
Burlington Electric Department Comprehensive Municipal DSM Profile #98

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Executive Summary

Burlington Electric Department (BED) is a municipal utility that has served the residents of Burlington, Vermont with a mix of electricity and energy efficiency services since the late 1970s when it responded to the oil shocks by introducing its first energy efficiency programs. Since then a number of factors have driven efficiency in Burlington, ranging from the very pronounced concerns over power purchases from Hydro-Quebec and its controversial James Bay development to the termination of 40 MW of purchased power contracts in the next ten years.

Perhaps it was the controversy over the prospect of purchasing additional blocks of power from the James Bay that was most telling of the City's and utility's commitment to environmental and social responsibility. Although the power would have been generated in hydroelectric dams, the Burlington community was deeply concerned about the plight of the Cree and Inuits that are native to the James Bay area, as well as other environmental concerns. While purchasing power would have been the most expedient option, Burlington's voters elected instead to pass an \$11 million bond issue to catalyze DSM in Burlington. Despite the fact that doing so would raise rates, voters in the City chose to reduce the flow of dollars out of the community and to avoid participation in the ecological impacts of the James Bay.

Burlington is a highly progressive community politically and thus it's no surprise that its utility has been a national leader in a number of program areas. BED introduced its Smartlight program, a leasing program for compact fluorescent lamps (CFLs), at a time when many energy efficiency enthusiasts questioned whether it was possible to get desirable levels of program participation and thus savings with any form of customer payment requirement. And while electric utilities across the country fear fuel switching away from electricity, BED promoted the conversion from electric resistance heating to other fuels to reduce its winter peak and worked with the City's Building Department to get resistance heating banned in all future applications.

BED has been careful to offer all ratepayers the opportunity to participate in its DSM programs. Thus its eight programs provide a comprehensive package, from residential audits, direct installations, leasing of CFLs, fuel switching assistance, to programs targeted specifically at small commercial and industrial customers, to the "Top 10" program which emphasizes savings for BED's largest customers. This portfolio of programs has been extremely well received, resulting in a situation where the utility is "of the people and for the people." This fundamental orientation, whereby BED considers its customers as owners, has been key to BED's success with the delivery of energy services.

BURLINGTON ELECTRIC DEPARTMENT Comprehensive Municipal DSM

- Sector:** Residential, Commercial, Industrial
- Measures:** Wide spectrum of load management and efficiency improvements from residential radio-controlled water heaters; to weatherization; energy-efficient lighting, HVAC, and refrigeration; and fuel switching
- Mechanism:** CFL leasing; residential direct installation; residential and commercial new construction incentives; concentration on largest customers with payback buy-downs
- History:** DSM began in 1980; ramped up in 1990; full roster of programs implemented in 1991 and continuing to date

1993 PROGRAM DATA

Energy savings:	9,198 MWh
Lifecycle energy savings:	128,772 MWh
Capacity savings:	2.6 MW
Cost:	\$861,000

CUMULATIVE DATA (1991-1993)

Energy savings:	33,944 GWh
Lifecycle energy savings:	290,183 GWh
Capacity savings:	5.5 MW
Cost:	\$2,410,000

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. **ANNUALSAVINGS** 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

The City of Burlington, Vermont consists of 38,700 residents including 8,000 students. It is located on Lake Champlain only 60 miles south of the Canadian border. There are four colleges within the city limits of Burlington including the University of Vermont. (As such there is an unusually high apartment turn-over rate.) The community is a progressive one in terms of environmental issues with interest and involvement in energy efficiency dating back to the oil crises of the 1970s.[R#10]

The Burlington Electric Department (BED or “the Department”) is a municipal utility which provides electricity in its service territory of approximately 10 square miles. With 160 employees, the utility has roughly 15,000 residential customers, 2,900 small commercial customers, and 700 commercial and industrial (C&I) customers totalling 18,578 customers. The utility has evolved into a leader amongst municipal utilities with regard to demand-side management (DSM) and integrated resource planning (IRP).[R#4]

