Boston Edison

Large Commercial & Industrial Retrofit

Profile #116

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Executive Summary

Boston Edison's Large C/I Retrofit program for customers that have an average monthly demand greater than 150 kW is an example of a highly sophisticated, but "conventional" incentive-based DSM program. While its generous direct incentives may soon be a thing of the past, many of its program design elements – such as market segmentation, financing options, and verification guidelines – will likely be highly applicable to future programs that will serve both customers' needs and shareholder profitability in the future.

The Large C/I program exemplifies a refined approach to market segmentation and customer financing options. For instance, a customer can elect one of three program tracks depending on the complexity of his or her retrofit. The program is further subdivided based on whether or not the customer is an institutional or non-institutional customer, since institutional customers tend to have even more restricted access to capital than their private-sector counterparts. Furthermore, while the utility has been increasing the required customer contribution over time – and BECo plans to require a 100% customer contribution by the year 1998 – customers have had two basic fundamental options: They can either utilize the program's 100% financing option and receive smaller incentive rebates, or they can finance the retrofits independently and collect a commensurately larger incentive. In fact, staff consider three important parameters for incentive payments: who pays for audit costs, the timing of payments, and incentive levels. Institutional customers, for example, can finance audit costs. Non-institutional customers, on the other hand, receive incentive payments based on quarterly verification of program savings.

The Large C/I program also has had a heavy emphasis on metered savings using BECo's Verification Guidelines, a protocol for establishing confidence in program savings. BECo, like many utilities, is moving away from engineering estimates of savings and now demands greater accuracy and consistency from savings. (A BECo evaluation of school retrofit savings suggested that the utility expected nearly twice the level of savings than it actually achieved.) Thus BECo has placed a great deal of attention on determining "net savings" using rigorous in-house and external evaluations and "true-ups" in subsequent years. Free ridership, for example, has been backed out of program impacts. Through the true-ups BECo has squarely addressed persistence of installed measures. Furthermore, the utility has maintained a keen interest in programs' load shape impacts.

Despite the program's basic transition, it has nevertheless racked up impressive impacts. During 1992 and 1993 alone, the program resulted in annual energy savings of 32 GWh and nearly 8 MW of capacity from a total, two-year expenditure of just $28 million. Lighting accounted for 79% of the savings. The commercial sector contributed nearly 80% of the total savings; within the commercial sector, colleges provided the majority of the savings followed by offices.

BOSTON EDISON COMPANY
Large Commercial and Industrial Retrofit

Sector:	*Commercial, Industrial*
Measures:	*Lighting, heating, and cooling systems; ventilation, motors, refrigeration, industrial processes, and energy management systems*
Mechanism:	*Institutional customers receive rebates after confirmed retrofit savings; non-institutional customers receive progress incentives on a quarterly basis*
History:	*Began DSM initiatives in 1981; created separate DSM planning group in 1984; formed the Pricing, Research, and Evaluation Group in 1993*

1993 PROGRAM DATA

Energy savings:	*22,027 MWh*
Capacity savings:	*6.25 MW*
Lifecycle energy savings:	*194,227 MWh*
Cost:	*$14,703,300*

CUMULATIVE DATA

Energy savings:	*41,501 MWh*
Lifecycle energy savings:	*280,087 MWh*
Capacity savings:	*7.88 MW*
Costs:	*$28,483,500*

CONVENTIONS

For the entire 1994 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 U.S. Federal Reserve's foreign exchange rates.

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.

Incorporated in 1886, Boston Edison Company (BECo) is a public utility which provides electricity to an area of approximately 590 square miles including the City of Boston, Massachusetts and 39 neighboring cities and towns. In 1994 BECo served 651,141 customers in an area with a population of over 1.5 million. The utility has steadily decreased its number of employees from 4,540 in 1992, to 4,404 in 1993, to 4,026 in 1994. Since 1990, the utility's workforce has been reduced mainly through attrition by over 712 positions, or 15%. BECo plans to decrease the number of employees to 3,600 by the year 2000 as part of its cost-cutting initiatives.[R#20]

Electricity sales totaled $1.36 billion for Boston Edison in 1994, a 4.5% increase over 1993. Total energy sales for 1994 were 16,884 GWh. Total retail sales for the year accounted for 75% of this, or 12,516 GWh, with the commercial sector purchasing the greatest amount at 7,478 GWh (49% of total). Residential customers purchased 3,534 GWh (29%) and industrial customers bought 1,539 GWh (10%). Total retail sales for 1994 increased 1%. This increase was in line with the years from 1988 to 1990 during which sales increased annually by at least 0.2% with a high of 4.8% in 1988. Declining sales in 1991 and negative load growth in the next few years reflected the severe impact of the recession on New England. By 1994, as the economy rebounded the commercial sector had the greatest growth in electricity sales at 3.0%. Residential growth for 1994 was 1.6% while the industrial sector dropped 2.5% in sales.[R#20]

Boston Edison generated 9,429 GWh of the total 1994 output from its own facilities. Of the utility generated power, 68% came from fossil fuels and 32% came from nuclear power generated at the Pilgrim Nuclear Station, a 670 MW facility located in Plymouth, Massachusetts. Peak demand in 1994 was 3,306 MW at which time the generating capacity was 3,485 MW, leaving a reserve margin of 5.3%. Residential rates are BECo's highest at 10.35 ¢/kWh. Commercial and industrial rates for 1994 were roughly 9.01 ¢/kWh.[R#20]

BECo 1994 STATISTICS

Number of Customers	*651,141*	
Number of Employees	*4,026*	
Electric Revenues	*$1.36*	*billion*
Energy Sales	*16,884*	*GWh*
Summer Peak Demand	*3,306*	*MW*
Generating Capacity	*3,485*	*MW*
Reserve Margin	*5.3*	*%*
Average Electric Rates		
Residential	*10.35*	*¢/kWh*
Commercial	*9.01*	*¢/kWh*
Industrial	*9.01*	*¢/kWh*

BECo's current challenge, like utilities across the United States, is to address intensified competition. To do so the company is concurrently reducing costs while improving service to both wholesale and retail customers. BECo is actively marketing new electric technologies, products, and services to its customers to improve their operations and help the environment. BECo has pursued electricity related business opportunities through its first unregulated subsidiary, the Boston Energy Technology Group. Through this, the utility plans to invest up to $45 million over three years in new businesses, including an electric vehicle recharging distributorship. (Boston Edison has also considered joint ventures to manufacture electric vehicles in its service territory.) The utility's latest business acquisition, REZ-TEK International Corporation, is a company which has developed an innovative system that treats cooling water used in commercial and industrial air conditioning systems in an energy-efficient and environmentally sound manner which will eliminate chemical treatment.[R#1]

Utility DSM Overview

Boston Edison Company (BECo) first began to explore demand-side management in 1981 with several conservation and load management pilot projects. Early initiatives included an air conditioning cycling program, water heater controls, and other audit conservation services. Then, in late 1984 BECo created a separate DSM planning group which was followed by DSM program implementation since mid-1986. Subsequently, the evaluation area became a separate function in 1990 when the Monitoring and Evaluation Department was established, however, some program evaluation began in 1988. During 1993, the evaluation function was merged with two others in forming the Pricing, Research, and Evaluation Department.[R#6,7]

In BECo's 1989 rate case settlement, $75 million was earmarked for expenditure on specific DSM programs as agreed upon by a group of organizations interested in promoting DSM. This group, called the Settlement Board, included BECo, the Massachusetts Attorney General, the Massachusetts Public Interest Research Group, and the Division of Energy Resources. The 1991 Settlement Board's residential programs exceeded their targets for participation by 15%. The utility has registered similar success over time. Participation achieved in all DSM programs in 1993 at BECo was 28.9% better than the target level. Peak summer demand savings for 1993 were 86.3% of target levels. In the same year, BECo achieved 97.9% of projected MWh savings from its DSM programs.[R#2,3]

