of the total required capacity).[R#3]

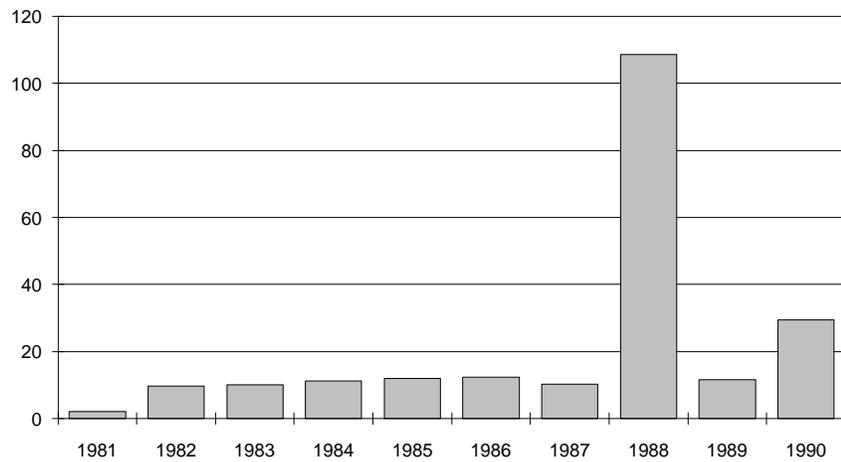
**ANNUAL DSM
EXPENDITURE
(\$1,000,000)**



**ANNUAL ENERGY
SAVINGS (GWH)**



**ANNUAL SUMMER
CAPACITY SAVINGS
(MW)**



Program Overview

The Spectrum Neighborhood Program is a residential direct installation program started in June 1991 by the Western Massachusetts Electric Company (WMECO). Its objective is, "to achieve measurable energy savings for both the customer and the utility company through the installation of lighting, water, and appliance efficiency measures in customers' homes." [R#10] This goal is achieved by providing free, cost-effective electricity conservation services to WMECO residential customers. The Spectrum Neighborhood program, which is planned to continue through 1998, was managed for the first two years on contract by Conservation Services Group, an energy service company that specializes in residential weatherization located in Boston, Massachusetts.

The program is currently offered to residential customers in WMECO's urban service areas. All residential customers residing within target areas, regardless of their housing type, heating fuel type, whether they rent or own their residence, or what their actual income is, are offered the opportunity to participate in the program. To insure service

to low-income customers, geographic areas are selected through a coordinated effort by NU's Regional Conservation and Load Management and Regional Community Relations Departments. Areas where average income is below 175% of the Federal Poverty Index are targeted.

The program is designed to deliver several electric efficiency measures in a single visit, including energy-efficient lighting, water heater tank wraps, pipe insulation, faucet aerators, and high-efficiency showerheads. In addition refrigerator coils are cleaned, air conditioning filters are replaced, and hot water tank thermostat settings are lowered. Each customer is also provided with information on energy conservation. [R#5,13]

Implementation

MARKETING AND DELIVERY

The Neighborhood Program has been marketed and delivered solely by one contractor. Through 1992, the contract has been held by Conservation Services Group (CSG), though NU will award a new contract for 1993.

Target neighborhoods are identified by WMECO and include most areas where the average income is less than 175% of the Federal Poverty Index. All residents in a neighborhood are eligible to participate, including single- and multi-family dwellings, electric, oil or gas-fired space and water heated residences, and both owner-occupied and rental units.

The installation crew spends from one to two weeks in each target neighborhood, depending on the size of the area. First, customers are given several opportunities to be informed of the program and to make an appointment for a weatherization treatment. The initial contact is made through a postcard or brochure that is mailed directly to customers' residences. The mailer describes the program in simple language and invites customers to call a local phone number for an appointment. Where appropriate, these marketing materials are provided in Spanish.