In 1993, BED had gross electric revenues of approximately \$39 million and electric sales of 329 GWh. BED sold 90 GWh of this to the residential sector, 19.5 GWh to the small commercial sector, 216.4 GWh to the larger commercial and industrial sectors, and 2.7 GWh went to street lighting. From 1992 to 1993 residential sales decreased 1.9% and small commercial sales decreased 0.65%, while C&I and street lighting sales increased 3.9% and 0.82% respectively. The net effect was an increase in kWh sales of 1.9% from 323 GWh in 1992. BED’s net growth rate, however, has decreased by roughly 1% due mainly to the economy, weather, and DSM.[R#1]

From 1985 to 1990 BED had no customer rate increases, but since 1990 BED has increased its rates a total of 25.48%, equal to an annual average increase of around 8.4%. Small commercial customers currently pay the highest rate for electricity at 13.5 ¢/kWh. Large C&I customer rates are 6.9 ¢/kWh, while residential customer rates are 8.8 ¢/kWh. Due to the recent annual rate increases no additional hikes are projected for the next few years. The recent rate increases were needed largely to compensate for decreases in revenues and to reduce BED’s short-term debt. These factors were related to the economic recession and production costs of the McNeil plant.[R#5,13]

In August of 1992 BED had a system peak of 57.3 MW. This was noteworthy because it was the first time in BED’s history that demand for electricity has ever been higher during the summer months than the winter months. Milder winter weather and the success of the Department’s fuel switching program, Heat Exchange (Profile #39), are two factors credited with contributing to this lower demand for electricity during

BURLINGTON 1993 STATISTICS

<i>Number of Customers</i>	18,578
<i>Number of Employees</i>	160
<i>Electric Revenues</i>	\$39 million
<i>Energy Sales</i>	329 GWh
<i>Summer Peak Demand</i>	57 MW
<i>Generating Capacity</i>	90 MW
<i>Reserve Margin</i>	57 %
<i>Average Electric Rates</i>	
<i>Residential</i>	8.8 ¢/kWh
<i>Small Commercial</i>	13.5 ¢/kWh
<i>Large C&I</i>	6.9 ¢/kWh

the winter. Based on a total available capacity of 90 MW (self-generated and purchased power combined), the utility has a reserve margin of 57%.

Of the 90 MW of total capacity available to BED, approximately 50 MW is owned by BED with 23.9 MW derived from the Burlington Gas Turbine plant and 26.5 MW available from the McNeil Generating Station wood-chip fired plant, one of the largest wood-fired generating stations in the world. The plant also burns natural gas and fuel oil during times of low wood-chip availability. BED sells 8.5 MW of peaking capacity from the McNeil plant thus making the plant’s actual contribution to BED’s power mix 18 MW. Without this sale BED’s total capacity would be 98.5 MW.

The remainder of BED’s power mix is purchased from an amalgam of sources which include 18.5 MW from Vermont Yankee nuclear power plant, 11.3 MW from Hydro-Quebec, 10.2 MW from the Merrimack coal-fired plant in New Hampshire, and 4.0 MW from Niagara Falls. Rounding out BED’s resource mix is 5 MW derived from in-state purchased power.

In 1990 BED added gas-burning capabilities to the McNeil plant and since then has been buying natural gas on an interruptible basis from Vermont Gas. The availability of natural gas at McNeil has allowed BED to reduce the monthly consumption of fuel oil in the station’s boiler by 94% to 1,424 gallons, thus reducing costs and air emissions. When gas is used at McNeil the plant’s output is highly competitive in the New England Power Pool mix. In 1993 the station consumed 109,270 tons of wood and 386.2 million cubic feet of natural gas producing 104,287 net MWh of power.[R#1,12] ■

Utility DSM Overview

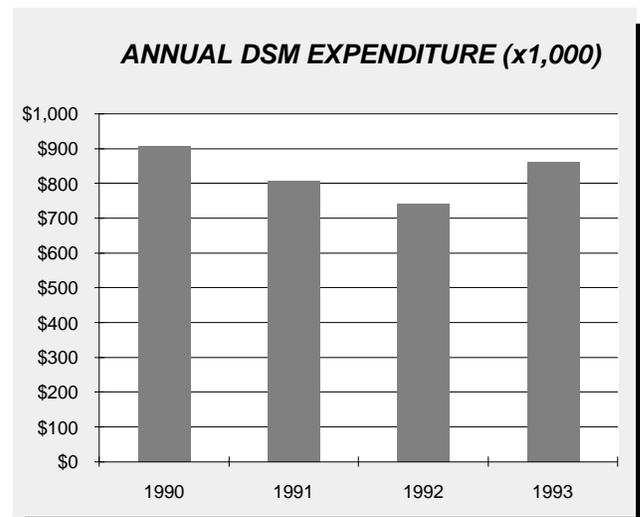
BED DSM PROGRAMS
<i>Residential</i>
<i>Smartlight</i>
<i>Neighbor\$ave</i>
<i>Heat Exchange</i>
<i>Residential Construction</i>
<i>Commercial/Industrial</i>
<i>Top Ten</i>
<i>Energy Advantage</i>
<i>Smartlight</i>
<i>Construction</i>