DSM OVERVIEW	DSM EXPENDITURE (x1,000)	ENERGY SAVINGS (MWh)	CAPACITY SAVINGS (MW)
1987	$5,928	11,714	23.20
1988	$8,053	24,463	36.50
1989	$14,543	38,358	78.20
1990	$29,472	91,481	100.90
1991	$38,271	48,732	40.20
1992	$49,671	72,788	30.00
1993	$49,545	67,592	24.70
Total	$195,482	210,571	59.94

1993 DSM PROGRAMS AT BECo

RESIDENTIAL

Residential Efficient Lighting

Energy Fitness

Multi-Family Electric Efficiency

Public Housing Authority

Residential New Construction

Residential High Use (Electric Heat)

Boston Housing Authority/Public Housing Authority

HVAC Rebate Program

COMMERCIAL / INDUSTRIAL

Commercial / Industrial New Construction

Small Commercial / Industrial Retrofit

Large Commercial / Industrial Retrofit

ENCORE

Commercial/Industrial Remodeling Program

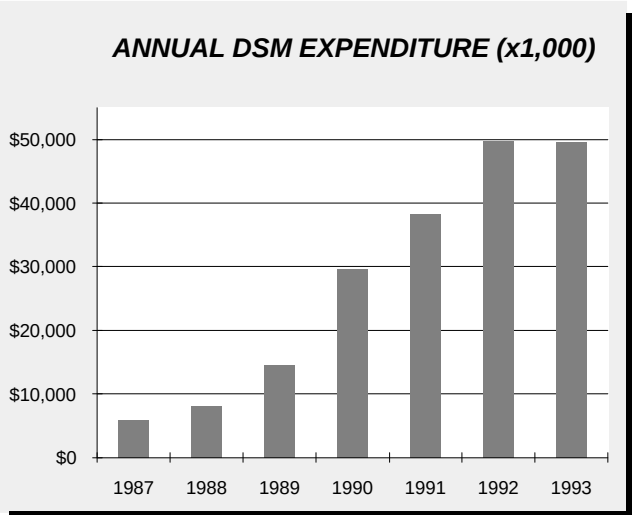
Equipment Replacement

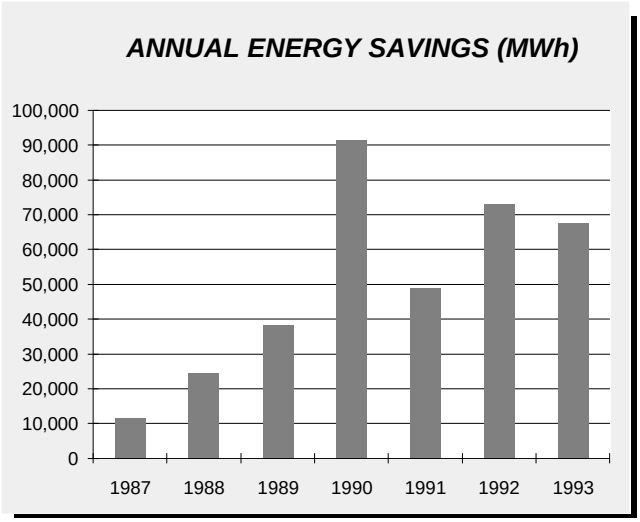
BEEC and GAP

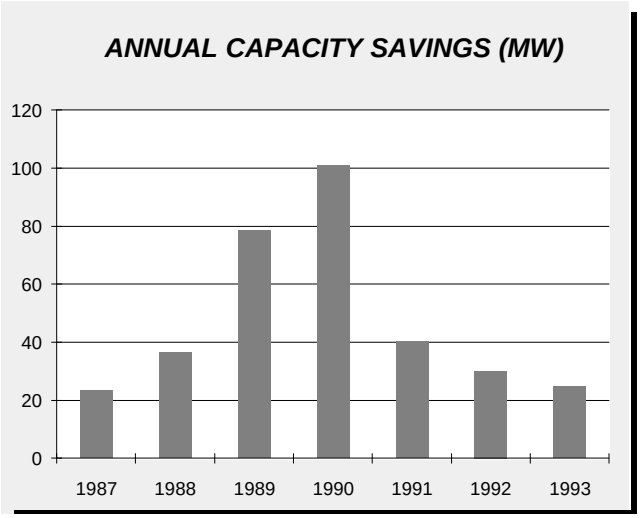
Following a similar progression to many utilities, BECo's DSM programs have evolved from relatively simple, end-use specific prescriptive applications to customer-specific customized options. This shift has paralleled a movement of increased emphasis on DSM at Boston Edison where its latest generation of DSM programs began in 1987. DSM expenditures have grown from $5.9 million in 1987 to $49.5 million in 1993. During this time frame BECo spent a total of $195.5 million on energy efficiency, resulting in a summer peak demand reduction of 59.9 MW and total annual energy savings of 210.6 GWh through programs involving more than 406,493 participants. (Note that Boston Edison accounts for total demand savings based on conservation programs with on-going savings. Load management programs' impacts are considered only in the first year of their implementation and produce savings only if activated.) The programs have grown tremendously since their inception in 1987 with the number of participants more than tripling, expenditures increasing more than seven-fold, and actual annual energy savings rising from 11,714 MWh to over 67,592 MWh in 1993. Total DSM-related expenditures since 1987 equal 3.3% of the utility's total energy revenues.[R#2]

BECo implemented seventeen DSM programs during 1993. A few of the more notable programs are briefly discussed in the following text.

The Residential Efficient Lighting program (Profile #23) offers three components in which customers can purchase or receive







energy-efficient lighting devices. A mail-in rebate program allows customers who purchase energy-efficient lamps or fixtures at market prices to receive rebates through the mail for a portion of the purchase price. Customers may also purchase lamps or fixtures at several large retailers, Boston Edison Energy Centers, or through a mail order catalog, and receive an instant rebate at the point of purchase. The third way a customer can obtain lamps is through a home energy audit. During the audit, energy saving measures, including some lamps, are directly installed in customers' homes. In 1993 this program saved 9.99 GWh and 1.9 MW of summer peak capacity. It had a benefit to cost ratio of 1.82 and included over 45,000 completed new projects.[R#2]

The Multifamily Electric Efficiency program began operation in February 1991. Program services are delivered by qualified energy service companies (ESCOs). The ESCOs provide direct installation of energy saving measures including fixtures and lamps, weatherstripping, interior/exterior storm windows, water heaters and pipe insulation, low-flow devices, and ceiling and wall insulation. In 1991 and 1992 BECo paid 100% of the installed measure costs. Starting in 1993, customer contribution was required for common areas only. In 1993 the program saved 3.67 GWh and 0.77 MW of winter peak capacity.[R#2]

In 1989, BECo's Small Commercial and Industrial (C/I) Retrofit program was created to provide free technical assistance, analysis, and energy efficiency measure installations for nonresidential customers with peak demands of less than 150 kW. (See Profile #31) The majority of program participants have been owner-managed, small businesses. The program was designed to offer efficient electric systems in lighting, HVAC, commercial refrigeration, hot water, cooking, and process equipment.[R#2,3]

The Small C/I Program addresses specific DSM needs and barriers unique to small commercial and industrial customers. Some of the unique aspects of small C/I businesses include: leased workplaces, absence of capital for energy improvements, use of relatively simple energy-using systems, and general absence of qualified staff designated to oversee the implementation of energy-efficiency projects within the facility. This program resulted in 7.95 GWh of electricity savings and 2.1 MW of summer capacity savings in 1993. The program complements BECo's Large C/I Retrofit program, the subject of this profile, which targets commercial and industrial customers with monthly billing demands greater than 150 kW.

Program Design and Delivery

Fully implemented in 1990, Boston Edison Company's Large Commercial and Industrial (C/I) Retrofit program was originally developed as part of a collaborative process to replace BECo's ENCORE program which was closed to all new applicants in June 1991.