One to two days after the mailer has arrived, program crews distribute brochures throughout the neighborhood, again, describing the program and repeating the phone number, and informing customers of the time period that the program will be offered. One day after the brochures are distributed, a canvasser travels door-to-door, making appointments with those customers who have not responded by telephone. If possible, the canvasser will make the appointment for the same day. An installer is radio-dispatched after the canvasser informs the crew chief of an appointment. The program van is parked outside during the installation, and a sign is often placed next to the van, informing passers-by of the program and soliciting walk-up appointments.

During the appointment, installers spend a great deal of time speaking with the customers and explaining the rationale behind the program. Customers are often skeptical of the program and must be convinced that there are no strings attached and that the products being offered are truly beneficial. CSG crews have found that by explaining that NU benefits from the program by avoiding the cost of new power plants, a customer's apprehension is generally alleviated and the installation can proceed.

Safety concerns are an issue when installers enter some neighborhoods. Thus, all crew members carry two-way radios and work within each neighborhood as a team. (The radios are primarily used for communication with the crew chief -- rescheduling appointments, reporting no-shows, and ordering additional supplies.) CSG reported one incident in which an installer was threatened but was able to use the radio to contact a nearby canvasser, who called the police for assistance. Community police officers and community leaders are contacted prior to the implementation of the program in a neighborhood, and their help is enlisted in identifying potential problems.

CSG has also utilizes the assistance of neighborhood and community groups in advertising the Neighborhood Program. Program brochures and displays have been erected in community centers. Also, these centers have provided interpreters and assistance with translation of written materials.[R#6]

Quality assurance inspections are conducted by the Regional Conservation and Load Management Department of WMECO. Approximately 5% of the jobs are inspected for quality assurance.[R#5]

Implementation (continued)

MEASURES INSTALLED

All customers are provided with energy-efficient appliance information, a lighting catalog (See Profile#21), and basic information on conservation and efficiency.

The number of additional measures installed varies depending on the electrical end-use devices present in the home. Generally, compact fluorescent lamps are installed in place of incandescent bulbs, and refrigerator and freezer coils are cleaned. If there is a room or central air conditioner, the coils are cleaned and the filters replaced.

Additional measures are installed where electric water heaters are used. Water heaters are wrapped with an insulation jacket, water-efficient showerheads and faucet aerators are installed, and up to 8 feet of pipe insulation are installed on the hot water distribution pipes. In addition, with customer approval, the installer sets back the hot water tank's thermostat to 120°F (49°C). If the installer observes the need for more comprehensive weatherization measures, the customer's name is referred to the Regional Conservation and Load Management Department for referral to the appropriate program. (Through its Mass-Save Energy Conservation Services and the other SPECTRUM components, WMECO offers comprehensive weatherization services and assistance to its residential customers.) [R#10,12]

STAFFING REQUIREMENTS

Northeast Utilities Conservation and Load Management (C&LM) staff, located at the headquarters near Hartford, Connecticut, are responsible for establishing material and installation specifications, and soliciting and selecting the implementation contractor. NU staff perform all program impact and process evaluations as well. Fifty C&LM staff are responsible for implementation and evaluation of all residential, commercial, and industrial programs. Of these, 7 are responsible for the 22 residential programs; the Neighborhood Program is just one of the programs they are responsible for.

The Regional C&LM staff coordinates program activities, monitors and coordinates contractor activities, and maintains contact with Regional Customer Service Centers. Additionally, the regional C&LM staff is the direct contact for customer questions and concerns and is responsible for quality assurance inspections and contractor billing approval. The C&LM staff works in conjunction with the Regional Community Relations Department to identify target neighborhoods and to develop specialized marketing and outreach activities. Part of one person's time, or approximately 0.4 FTE, is spent to implement the program on a regional level.