BED's DSM efforts began in 1980 when BED reacted to the oil crises of the 1970s with a \$2.3 million bond issue for an energy conservation program that provided electric water heater tank wraps as well as water conservation measures to its residential customers. The program was highly successful and ran through 1984 with nearly half of BED's customers, or approximately 7,000 homes, participating.

BED developed an energy-efficient building code which was adopted in 1983 as a municipal ordinance. The utility also began providing Residential Conservation Service (RCS) audits in the early 1980s, offering audits and retrofits. BED worked closely with two statewide programs, the "HEAT" (Home Energy Audit Team) and RCC (Residential Conservation Corporation). The audits were free while financing for the retrofits was arranged with the contractors. In Burlington a three-person audit team performed roughly four audits per day from 1980 to 1984. This resulted in approximately 1,200 audits an-

nually and addressed about 9% of the housing stock at that time. Between 1985 and 1987 BED also put one-half of the electric hot water tanks in the City under direct radio load control. [R#3]

In 1989 and after a public controversy over whether to purchase additional increments of power from Hydro-Quebec and its James Bay development, Burlington's voters opted to invest in energy efficiency as an alternative to the power purchase. Thus BED began its Smartlight program, an innovative compact fluorescent lamp leasing campaign as well as other programs designed to deliver short and long-term savings to the City. Today, other DSM programs implemented by BED's Energy Services Department staff of six include the more extensive residential Neighbor\$ave program, started in 1990, and residential Heat Exchange, commercial Energy Advantage, and the commercial/industrial Top 10 program, all begun in 1991. These, along with residential and commercial construction programs,

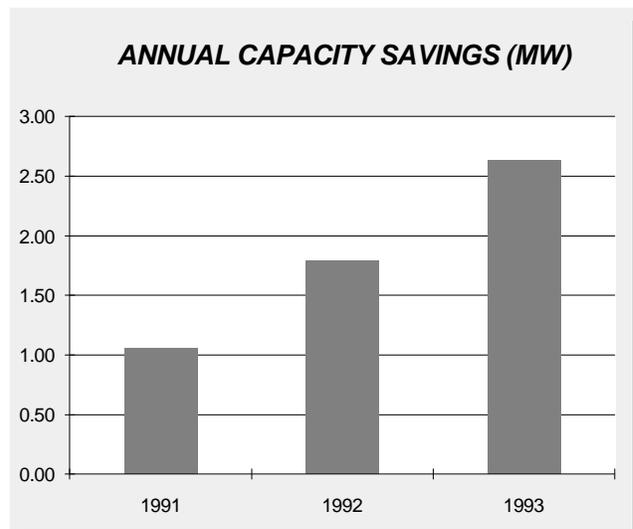
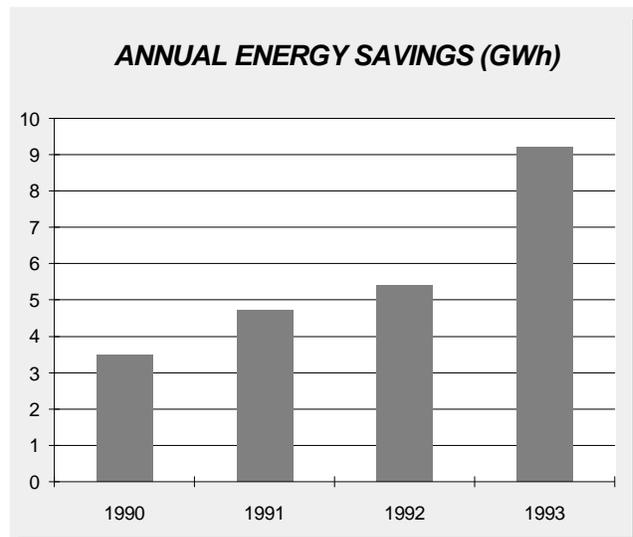