The ENCORE program was designed strictly as a commercial and industrial program for customers with billing demands greater than 150 kW. In the program technical assistance and measure installation were typically provided to the customer through the use of energy service companies (ESCOs). Customers received proposals from at least three ESCOs. Dollar savings were paid to the ESCO and customer based upon energy savings and a cents per kWh rate established in a contract. In 1990, the program was closed to private sector customers.

The Large C/I Retrofit program which then took over as the premier C/I program was designed to help large C/I customers save money by becoming more energy efficient via customized retrofits. Its original target market was any commercial or industrial customer with monthly billing demands greater than 150 kW. However, the program has evolved to allow several small facilities (such as schools and municipal-service buildings) to group together to reach the combined 150 kW threshold.[R#4]

The program operates on two large C/I fronts: one for institutional customer buildings and one for non-institutional customer buildings. The applicable buildings span a wide range of types, with the institutional sector including federal, city government, school, university, recreational, and medical buildings that may face particular financing barriers for making energy efficiency investments. The non-institutional customer market is segmented by BECo into the following five sectors for marketing and operational purposes: real estate management companies, industrial, owner occupied, private education, and other.[R#4]

From a customer's perspective there are three procedural pathways for participants to follow in order to participate in the program: Level 1, Level 2, and Customer Generated Proposals

Level 1 Projects: Level 1 projects follow a simplified approach that usually involves lighting and simple motor changeouts. This program design hopes to encourage firms to initiate investments in energy efficiency with the simpler measures and then encourages them to eventually move forward with more complicated (Level 2 type) projects. An advantage to this two-tiered approach is that it allows the savings from Level 1 projects to begin accumulating as soon as possible without waiting for the phasing or completion of the more complicated projects.[R#4]

In 1993 a Direct Install option was introduced in which preselected contractors installed Level 1 measures without extensive analysis and review as the other paths require. This simplified process contains only two steps for the customer: 1) A BECo engineer works with the customer's facility manager and installation contractor to perform a basic audit of the site and determine what measures are eligible. 2) Then the installation contractor installs the eligible measures. This simplified process avoids the bidding process for the customer.[R#2]

Level 2 Projects: Level 2 projects are those which involve complex installations such as HVAC systems, or which have complex interactions with existing or new equipment such as energy management systems (EMS). For Level 2 projects, a detailed audit by a selected, BECo-approved design team, which consists of 15 reputable area ESCOs or design and consulting engineering firms, is required. Design teams examine building plans and operating logs, conduct surveys, and conduct audits to investigate various energy conservation opportunities for every energy-using function. Level 2 projects require the intermediate step of a formal design and approval by the customer and BECo. Then a contract is negotiated and measures installed.[R#2]

The winning contractor is responsible for the verification of savings in accordance with the DSM Verification Guidelines (described in detail in the Monitoring section) outlined in the contract and approved by BECo. If the customer requests the termination of the contract at any time after the installation but prior to the end of the contract term, the customer is responsible for compensating the ESCO that actually installs the

equipment for loss of contractual payments, thereby relieving BECo and its ratepayers of financial responsibility for measures no longer producing savings as anticipated.

Customer Generated Proposals (CGP): Customers can submit Customer Generated Proposals (CGPs) in which the customer acts as his own energy service company (ESCO). This is most commonly done on the more simplified Level 1 projects with lighting and motor retrofits only. The CGP must be complete with a description of energy conservation opportunities (ECOs), projected costs, projected energy savings in kWh, an ECO load shape form, a baseline confirmation procedure, and a proposed verification procedure.[R#4]

All projects costing over $100,000 are also required to perform another step in the approval process prior to construction. Besides an Energy Management Department review, these projects must be reviewed by BECo's Demand Planning Division and the Monitoring and Evaluation Department.

DELIVERY

Site Selection: Buildings are recruited into the program based upon inquiries from BECo regarding interest in the program, inquiries from customers regarding program offering, or as the result of a Customer Generated Proposal.

Audit Terms Outlined: First, proposals for an audit are sought from three design teams. A two-party contract is established between BECo and the customer, and between the customer and the audit design team outlining the terms and conditions of the audit. BECo engineers must approve the audit plan. The audit identifies potential measures to be installed. The customer can then select from a list of eligible ECOs. A second two-party contract, which contains the agreement of the parties to continue the project through the design, construction, and verification stages, is negotiated prior to actual design. BECo assumes 100% of all audit costs. BECo engineering services for Level 2 projects are provided by Design Services engineers from the Design Services and Technical Assistance group at BECo.[R#16]

Acquiring Proposals: Once the eligible ECOs and scope of work for design, construction, and verification is approved, the customer then seeks proposals from three pre-qualified design firms from a list provided by BECo. There are currently 15 teams pre-qualified. The purpose of the design team is to provide design services, construction oversight, and verification of savings for the project. The design team also helps the customer choose a qualified, competitively priced installation contractor.[R#16]

Measure Identification: Energy conservation measures are identified as the result of the detailed audit for Level 2 sites or as part of a CGP. The process used for the Level 2 sites is more effective, wherein the contractors are paid to explore all potentially cost-effective energy conservation opportunities. Contrarily, the customer generated proposals focus upon one end-use (usually lighting) that is the area of expertise of the contractor generating the proposal.

Screening: When a cost and energy savings estimate for a measure is submitted to BECo, the information is run through BECo's screening model to determine whether it passes the cost-effectiveness hurdle. BECo uses this benefit/cost screening model to determine which of the audit team's recommendations will be eligible for BECo incentives.[R#2]

Measure Installation: Measures that pass the screening model move to the installation and construction phase. Usually a meeting is convened with the facility staff, BECo engineers, and contractors, to discuss and plan the installation activity. The installers work professionally, minimize inconveniences to the customers, and clean up after themselves. BECo's design team monitors the construction schedule, quality of work, and costs.

Measure Commissioning: An important and often overlooked component of program implementation is commissioning. Commissioning ensures that the measures are installed properly, and that the operators are trained to use the measures effectively. This process is particularly important for HVAC measures that have complex control and maintenance characteristics. Installation contractors ensure that facil-

ity staff are provided with the necessary manuals and training.[R#2]

DSM Verification Guidelines: The Verification Guidelines confirm the installation of measures and ensuing savings. Pre- and post-installation metering ensures BECo's investments are financially sound while providing feedback to project engineers and contractors regarding the effectiveness of the measures installed. BECo engineers also perform on-site inspections of the retrofits. (Please refer to the following Monitoring and Evaluation section for details on metering procedures). [R#17]

Incentive Allocation: After completion of the project, incentives are allocated to the customer.

FINANCIAL INCENTIVES

Over time various changes have been made in the incentives offered and in the definition of eligible customers. Only in 1993 did institutional customers begin to make a contribution toward the cost of the retrofits. Non-institutional or private customers made contributions beginning in 1991. The program incentives and payout arrangements differ for varying customer segments. There are three differences in the incentives for institutional versus non-institutional customers. These are: 1) The conditions under which the audit costs are included in the calculation of the incentive level; 2) The timing of incentive payout (how soon the incentive is received); and 3) The incentive level itself.[R#2]

For institutional customers, 100 percent of the audit costs are always included in the calculation of the incentive payment. For non-institutional customers the audit costs are included in the incentive payment calculation if the participant installs over 50 percent of the recommended and eligible measures. If the non-institutional participant does not install over half of the eligible measures, then the customer must bear the audit costs.