The installation crew at CSG consists of a crew chief, a canvasser, and five installers, for a full time equivalent count of seven. Crew members undergo a two-day training prior to their first assignment. The training is administered by CSG and emphasizes the role of the installers and canvassers in educating and motivating the customers. As representatives of NU, the crew must also be able to communicate about NU's overall conservation and load management programs, thus these programs are also discussed in the training. [R#5,10]

Monitoring and Evaluation

MONITORING

The crew that performs the installations must complete a work sheet after each installation. The tracking forms contain specific information on measures installed in each home, measures that were replaced, (i.e. type and wattage of light bulbs), housing stock information, and demographic data, such as number of people who live in each household and their income levels. Typically, about one-half of those participants who provide income information have incomes that fall below the 175% level. About 25% of the program participants, however, do not provide income information, so the actual number meeting the low-income definition is likely to be greater. All information collected by the installers is entered into a database that was designed by NU.[R#13]

EVALUATION

A telephone and on-site survey was completed for the Neighborhood Program by the Bourget Research Group in October, 1991, a mere four months after the program's inception. The primary purpose of the study was to collect data to provide input to engineering estimates of annual and lifetime energy savings from measures installed. The study focussed on lighting, but some information regarding water heating measures was also collected.

The study was based on surveys of 435 Neighborhood Program participants and 403 non-participants. The survey found that 98% of the lighting measures installed during the program were still in use four months after the program had started. Average daily use of lighting products was 5.6 hours, which was not significantly different from the estimated hours of use for lighting products that had been replaced. The study found that estimated household gross savings attributable to the lighting measures may be greater than the program planning estimates, which were based on an assumption of 4 hours of daily use. Thus, the survey estimated annual savings of 515 kWh/household due to lighting, while program plans estimated 356 kWh/household for lighting measures. The most commonly installed bulbs were 13 and 18 watt, at 35% and 46%, respectively. The survey also revealed that 91% to 100% of the domestic hot water energy conservation measures installed as part of the program were still in place.[R#11]

The survey also evaluated customer demographics, and the persistence of the installed measures. Of the 435 program participants surveyed, almost 60% were in 2 to 4 family dwelling units, and 55% were renters. Only 3% of the program participants' homes in the survey had electric space heat, and 9% had electric water heat. Between 91% and 96% of the hot water heating measures that were installed as part of the program remained in place, and 98% of the lighting products installed were still in use at the time of the survey.[R#11]

In the fall of 1992, NU awarded a contract for a process and impact evaluation. The evaluation will include an assessment of program implementation, as well as inputs to engineering estimates. The evaluation will be completed in the spring of 1993.

DATA QUALITY

The survey completed for the Neighborhood Program suggests that the program's initial savings estimates may have been conservative. However, while the survey results, which were based on interviews as opposed to end-use metering, may be valid, they are not immediately verifiable.[R#11] Subsequent to finalization of the report, decisions were made to use some of the survey findings to improve engineering assumptions. The 2% removal rate of lighting measures, and other findings such as daily hours of use and wattages removed were incorporated into the engineering estimates.[R#13]

Based on the survey findings, the annual estimated savings in 1991 were 564 kWh per participant, with lifetime savings of 3,239 kWh per household. The 1992 savings figures are based on estimates provided by NU.[R#13]

The 1991 survey results indicated that energy savings could be as high as 644 kWh per participant. The higher savings would be due primarily to differences among estimates for hours of use of lighting products.[R#11] Any corresponding increase in annual energy savings would, however, be accompanied by a decrease in the calculated lifetime, so lifecycle savings would not change.

Program Savings

Savings Overview Table	Annual Energy Savings (MWh)	Cumulative Energy Savings (MWh)	Lifecycle Energy Savings (MWh)
1991	2,580	2,580	14,822
1992	2,737	5,317	15,867
Total	5,317	7,897	30,689

[R#13]

Based on the results of the survey of 1991 participants and estimates for 1992, annual savings for the program have totalled 5,317 MWh for the period 1991 to 1992. Annual savings have averaged 582 kWh per participant for the period. Lifecycle savings for the two years are estimated at 30,689 MWh. Capacity savings have totalled approximately 2.8 MW.