BED DSM OVERVIEW	EXPENDITURE (x1,000)	ENERGY SAVINGS (GWh)	CAPACITY SAVINGS (MW)
1990	\$907	3.5	N/A
1991	\$808	4.7	1.05
1992	\$741	5.4	1.79
1993	\$861	9.2	2.63
Total	\$3,317	22.8	5.47

are the focus of this profile. Costs and savings for these programs are presented for the years 1991 through 1993.

The current driver for BED's DSM efforts is the forthcoming expiration of power supply contracts. Several major contracts are due to expire within the next 10 years and this has solidified BED's commitment to DSM as a resource. Of the utility's current 90 MW capacity, an 11.3 MW Hydro-Quebec contract expires in 1995, the Merrimack coal-fired power plant contract for 10.2 MW expires in 1998, and the 18.5 MW Vermont Yankee contract expires in 2002. Thus BED must replace 40 MW or 44% of its current capacity in the next ten years. Of this, BED plans to fulfill 7-9 MW through DSM.[R#3,5]

In 1993, BED had DSM expenditures of \$861,000, equivalent to 2.9% of gross revenues. This was a 16% increase over 1992 expenditures of \$741,000. However, total DSM expenditures decreased 18% from 1990 through 1992. For 1991, total DSM expenditures were equal to 3.85% of gross revenues. All told, BED's DSM programs have resulted in 22.8 GWh of energy savings and 5.47 MW of capacity savings since 1990. During the same time frame, 3% of electricity use and fully 9.6% of peak demand have been avoided as a result of DSM.[R#1,4] ■



BED's DSM Portfolio

Currently BED offers eight DSM programs that provide energy services to its customers. The Top 10 program is specifically targeted at BED's largest customers to help them finance energy saving retrofits. The Energy Advantage program provides comprehensive retrofits, Commercial Smartlight, and Heat Exchange services to small commercial and industrial customers, traditionally a hard-to-reach market segment. The Commercial and Residential Smartlight programs provide compact fluorescent lamp leasing mechanisms for BED customers either over the counter or through the Energy Advantage and Neighbor\$ave programs. The Neighbor\$ave program is a residential retrofit program that provides efficiency services and includes the Residential Smartlight program. (See Profile #2: Burlington Electric Department, Smartlight) Heat Exchange provides incentives for customers to switch from electric space and water heating to other primary fuels. (See Profile #39: Burlington Electric Department, Heat Exchange)

Additionally, all customer groups are offered construction services programs which provide incentives to homeowners, designers, and builders to exceed energy efficiency levels required by the code of Energy Efficiency Guidelines. These are developed by BED and enforced by the City's Department of Public Works Building Inspection Division. According to BED staff, this "something for everyone" approach helps eliminate non-participant and cross subsidy issues.[R#2]

The Top 10 program: The Top 10 program began in 1991 and provides a customized menu of energy-saving measures to BED's largest commercial and industrial customers by helping to finance energy-efficient retrofits in their facilities. Despite the program name, it actually deals with approximately 30 large C&I customers who qualify for this program by having a peak annual demand greater than 200 kW. (Originally the program was targeted at the ten largest customers, but has since been expanded though the name stuck.)[R#6]

Utility engineers and energy service representatives work directly with the customers. BED works closely with the customer's management team to provide a positive cash flow for financing DSM measures, typically buying down the customer's payback to between 3 and 3 1/2 years. A project

must be screened as less costly than the energy it displaces in order to participate. Loans are provided via BED's contract with one local bank. This is an exclusive service whereby loans are bid out on an as-needed basis. BED serves as the loan agent, providing security and taking the risk for the loans. In some instances BED provides project financing directly.