Institutional customers generally have greater barriers acquiring customer financing for comprehensive energy efficiency investments. Given this view, the incentive structure was established whereby institutional customers did not have to provide construction financing for the cost of the entire project, while non-institutional customers did. This financing option for institutional customers allowed them to receive incentive payments, or progress payments, throughout the construction period of the project with 100 percent of the incentive paid upon completion of the project and BECo's receipt of the verification data. Non-institutional customers, on the other hand, received incentive payouts based upon quarterly verification data after the project was commissioned, i.e., they provided full construction financing.[R#2]

Prior to January 1993, institutional customers received incentive payments which covered the entire investment cost of the eligible measures. Beginning in 1993, incentive payments for institutional customers were reduced by an amount related to their energy and demand savings, though there were two different levels of their required contribution. If a customer chose the financing option, their required contribution was 18 months' equivalent savings contribution derived from their estimated energy and demand savings from the retrofit. This meant, for example, that if a facility's energy and demand savings were $500 per month, then the facility would be required to pay this amount on a monthly basis for an 18-month payback on an investment totaling $9,000. If they did not choose the financing option, their required contribution would be one year's savings of their energy and demand costs, meaning they would have a one-year payback, totaling $6,000. [R#2]

Non-institutional customers must now provide 100 percent of construction financing and are incented after the installation of measures based on verified savings. If the projected incentive payment total is $20,000 or less, the incentive payment is paid out over two quarters, or one year. For incentive payments calculated to be over $20,000 the payout is longer (this length was shortened in 1993). Prior to 1993, the incentive payment for non-institutional customers had a payout period of eight quarters (two years). Beginning in January 1993, the payout period is four quarters (one year).[R#2]

The incentive amount was also changed in 1993 for non-institutional customers. As with the institutional customers, the incentive amount was reduced by an increased customer

contribution based upon the customer's energy and demand savings. Prior to 1993, non-institutional customer's incentive payments were calculated by subtracting the projected energy and demand savings the customer would see over one year from the total investment cost. Beginning in 1993, the customer incentives were calculated using the cost of the installed energy efficiency measure less the value of 18 months' energy and demand savings. That is, prior to 1993 the non-institutional customers were guaranteed a one-year payback (minus construction financing costs and audit costs if less than 50 percent of eligible measures are being installed), but in 1993 they were guaranteed a lower one and a half year payback (minus construction financing cost and audit costs if less than 50 percent of eligible measures are being installed).[R#2]

In late 1993 BECo had to stop recruiting or accepting new applicants to the program. A similar situation occurred in mid-year 1994. The budgets for those years were full and over-subscribed. In order to stay within their pre-approved budgets, BECo found it necessary to stop accepting new applications.

MARKETING

Since 1994, no marketing efforts have been initiated due to over-subscribing the program and its ensuing temporary closure. Prior to 1994, marketing for the Large C/I Retrofit program was minimal, easy, and barely necessary. Initiatives included basic brochures and mailers sent to large industrial and commercial customers, as well as contractors, informing them about the program. Marketing the program via word-of-mouth then took over, and the program has required no further marketing efforts since.[R#5,8]

MEASURES INSTALLED

The Large C/I Retrofit program offers financial incentives for a broad range of measures and customized engineering. The measures include those affecting: lighting systems, heating, ventilation, cooling, motors, refrigeration, industrial processes, and energy management systems.

Simple lighting and motor retrofits are considered Level 1 projects. These do not require extensive engineering or design support services. Level 2 projects are those involving more comprehensive retrofits and includes HVAC, refrigeration, and other processes. These projects have greater engineering and procedural requirements.[R#2]

STAFFING REQUIREMENTS

In 1993, program implementation staff could be seen as belonging to one of the following three categories:

• Sector engineers who "sold" the program to the customers. This category consists of sector managers and customer service engineers. The engineers operated in sectors defined as industrial, real estate management companies, owner occupied sector, private education, state facilities, federal facilities and hospitals;

• Administrative support staff operating as two relatively independent groups, one for the non-institutional customers and one for the institutional customers; and

• Project engineers within Design and Technical Services who perform audit reviews and Level 2 project engineering coordination with the Design Team.[R#4]

From the beginning, the sales engineers were divided and operated in sectors. Each engineer has their own customers. The assignment of customers to project engineers was initially based solely on workload. Recently the project engineers have also been divided into sectors. This has allowed the sector personnel to form a better servicing team relationship with their project engineer.[R#4]

Staffing requirements in terms of number of full-time equivalents (FTEs) for the Large C/I Retrofit program are difficult to assess. Since there is no one specific manager for the one program, a number of people are involved with its administration, marketing, monitoring, implementation and delivery. All told, roughly 70 people are involved in some way with the program. On an annual basis, it is estimated that 8 FTEs are required to run the program.[R#5,8]

MONITORING

BECo confirms the installation of measures and ensuing savings through implementation of the DSM Verification Guidelines. Since BECo cannot anticipate every kind of conservation or load management technology, measure, or strategy that may be recommended by its customers, design teams, or ESCOs, procedures for verifying the savings from installed measures are flexible enough to cover a variety of technologies and applications. The Verification Guidelines, therefore, are general in procedures and application. These verification guidelines are internally developed by BECo for use by ESCO's in preparing project specific verification plans. This is not to be confused with BECo's pre-approval projections of "program" savings and subsequent evaluation and reconciliation with the Massachusetts DPU for cost, incentive and lost base revenue recovery.

The BECo DSM Verification Guidelines are strongly oriented towards measured or metered savings rather than engineering estimates, since measure performance is strongly dependent on a unique combination of technology and applications that are not directly comparable to other installations or a laboratory environment. While there is no fixed component of project costs that is earmarked for verification, these costs usually constitute between 5 and 10% of total project costs.[R#15]

The Verification Guidelines provide an approach which is tailored to the load shapes of the pre- and post-installation end-use. The level of detail in the data collection and the calculation of savings reflects the complexity of the changes in the load shape produced by the installation of the measure.[R#16]

BASELINE ESTIMATES

The foundation of the savings calculation is the baseline estimate of consumption. This estimate must be established not only for electric use, but for any factors which are assumed to cause changes in consumption, such as weather, hours of operation, facility occupancy, or production levels. The Verification Guidelines identify any factors which cause electric usage to change, estimate the magnitude of the effect, and delineate how and under what circumstances the baseline estimates should be modified. The measurement and metering of given load shapes conforms to the same guidelines as the methods used for the post-installation period.[R#15]

VERIFICATION BY LOAD SHAPE TYPE

BECo identifies four basic load shapes and metering strategies.

Types 1 and 2: Constant load with fixed or varying operating schedule: These simplest of the load shapes are verified by using an instantaneous demand or current reading of the fixture or circuit in conjunction with short-term elapsed time meters to validate the fixed operating schedule during both the pre- and post-installation period. Persistence are addressed by annual visual inspections and inventories of the measures, annual remeasurements of the instantaneous demand, and annual, short-term elapsed time readings for the operating schedule.[R#15]

Type 3: Consistently varying load with fixed operating schedule: Interval demand (or current) metering is required for a period long enough to establish the consistency of the operating schedule and load levels. (An example of this type load shape would be variable speed drives in a production environment in which the load varies in a consistent and predictable way based on output levels and flow production.) A continuously installed elapsed time meter installed during the post-installation period and the length of the normal operating schedule is used to determine the number of cycles in any period. Persistence is addressed by annual visual inspections and inventories and annual remetering of interval demands.[R#15]

Type 4: Varying load with varying operating schedule: In this most complex case, interval demand (or current) recorders are needed. Load data is collected until all of the likely operating conditions have been experienced. The factors caus-

ing the variation in loads or in operating schedule are identified and data on those factors, concurrent with the metered demand, is collected. The relationship among the various factors and the load levels is established using multiple regression analysis. During the verification period, data on the causal factors is collected and the pre- and post-consumption levels are estimated using the regression-derived relationships. [R#15]

For retrofits with numerous measures installed, such as lighting, only 10% of required pre- and post-installation measures need to be metered.