Bulbs	7 years
Exit signs	5 years
Showerheads	10 years
Aerators	10 years
Pipe insulation	25 years
Temperature setback	7 years
Refrigerator coil	2 years
A/C filters	2 years

MEASURE LIFETIME

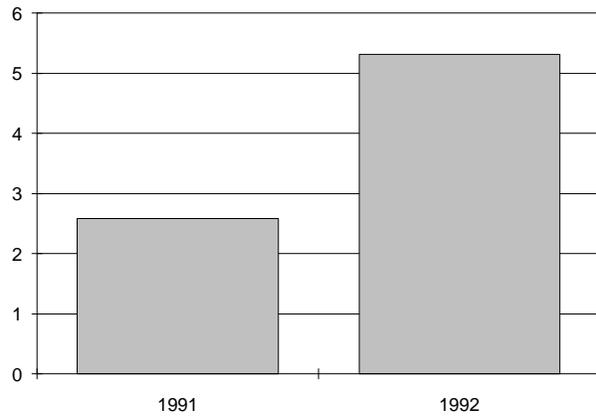
For program planning purposes, NU estimated measure lifetimes for each of the measures installed through the Neighborhood Program as shown. The life of compact fluorescents is based on 4 hours of use per day, and exit signs and fixtures are based on 18 hours of use per day.

NU used 5.74 years in 1991 and 5.79 years in 1992 for the average lifetime of the measures installed through the Neighborhood Program. [R#13]

ANNUAL ENERGY SAVINGS (GWH)



CUMULATIVE ENERGY SAVINGS (GWH)



PARTICIPATION

As part of their contract with NU, CSG is required to attain at least 50% participation in each neighborhood.[R#11] (The 50% participation goal will be part of the contract that will be signed with whomever is awarded the 1993 contract.) Additionally, the goal of 45 appointments per day has generally been attained. Each appointment takes about 45 minutes, and five installers are at work simultaneously.[R#13]

Through September 1992, 9,144 installations have been completed under the Neighborhood Program.[R#13]

PROJECTED SAVINGS

With approximately 8,500 installations per year, 582 kWh annual energy savings per installation, and 5.8 years average lifetime, the lifecycle savings achievable by this program are about 28.7 GWh per year. That is, for each year the program remains in operation, 28.7 GWh in lifecycle savings will be accumulated.

Participation Table	Participants	Annual Energy Savings per Participant (kWh)
1991	4,576	564
1992	4,568	599
Total	9,144	

[R#13]

SAVINGS PER PARTICIPANT (kWh)

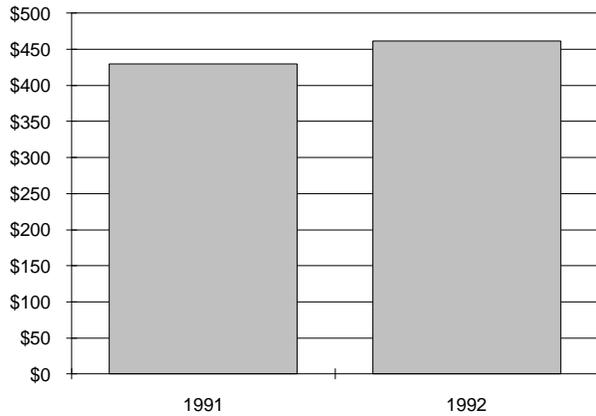


Cost of the Program

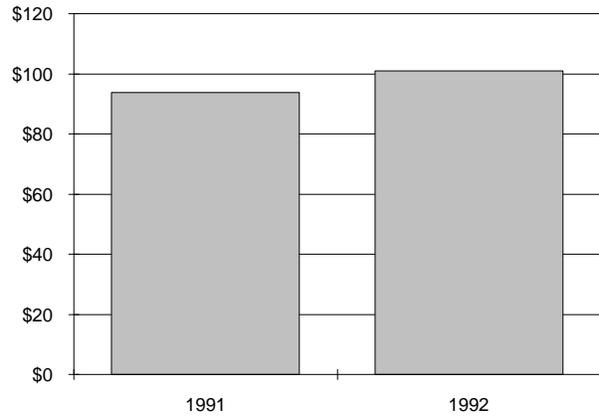
Costs Overview Table	Administration (x1000)	Supplies (x1000)	Marketing (x1000)	Other Costs (x1000)	Total Program Cost (x1000)	Cost per Participant
1991	\$137.5	\$275.0	\$8.6	\$8.6	\$429.6	\$93.89
1992	\$147.7	\$295.3	\$9.2	\$9.2	\$461.5	\$101.02
Total	\$285.2	\$570.3	\$17.8	\$17.8	\$891.1	

[R#13]

TOTAL PROGRAM COST (x1,000)



COST PER PARTICIPANT



Cost of Saved Energy Table (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%
1991	3.17	3.27	3.38	3.48	3.59	3.70	3.81
1992	3.21	3.31	3.42	3.53	3.64	3.75	3.86

Total program costs to date have been \$891,100. These costs include administration, contractor payments, marketing, and materials.

COST EFFECTIVENESS

NU determined cost of energy saved, including societal benefits, at 2.29 ¢/kWh. [R#13] The Results Center calculations for the cost of saved energy at various discount rates are shown in the Cost of Saved Energy table. These costs are higher than NU's determination because no societal benefits have been incorporated. At 5%, The Results Center calculation is 3.38 ¢/kWh for 1991, and 3.42 ¢/kWh for 1992.

COST COMPONENTS

Program costs are approximately 32% for administrative costs, 2% for marketing, 64% for supplies and measure installation, and 2% for miscellaneous costs.

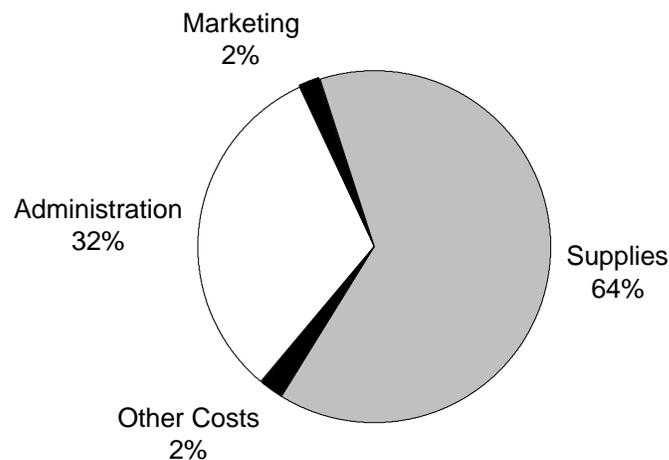
COST PER CUSTOMER

The Results Center calculates costs per participant in the Neighborhood program based on total NU costs to implement the program. In 1991, the cost per customer was \$94, and the cost per customer was \$101 in 1992.

FREE RIDERSHIP

Like most other low-income programs, the Neighborhood Program has a low incidence of free-riders. The marginal expense of the comprehensive package of measures installed precludes the possibility that many customers would have installed the measures on their own. Additionally, NU has found that most landlords demonstrate little interest in investing in electricity-saving technologies, as the bills are generally paid by the residents.