Savings verification reports are submitted to BECo on a quarterly basis for a period of two years. These reports outline the savings achieved for the reporting period, which is for three months each.[R#17,18]

EVALUATION

Cambridge Systematics, Inc. was contracted to evaluate the Large C/I Retrofit program for installations in 1992 and 1993. The purpose of the evaluation was to assess the implementation of the program and to estimate the net savings resulting from the program. A process evaluation was performed in order to provide valuable lessons in the areas of customer satisfaction, quality of measure installation, persistence of savings, remaining DSM potential at treated facilities, marketing, and barriers to participation. An impact evaluation was performed to provide the second and final true-up of 1992 program year savings and the preliminary or first true-up of 1993 savings. No comprehensive evaluation of the remaining market potential for this program was conducted under this evaluation effort, although the comprehensiveness of individual facilities was discussed. The evaluation also included a database review and assessment, a site visit component, and an implementation analysis for updating savings estimates for 1993 participants. Just as this Profile was going to press, Barakat and Chamberlin submitted its July 14, 1995 Final Report of the program to Boston Edison. Its process, survey, and impact findings, therefore, are not included in this Profile.[R#2]

PROCESS EVALUATION

The process evaluation used a census telephone survey of 1992 and 1993 participants to provide customer feedback on the program's operation and level of customer satisfaction. Staff interviews and interviews with design team members were also conducted as part of the process evaluation.[R#2]

The major goals of the process evaluation were to assess general customer satisfaction; provide a follow-up with BECo staff with regard to issues discovered in the process evaluation; identify barriers to participation; and assess net savings factors such as persistence, free riders, free drivers, and snapback effects.

Subtasks conducted included participant telephone surveys which were used to gather information on customer satisfaction, free ridership, spillover, snapback, potential program problem areas, and suggestions for program improvements; more in-depth customer discussions with customers while conducting site visits; interviews with BECo staff to gather information on the impacts of program changes; and telephone interviews with members from three design teams which gathered information on the customer feedback they received. [R#2]

As part of the process evaluation, site visits were made to seventy-five sites. A list of measures was surveyed for installation quality and continued operation. Interviews were conducted with BECo staff and Design Team members to ascertain the inside view of the program's strengths and areas for improvement. A participant telephone survey of all 1992 and 1993 customers (113 individual contacts covering 154 projects) was attempted with 92 participants responding, a large response rate of 81%. These telephone surveys were designed to provide information on customer satisfaction, barriers to participation, adjustments to gross savings estimates (such as free ridership), customer response to program changes, and suggestions for program improvements.[R#2] ☞

Contractors conducting the site visits were also able to comment on the comprehensiveness of the measures installed and to assess the engineering estimates used to develop the preliminary DSM savings estimates.

The major complaint from customers, as reported by BECo staff, was the length of time needed to move through the program. Many projects required over one year to fully come to fruition.

The major internal problem that surfaced was the database. The evaluators and their contractors find that the essential program data was still not being entered by the implementation staff. The implementation staff maintained that they did not have sufficient staff to perform data entry while still doing their primary function of recruitment and contract administration. [R#2]

From telephone surveys, over 75% of the participants were satisfied or very satisfied with the program, although there was a decline in satisfaction from the 1992 to the 1993 participants. The component of satisfaction which seemed to lead to this decline was in the level of energy savings. Only 68% of the 1993 participants were satisfied or very satisfied with the savings achieved. The potential cause of this is the large number of schools and poor lighting estimates given to those schools. The educational content of the program was high with half of all participants indicating that they first heard of the measures they installed from BECo representatives. The program changes in length of payout and incentive level seemed to have little effect, perhaps because many of these participants were already grandfathered into the old guidelines. More information on non-lighting measures was a need identified as well as the need to shorten and simplify the whole process.[R#2]

Site visits were performed with 50 1992 participants, 10 1993 participants, and 15 1991 participants. Given the importance of this program and these customers to BECo, these site visits were conducted by experienced energy engineers. The site visits served many purposes. These were intended to provide information for the engineering analysis and back-up estimates for the five largest 1992 expected program savers; to gather additional participant information to be used in the impact and process evaluations; to provide BECo with individual site reports on these customers to identify greater opportunities for program optimization, and where necessary, information for customers that require follow-up; to assess the possible persistence issues from the site visits of 1991 participants; and to provide additional experienced energy engineering assessments and suggestions concerning program improvement if the program were to be re-opened, redesigned, or accepted as a bidded program.[R#2]

The site visits found an 88% satisfaction level for measure installation and an 87% satisfaction with measure performance. The major finding of the site visits, in combination with the review of the engineering estimates of savings, was that the lighting savings of schools appears to be dramatically overestimated. More of the lights were turned off and ran for fewer hours than estimated. Some lighting was located in space only occasionally used, and vacation days reduced the actual burn hours below the standard estimates from ESCOs. Another problem was the interaction effects of lighting with HVAC systems. Usually more efficient lighting was cooler than what it replaced, so heating requirements increased in the winter and cooling requirements decreased in the summer. This phenomenon created problems in the savings estimates when electricity was the primary fuel for heating or cooling. More attention should be paid to these interaction in BECo's estimation procedures.[R#2]

IMPACT EVALUATION

The impact evaluation employed new econometric billing procedures. Individualized time-series econometric regression models were used to estimate demand savings for some of the largest projects. Also, revised engineering estimates using sector-specific relationships between energy and peak demands were used to calculate demand savings. These methods were complemented by a significant level of examination for potential bias problems and correction for these problems when they were found.[R#2]

Data Alert: Based upon free ridership estimates obtained from telephone survey responses of participants, savings are net and estimated only for the years 1992 and 1993. Previous year's savings are fragmented due to overlap with ENCORE.

In 1992 and 1993, the Large C&I program resulted in total annual energy savings of 31,764 MWh. Of this savings, 71%, or 22,027 MWh, occurred in 1993. The program has produced a total cumulative savings of 41,501 MWh and will create lifecycle savings of 280,087 MWh. In terms of capacity savings the program has resulted in cumulative savings of 7.88 MW.

On a savings by measure basis, lighting efficiency improvements produced 79% of total savings at 25,111 MWh. In a distant second, savings from improved efficiency HVAC measures account for 4,688 MWh or 15% of the total. Improvements in motors resulted in savings of 1,413 MWh.

PARTICIPATION RATES

Participation in BECo's Large C/I Retrofit program actually occurs in stages and phases. Participants go through the following stages as part of complete participation: lead, audit, design, construction, and verification. Many participants also complete projects in phases. That is, they may have decided to retrofit a complex of six buildings. If they phase this work they may have, for example, two buildings retrofitted per year for three years though there might only be one decision maker. One decision maker could also be involved in three projects, or appear as three participants in one year.

In 1992, 68 participants were involved in BECo's Large C/I Retrofit program. This year resulted in a savings per participant of 143 MWh. In 1993, participation increased 4.5% to 71, and savings per participant also increased a dramatic 116% to 310 MWh. The increase in the savings per participant from 1992 to 1993 is primarily due to the method in which the 1992 evaluation findings were applied to the 1993 database savings estimates.

PARTICIPATION	NUMBER OF PARTICIPANTS	ANNUAL ENERGY SAVINGS (MWh)	ANNUAL ENERGY SAVINGS PER PARTICIPANT (MWh)
1992	68	9,737	143
1993	71	22,027	310
Total	139	31,764	229

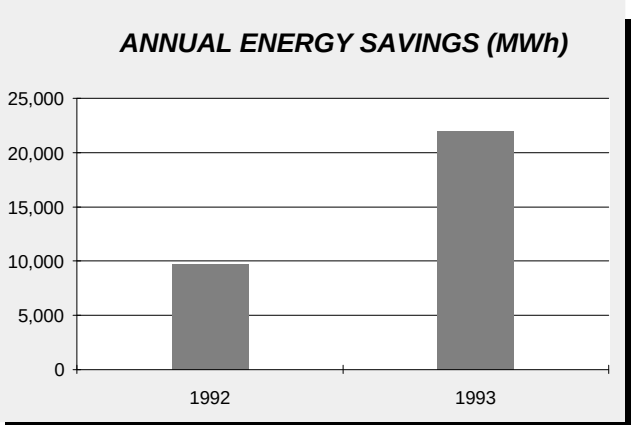
In terms of capacity savings once again lighting measures produced the greatest savings at 5.958 MW, or 79% of total capacity savings.