The survey conducted in October, 1991, included a preliminary analysis of free-riders. The survey found that 3% of the customers interviewed indicated that they had purchased compact fluorescent bulbs and fixtures, and high pressure sodium fixtures prior to the implementation of the Neighborhood Program. The survey, however, did not address whether the products purchased could actually be classified as energy-efficient, nor did it determine whether the households were likely to purchase and install all of the energy-efficient products that were included in the Neighborhood program. NU plans to evaluate free-ridership more completely in future studies. [R#11]



Environmental Benefit Statement

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

A	9,400	2.50%	17,026,000	404,000	82,000	8,000
B	10,000	1.20%	18,155,000	156,000	53,000	39,000

Controlled Emissions

A	9,400	2.50%	17,026,000	40,000	82,000	1,000
B	10,000	1.20%	18,155,000	16,000	53,000	3,000
C	10,000		18,155,000	104,000	52,000	3,000

Atmospheric Fluidized Bed Combustion

A	10,000	1.10%	18,155,000	48,000	26,000	13,000
B	9,400	2.50%	17,026,000	40,000	33,000	2,000

Integrated Gasification Combined Cycle

A	10,000	0.45%	18,155,000	32,000	5,000	13,000
B	9,010		16,331,000	12,000	4,000	1,000

Gas Steam

A	10,400		9,903,000	0	23,000	0
B	9,224		8,600,000	0	54,000	3,000

Combined Cycle

1. Existing	9,000		8,600,000	0	33,000	0
2. NSPS*	9,000		8,600,000	0	16,000	0
3. BACT*	9,000		8,600,000	0	2,000	0

Oil Steam--#6 Oil

A	9,840	2.00%	14,333,000	217,000	26,000	24,000
B	10,400	2.20%	15,202,000	215,000	32,000	16,000
C	10,400	1.00%	15,202,000	31,000	26,000	8,000
D	10,400	0.50%	15,202,000	90,000	32,000	5,000

Combustion Turbine

#2 Diesel	13,600	0.30%	19,024,000	38,000	59,000	3,000
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Refuse Derived Fuel

Conventional	15,000	0.20%	22,585,000	58,000	77,000	17,000
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Avoided Emissions Based on 7,897,000 kWh Saved (1991-1992)

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 NU's level of avoided emissions saved through its Neighborhood 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 includes a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

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

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

* Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

Lessons Learned / Transferability

LESSONS LEARNED

In slightly more than one year, the Neighborhood Program has proven to be a great success. With more than 9,000 installations, NU has provided an important segment of its customer base with valuable energy-saving products and information. Perhaps the most important facet of the Neighborhood Program is that it takes advantage of the educational opportunity presented when the installer is invited into a customer's home. As customers in a community participate in the program, they will pass along their positive experiences and new-found knowledge to acquaintances in their own and other communities, making the reach of the program extend beyond just the participant group.

NU's Neighborhood Program has made good use of the lessons learned from predecessor programs across the U.S. The multi-step process by which installers inform residents of the program and the ways that they can participate is successful and efficient. The flexibility of the program to accept changes in the process has ensured that the program will continue to be implemented in the best possible manner.

Installers are well prepared for the unique challenges that face them as they attempt to enter peoples' homes and install energy-efficient technologies unfamiliar to many of the residents. The marketing piece, which originally was complex and detailed, was simplified and made more visually exciting, and proved to be more enticing to customers. Installers are also learning how best to make use of each community's special resources in an effort to maximize participation rates. The inclusion of community members in the program implementation, as interpreters, translators, and advisors, has been valuable, lending a spirit of fellowship to the Neighborhood Program.

The program's education element has undoubtedly helped the program attain the low removal rate for the measures installed. Participants surveyed several months after the program had started indicated that they had not removed most of the measures that had been installed.

Additionally, 46% of the survey respondents indicated that they intended to make additional purchases of energy-efficient products within the coming year. These results clearly indicate that the Neighborhood Program is well on its way toward achieving its goals of influencing customer energy-use behavior and achieving significant persistent energy savings in low-income areas. Additionally, by referring customers to other WMECO DSM programs for which they may be eligible, the number of these customers who will participate in the more comprehensive weatherization programs is likely to increase.