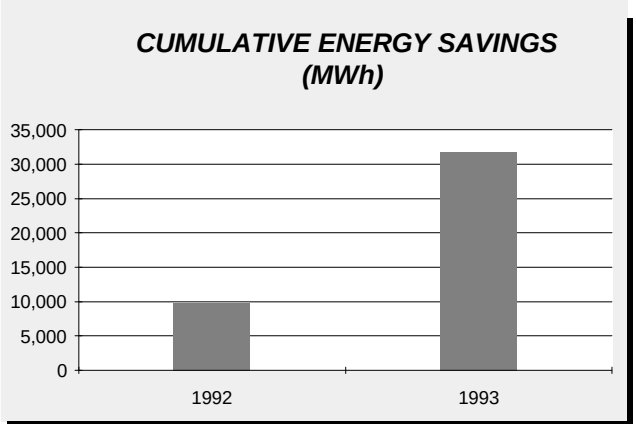
As shown in the Savings By Sector table, the commercial sector resulted in 70.05% of total savings while the industrial sector accounted for the difference of 29.95%. Within the commercial sector, colleges comprised the largest portion of savings, 26.78% at 8,507 MWh. Offices comprised 23.24% of commercial savings with 7,380 MWh. Within the industrial sector, electronic equipment made up 16.05% or 5,097 MWh of the total 31,762 MWh saved for both sectors.

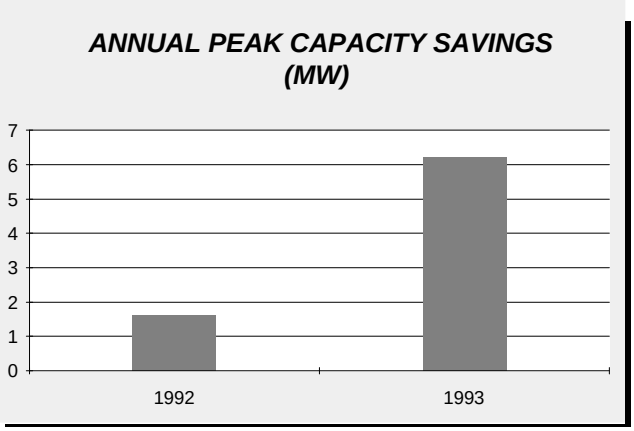
FREE RIDERSHIP

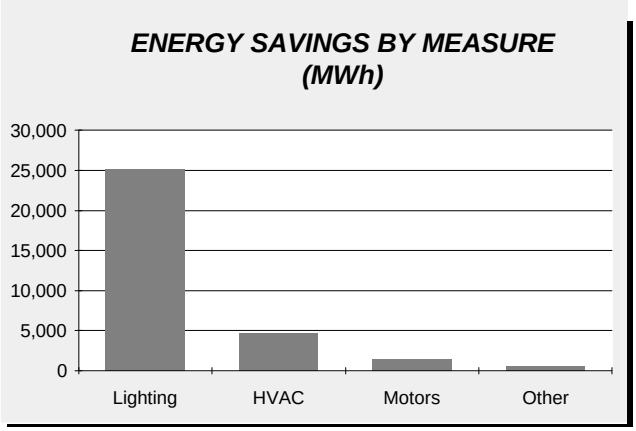
BECo's Impact Evaluation estimated free ridership at 45.6% for the institutional customers and 22.8% for the non-institutional customers in 1992. In 1993, both groups had free ridership estimates of 16.2%. While this Profile contains results using these free ridership estimates, the estimate for institutional customers, predominantly schools for this program year, appears to be very large given generally tight maintenance budgets and difficulties with financing. Moreover, the dramatic decline from 45.6% to only 16.2% over the course of a single year raises questions about reasonableness of self-reported free ridership. BECo is currently investigating the development of this factor with the evaluation contractor and may file a revision if new information comes to light. ☞

SAVINGS OVERVIEW	ENERGY SAVINGS (MWh)	CUMULATIVE SAVINGS (MWh)	LIFECYCLE SAVINGS (MWh)	CAPACITY SAVINGS (MW)	CUMULATIVE CAPACITY SAVINGS (MW)
1992	9,737	9,737	85,860	1.636	1.636
1993	22,027	31,764	194,227	6.248	7.884
Total	31,764	41,501	280,087	7.884	









SAVINGS OVERVIEW BY MEASURE	1992 (MWh)	1993 (MWh)	TOTAL ENERGY SAVINGS (kWh)	PERCENT OF TOTAL SAVINGS
Lighting	7,697	17,414	25,111	79%
HVAC	1,437	3,251	4,688	15%
Motors	433	980	1,413	4%
Other	170	382	552	2%
Total	9,737	22,027	31,764	100%

SAVINGS BY SECTOR	1992 (MWh)	1993 (MWh)	TOTAL (MWh)	PERCENT OF TOTAL
COMMERCIAL				
Office	2,711	4,669	7,380	23.24%
Retail	235	660	895	2.82%
Hospital	271	392	663	2.09%
Other Health	466	439	905	2.85%
College	284	8,223	8,507	26.78%
School	628	1,357	1,985	6.25%
Government	NA	20	20	0.60%
Miscellaneous	73	1,820	1,893	5.96%
Total Commercial	**4,668**	**17,580**	**22,248**	**70.05%**
INDUSTRIAL				
Food Products	NA	26	26	0.80%
Apparel & Textiles	NA	264	264	0.83%
Paper & Allied Products	NA	141	141	0.44%
Chemical Products	205	916	1,121	3.53%
Misc. Plastic	NA	60	60	0.19%
Stone &Concrete Products	NA	58	58	0.18%
Industrial Machinery	679	NA	679	2.14%
Electronic Equipment	2,328	2,769	5,097	16.05%
Misc. Manufact. Ind.	1,856	212	2,068	6.51%
Total Industrial	**5,068**	**4,446**	**9,514**	**29.95%**
Total for Both Sectors	**9,736**	**22,026**	**31,762**	**100.00%**

MEASURE LIFETIME

The lifetimes BECo assumed for the various end-uses or measures were approximately as follows: 7 years for lighting and motors; 15 years for HVAC, refrigeration, process and other; and 30 years for insulation, glass, and water heating. In order to calculate the cost of saved energy, The Results Center has used an average measure life of 8.8 years derived from a weighted average based upon savings.

PROJECTED SAVINGS

BECo projects that gross savings for years 1995 and beyond are expected to be 2.8 MW. This is comprised of 1.1 MW from manufacturing participants, almost three-quarters of a megawatt from schools, over one-half a megawatt from offices, and less than one-half a megawatt from the other sector. Overall, the demand savings realization rate for 1995 and beyond is expected to be 95 percent.

Cost of the Program

BECo has spent a total of $28,483,500 on the Large C/I program from 1992 to 1993. Expenditures rose 7% from $13.8 million to $14.7 million from 1992 to 1993.

COST EFFECTIVENESS

The Results Center calculations of cost of saved energy using a 10 year measure life are shown in the accompanying table. At a 5% discount rate the cost of saved energy in 1992 was 20.27 ¢/kWh. In 1993, costs increased only slightly but savings rose precipitously, resulting in a cost of saved energy decrease of 53% to 9.56 ¢/kWh. BECo's levelized avoided cost including environmental externalities was about 18 ¢/kWh, the ceiling prices used in the screening models.

COST PER PARTICIPANT

At a total cost of $13.8 million and with 68 participants in 1992, the program cost BECo $202,941 per participant. In 1993, participation increased slightly to 71 and costs increased to $14.7 million, resulting in a BECo cost per participant increase of 5.5% to $207,042. In terms of customers' contributions, of a total program cost (inclusive of customer contributions as well as BECo overhead, etc.) of $31.1 million for 1992 and 1993, customers paid $2.6 million or 8%. This decreased from 9% in 1992 to 7.5% in 1993 of total program costs.

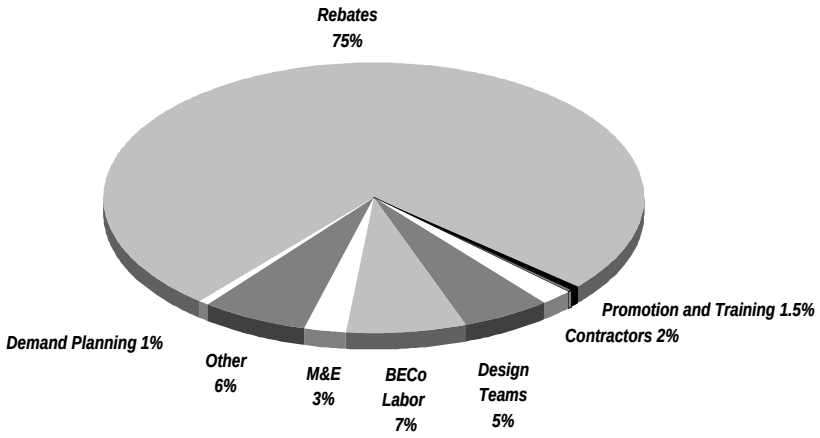
COST COMPONENTS

In 1992 and 1993, 75% of expenditures or $21.5 million, were spent to pay rebates to customers for equipment installed. The next largest cost to BECo was for labor which has required 7% of expenditures or $2.0 million. Design teams accounted for 5% of total expenditures, or $1.5 million. The other 13% of expenditures went towards monitoring and evaluation (M&E) (3%), contractors (2%), promotions (1%), demand planning (1%), and training (0.1%). Other costs make up the difference at 6% of expenditures.

COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/KwH)	3%	4%	5%	6%	7%	8%	9%
1992	18.54	19.39	20.27	21.17	22.08	23.01	23.96
1993	8.74	9.15	9.56	9.98	10.41	10.85	11.30

COSTS OVERVIEW BY CONTRIBUTORS	BECo TOTAL COSTS (x1,000)	PARTICIPANTS TOTAL COSTS (x1,000)	TOTAL COSTS (x1,000)	PERCENT OF TOTAL COST PAID BY PARTICIPANTS	BECo COST PER PARTICIPANT (x1,000)
1992	$13,780	$1,409	$15,189	9.28%	$203
1993	$14,703	$1,229	$15,932	7.71%	$207
Total	$28,483	$2,638	$31,121	8.48%	$205

COSTS OVERVIEW	1992 (x1,000)	1993 (x1,000)	TOTAL UTILITY COST (x1,000)
Rebates	$10,018.3	$11,496.6	$21,514.9
Promotion	$87.3	$60.4	$147.7
Training	$43.7	($6.3)	$37.4
Contractors	$595.5	$11.7	$607.3
Design Teams	$696.8	$801.2	$1,498.0
BECo Labor	$1,033.1	$995.9	$2,029.0
M&E	$335.4	$398.4	$733.8
Other	$970.0	$794.0	$1,764.0
Demand Planning	$0.0	$151.4	$151.4
Total	$13,780.2	$14,703.3	$28,483.5



Environmental Benefit Statement

AVOIDED EMISSIONS:	***Based on 41,501,000 kWh saved 1992-1993***					
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%	89,476,000	2,123,000	429,000	43,000
B	10,000	1.20%	95,411,000	822,000	277,000	205,000
	Controlled Emissions					
A	9,400	2.50%	89,476,000	212,000	429,000	3,000
B	10,000	1.20%	95,411,000	82,000	277,000	14,000
C	10,000		95,411,000	548,000	274,000	14,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	95,411,000	251,000	137,000	68,000
B	9,400	2.50%	89,476,000	212,000	172,000	13,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	95,411,000	169,000	27,000	68,000
B	9,010		85,824,000	61,000	21,000	4,000
Gas	**Steam**					
A	10,400		52,042,000	0	119,000	0
B	9,224		45,195,000	0	283,000	13,000
	Combined Cycle					
1. Existing	9,000		45,195,000	0	173,000	0
2. NSPS*	9,000		45,195,000	0	82,000	0
3. BACT*	9,000		45,195,000	0	11,000	0
Oil	***Steam--#6 Oil***					
A	9,840	2.00%	75,324,000	1,141,000	135,000	128,000
B	10,400	2.20%	79,889,000	1,132,000	169,000	82,000
C	10,400	1.00%	79,889,000	162,000	136,000	43,000
D	10,400	0.50%	79,889,000	475,000	169,000	26,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	99,976,000	199,000	309,000	17,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	118,693,000	306,000	403,000	89,000

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 accomanying page is to allow any user of this profile to apply Boston Edison's level of avoided emissions saved through its Large 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.

*** Acronyms used in the table**

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

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.

Lessons Learned / Transferability

Boston Edison has demonstrated how a highly effective retrofit program for large C/I customers can evolve over time to address customers' needs, regulatory mandates, and the coming competition: Perhaps the fundamental strength of this Profile is that it presents a program in transition. With the Large C/I Retrofit program, BECo clearly has one foot in the past and the other in the future. The utility has demonstrated that it can clearly induce high levels of participation by offering direct financial incentives. It has also shown that these incentives can be modified over time to reduce the utility's exposure and to cover more eager participants. These changes are at the heart of repositioning DSM as energy services, and most importantly as services that customers will value.

The primary advantage of using a rather conventional incentive-based program for large C/I customers is its effect of increasing participation. Inversely, the primary disadvantage is its cost to the utility and its ratepayers: Since the initiation of BECo's Large C/I Retrofit program, participation has been higher than utility staff can handle. That's the good news. The bad news, however, is that with very little customer contribution, BECo's Large C/I Retrofit program has in fact had a rate impact and is thus costing nonparticipant ratepayers. In 1992 and 1993, BECo's Large C/I Retrofit program cost the utility $28.5 million, a cost that has been amortized through increased electricity rates.

Throwing money at large C/I customers is a short-term fix: When incentives are given to customers, they invariably push for more. Thus, a variety of approaches is necessary in order to decrease large C/I customers' spending on energy. This doesn't necessarily mean reducing rates, because reducing monthly energy bills, not rates, is what keeps large C/I customers satisfied with their utility.

A utility needs to identify all opportunities that a large C/I customer may have and come to an agreement that combines a variety of approaches such as long-term energy services and customer technical support, customer financing via low-interest loans or a roster of financing mechanisms, and limited financial incentives for the customer as well. In turn, the C/I customer agrees to remain the utility's customer for future years, resulting in a win-win situation that gives both the utility and the customer time to recoup their investments in energy efficiency.[R#9]

Fundamentally, the program has been very successful from a participation standpoint, so successful that it has been oversubscribed and has even drawn the ire of nonparticipants: With minimal marketing efforts, BECo was able to inadvertently over-subscribe the program. When large C/I customers heard about BECo's generous rebates for energy efficiency retrofits, they immediately signed up. The sudden increase in participation, however, has produced three polar reactions from utility customers: First, many customers who signed up late for the program were cut off and not allowed to participate in it. This angered and alienated many of BECo's large C/I customers, sending them shopping for energy services elsewhere. Second, those who weren't allowed to participate in the program were upset because they also are the very same ratepayers who indirectly are paying for the program through their electricity rates. Third, those who were allowed to participate were pleased to be recipients of large rebates for retrofitting their facilities.[R#11]

Sewing the seeds of panic in this new competitive utility environment, large C/I customers who are used to receiving generous rebates from their utility, need to slowly be steered towards more cost-effective financing mechanisms: Initially, BECo's Large C/I Retrofit program required no customer contribution. Over time various changes have been made in the incentives offered. After one year, the program required a customer contribution of 17% of total project costs. This meant that BECo paid close to 83% of all expenses involved in the program. In 1995, the utility is requiring the customer to pay an unprecedented 50% of implementation costs. In 1998, BECo plans to require the customer to pay 100% of program costs, with the utility acting simply as a service — supplying technical support, administration, and contractual delivery of the program.[R#9,13]

In essence, BECo is slowly weaning large C/I customers off their hand-fed habits of receiving large utility rebates. This in turn will reduce utility costs, making the program more cost effective, while meeting the needs of customers.