TRANSFERABILITY

Low-income community weatherization programs have been implemented successfully in a variety of locations across the United States. In order to provide energy efficiency to low income customers, experience has shown that direct installation is very effective and perhaps the only viable route.

NU's program does not include the installation of water heater efficiency measures in homes that do not have electric water heating. NU continues to attempt to enlist the cooperation of the local gas utility, as was done in United Illuminating's Homeworks program (See Profile#15), to take advantage of the opportunity to install all possible energy-efficiency measures at the time of the installer's visit. Since only about 5% of the homes in New England use electricity for water heating, there is a great opportunity for significant additional savings by coupling the electric utility's program with that offered by a gas utility if possible.

Regulatory Incentives and Shareholder Returns

Western Massachusetts Electric's Spectrum Neighborhood program is eligible for regulatory incentives and shareholder returns like all of the company's DSM programs. The following is a brief review of DSM in Massachusetts from the perspective of how DSM expenses have been accounted for, cost recovery, lost revenues, and special incentive mechanisms.

The Massachusetts Department of Public Utilities (DPU) has eliminated virtually all financial barriers to DSM by allowing all utilities in the state to recover DSM program costs and approving a mechanism for lost revenue recovery proposed by Western Massachusetts Electric Company (WMECO). In 1990, and again in 1991, the DPU approved shareholder incentive mechanisms for the state's two largest investor-owned utilities, WMECO and Massachusetts Electric Company (MECO). [R#11]

DPU orders in 1988, 1989, and finalized in 1990 established an IRP process based on competitive all-source bidding. The DPU instituted a collaborative process among utilities and interveners for the design of utility DSM programs in August of 1988. Utilities are required to submit annual resource plans to the DPU which consider DSM programs on a level playing field with supply-side resources. [R#11,15]

Utilities in Massachusetts may expense or capitalize DSM expenditures. Each utility must propose to the DPU the specific treatment that it prefers. Beginning in 1991, the DPU ordered each electric company to institute a separate conservation charge to collect all DSM related costs, including incentives and lost revenues that can be reconciled. [R#11,15]

The DPU expects that after sufficient time to evaluate a full year's program experience, the utilities should move to a performance-based recovery system of cost recovery. MECO and WMECO were ordered to include in their proposed preapproval contract for 1992 a recovery mechanism that ties cost recovery to actual savings performance.

WESTERN MASSACHUSETTS ELECTRIC'S INCENTIVE MECHANISM

The incentive mechanism available for WMECO's DSM programs is based on the savings that the programs produce for ratepayers. The Massachusetts Department of Public Utilities (DPU) approved WMECO's incentive structure based upon the idea that an "incentive bonus should not be based only on dollars spent since this rewards the Company for spending money rather than producing savings." The Massachusetts DPU, therefore, allows WMECO to collect an incentive based upon measured energy and capacity savings. The incentive is equal to 5% of the net benefits of the program after achieving at least 65% of the savings. (Net benefit is defined as the difference between total cost, including customer cost, and total benefits, and does factor in environmental externalities which are based on the company's proxy power plant which drives avoided cost.) [R#6,14,15]

Prior to each program year, the incremental values of each kWh and kW of capacity saved are set, as well as a target savings level for the program. The utility can only earn an incentive if it has achieved at least 65% of the target savings. Beyond 65%, WMECO earns a fixed amount for each measured kWh and kW saved. The incentive structure is designed so that if WMECO achieves 35% above the threshold, which equals 100% of the target savings level, it will receive the full target incentive. If WMECO achieves 135% of the target savings level, it will have doubled the amount of savings on which an incentive is available and, similarly, it will have also doubled the incentive which it will earn. [R#7,8,9,15]

If WMECO spends more than it has budgeted for the program, the threshold before which it can earn an incentive rises proportionately. The value of each kWh and kW saved is constant throughout the program year, regardless of threshold increases. Programs that do not meet the threshold are simply ineligible for incentives; there is no further penalty. [R#7,8,9]

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