Reducing electricity rates for large C/I customers is not as imperative as reducing large C/I monthly bills: In today's competitive utility environment, large industrial and commercial customers have become more demanding of their utilities and are insisting on decreased electricity rates. Now, large C/I customers hold a majority of the utility-cards and

threaten to leave the service territory if rates aren't decreased. This customer viewpoint only addresses rates but should address monthly bills. BECo developed the Large C/I program for this very reason – to help assist their large C/I customers in becoming more energy efficient and thus decreasing monthly energy expenditures, not decreasing rates.[R#9]

The goal of BECo's Large C/I Retrofit program is to facilitate national competition among large industries, then have the utility slowly pull out over time while allowing market forces to kick in: When large industries become more energy efficient, money spent formerly on energy can be spent elsewhere, allowing the industry to expand and become more competitive on a national level. This supports local economic development which will create a sustainable electricity market for the utility. Rather than seeing large accounts as "ratepayers," BECo, like many other utilities, views these as customers as "assets" whose needs must be met so that they can prosper and grow, again supporting the long term viability of the utility and the entire region.[R#13]

TRANSFERABILITY

Boston Edison's Large C/I Retrofit program represents a program design in evolution. Embedded in its structure are a number of features, however, that are intimately aligned with the new directions of energy services in the United States. For instance, BECo has been involved in a process of "weaning" its customers from what are now considered overly generous rebates. Rather than providing direct incentives that plague the utility with issues related to cross subsidies, inequity, and rate impacts.

Second, the program also contains features related to increased attention to market segmentation, and the specific needs of predominant customer types. Institutional facilities have different barriers in terms of access to capital, thus the program compensates for this by allowing their audit costs to be completely financed as part of the program. The program also addresses specific segments within the C/I sectors including industrial, real estate management companies, owner occupied sector, private education, state facilities, federal facilities and hospitals. This attention to market segmentation is clearly in line with utilities' new-found emphases on serving specific customers' needs through tailored energy services.

Third, the program also contains different "unbundled" tracks that allow customers options for participation. For relatively straightforward retrofits, a streamlined approach is possible. Once customers have had experience with simple energy saving opportunities, they can progress on to more comprehensive retrofits either through customer-generated proposals or working in collaboration with energy service companies. These options all point to the responsiveness of the utility to customers' needs, constraints, and opportunities.

A fourth and final attribute of the program that is especially aligned with competition and the delivery of energy services in an increasingly competitive environment, relates to verification of program savings. BECo adheres to a set of Verification Guidelines (based on the Massachusetts protocol for savings verification) that provides both utility and customer alike with confidence of program performance. Not only are installations metered after retrofits, but annual "true-ups" adjust savings (and shareholder incentives) for attrition over time, pointing to BECo's program emphasis on durability of savings and accuracy in regard to DSM resource procurement.

While some utilities may elect to adopt BECo's Large C/I retrofit program as is,... many others will consider its most attractive elements and tailor the program design to fit their specific needs. Just as Boston Edison is revamping the program in light of increased competition and a national trend toward "rebateless" programs, other utilities will take the plethora of lessons learned in Boston and modify their programs accordingly.

Regulatory Incentives and Shareholder Returns

REGULATORY TREATMENT

The purpose of this section is to briefly discuss the regulatory treatment of the costs of Boston Edison's Large Commercial & Industrial Retrofit program. To do so, a quick review of the regulatory treatment of all Massachusetts utilities' DSM programs is presented, followed by a review of BECo's specific DSM program treatment. Other discussions of the Massachusetts DSM regulatory treatment can be found in Profiles #1,6,21,22,23,31,36,92.

STATE OVERVIEW

In August of 1988 the Massachusetts Department of Public Utilities (DPU) instituted a collaborative process among utilities and intervenors for the design of utility DSM programs. Subsequent orders in 1988, 1989, and finalized in 1990 established an integrated resource planning process based on competitive all-source bidding. Since then utilities in Massachusetts have been required to submit annual resource plans to the DPU that consider DSM programs on a level playing field with supply-side resources.

The DPU has eliminated almost all financial barriers to utility investments in DSM by allowing all utilities in the State to recover DSM program costs, approving a mechanism for lost revenue recovery, and addressing incentives in a number of ways to further reward DSM program success. Like other states, the Massachusetts mechanisms for removing the disincentive for utility investment in DSM, and creating incentives to do so aggressively and effectively are still in transition, a transition made even more interesting by recent "megatrends" in the industry toward competition and ultimately customers' direct access to competing power suppliers.

Utilities in Massachusetts have been allowed to either expense or capitalize DSM program expenditures. Each utility was required to propose the specific treatment that it preferred. Beginning in mid-1991 the DPU ordered each electric company to institute a separate class-specific Conservation Charge to collect DSM-related costs. The Conservation Charge is the sum of direct program costs, lost revenues, and financial incentives. It has been collected as a surcharge on all kilowatt-hours sold.

UTILITY OVERVIEW

The incentive mechanism available for BECo's DSM programs is based on measured energy and capacity savings that the programs produce for ratepayers. The incentive was equal to 5% of the net benefits of the program after achieving at least 50% of the savings. In this case "net benefit" is defined as the difference between total cost, including customer cost, and total benefits which do factor in avoided environmental externalities based on the utility's proxy power plant. Although Boston Edison would have preferred to have expensed its DSM program costs, until the 1995 program year its regulators required that the utility capitalize most of its DSM program costs to reduce the intitial impacts of conservation charges on customers' bills.

CURRENT STATUS

By 1995, the regulatory progress that had been made in Massachusetts since the 1988 Collaborative, began to show signs of fatigue and of being out of date. Utilities across the country, fearing competition, began to seek permission to cut their DSM commitments as part of an overall effort to minimize all costs and thus keep rates as low as possible for competitive purposes. Boston Edison, for its part, proposed to cut its DSM budget for 1995 from $57 million to $42 million. Ultimately the budget was set at $39 million after the consolidation of several residential programs.[R#8]

Another aspect of BECO's DSM regulatory treatment that it sought to change was the DPU's requirement that it ratebase (capitalize) its DSM program costs. Unlike all other utilities in the state, BECo had been required to capitalize its DSM costs instead of expensing them. By 1995 BECo had capitalized about 70% of its program expenditures and had a "regulatory asset" of $74 million (unlevelized) on its books. This caused BECo to

have to collect more revenues from its customers through the Conservation Charge than it wanted given the pressures to keep rates low. In fact, BECo claimed that it was the only utility in Massachusetts that had been "straddled" by this regulatory requirement. The 1995 program year was the first in which BECo was able to expense its programs as it wanted.[R#8]

Also in early 1995, Massachusetts Electric challenged the DPU's use of environmental externalities for the purposes of integrated resource planning. The DPU had used environmental costs as an "adder" to generate an avoided cost figure; in fact the environmental cost accounted for about a third of the avoided cost. While the DPU sought to maintain the environmental cost, the State Supreme Court ruled against the DPU ruling that it had no statutory authority to impose such costs. This caused many of the programs approved for 1995 (for all Massachusetts utilities) to no longer be cost effective. In particular BECo had to redesign and scale-back its residential efforts; the commercial and industrial programs, however, generally remained intact.[R#8]

For 1996, BECo will continue to experience change in the regulation and implementation of its DSM programs. Per regulatory order, BECo will have to engage in an IRM Bidding practice where it will solicit outside organizations such as energy service companies to deliver its programs. Provided that they can deliver DSM cheaper and more effectively than BECo, they will be awarded contracts to do so. BECo would prefer to maintain its in-house DSM expertise and role – one that strengthens the utility's relationship with its customers – but will comply with the regulatory order that forces it to solicit delivery agents for DSM in four broad programatic areas: residential new construction (what are being classified as "lost opportunities" in the residential sector); other residential; commercial lost opportunities; and other commercial and industrial. For each area the utility has assigned estimated kW and kWh block sizes that it expects to procure. While BECo anticipates that its 1996 DSM expenditure will be approximately the same as 1995, given its new delivery structure for DSM in 1996, the budget allocation is not yet certain.[R#8]

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