Many Top 10 projects include measures such as state-of-the-art lighting and HVAC equipment. The utility tries to be very flexible when dealing with its large C&I customers in order to maximize DSM participation.[R#6]

All customers in this group have been informed of the availability of the service. The program has been extremely well-received and has achieved a high participation rate. To date, the key delivery issue surrounding the program has been project management, juggling the needs and desires of BED's customers with available program resources. Energy efficiency seminars, aimed at educating facility managers about the benefits of energy efficiency, have helped to raise the level of program consciousness and sparked much customer-initiated retrofit activity.[R#2]

Energy Advantage: Begun in 1991 with a total eligible market of approximately 2,300 customers, the Energy Advantage program promotes energy efficiency to small C&I customers that have a peak annual demand under 200 kW. The utility provides free energy audits, direct installation, and financing for a wide range of measures including lighting, HVAC, and fuel switching that are customized for each business. Incentives are designed to provide the customer with a positive cash flow based on the calculated energy savings resulting from the retrofit. Just as in the Top 10 program BED will buy down customer paybacks to around three years. Rebates are available to customers who perform the installation work themselves or use contractors to install more complex systems. Lighting retrofits, the primary measures installed through the program, are set-up through the Commercial Smartlight program.[R#7]

Energy Advantage has a low number of completed projects due in part to the long lag-time between the energy audit and project completion. BED has marketed the program by placing

regular progress reports in customer newsletters, targeting the distribution of program brochures throughout the business community, and tying the program into a variety of economic development activities.

BED has found a greater challenge in marketing DSM to small C&I customers than it has with the larger customers of the Top 10 program. This is likely due to a high turnover rate in the small C&I sector as well as the lack of time and capital that small business owners have to consider energy efficiency. Also efficiency usually ranks low on small commercial businesses' priority list. Overall the utility has had better luck getting new construction projects in this customer sector to participate. [R#2,7]

No substantial changes have been proposed for the Energy Advantage program. BED has found that the implementation path through the program was longer than planned. Thus they have made some minor changes to the financing mechanism and are also looking for ways to streamline administration and reduce the investment of customers' time and energy. Incentive levels are expected to increase as BED works with longer payback retrofits, widening the scope of retrofit services offered through the program, for example for HVAC and refrigeration end-uses. [R#2]

Residential Smartlight Leasing program: BED's Smartlight program provides compact fluorescent lamps to customers using a leasing financing mechanism. Customers can lease any of BED's compact fluorescent products for \$0.20/bulb per month paid for 60 months. BED's customer billing system also tracks each individual Smartlight to account for these leases. A customer can return the bulb at any time and in any condition and stop the lease. If a bulb breaks or burns out, or even if the customer doesn't like the bulb, upon return to BED, the lease fee stops. A new bulb is then issued and a new lease starts. This program even affords the customer a two month break-in period before the lease starts. Thus the customer doesn't have to pay until he or she has tried out the bulbs and elected to keep them. This option is an important promotional tool and greatly simplifies administration. If the customer moves, the lease fee is stopped whether the bulb is

returned or not. However, BED asks that the bulbs stay in their permanent locations and has found that people are remarkably conscientious in fulfilling this request. [R#2,9]

BED started out by modeling the Smartlight program that was implemented by Taunton Municipal Lighting Plant. (See Profile #42: Taunton Municipal Lighting Plant: Smartlight and Lightwaves) BED began marketing the program with a teaser newspaper ad, "Smartlight is coming," followed by an advertising campaign featuring brochures announcing Smartlight's arrival. These brochures and a postage-paid reply post card were mailed to all of BED's residential customers. The program's logo and display were prominently displayed at schools and as part of BED's Public Power Week activities. A large Smartlight display, which included a watt meter to visualize savings, was set up in the BED lobby. Department staff now use this display to assist customers in selecting the correct product for their needs.

Currently BED continues to direct mail market Smartlight to turnover accounts where leases have ended. BED's in-house customer service and cashier personnel have received extensive training in order to handle walk-in service.

Presently BED offers about 10 different lighting products through the Smartlight program. Initially Smartlight and Neighbor\$ave were separate programs, but Smartlight did not fare well as a stand-alone, mail-order program. It was eventually combined with the Neighbor\$ave program. However, today two-thirds of the business has shifted back from the Neighbor\$ave program to over-the-counter leases. [R#2,9]

Commercial Smartlight Leasing program: The Commercial Smartlight Leasing program fundamentally works the same way as the Residential Smartlight Leasing program, however in this program customers lease the bulbs for \$0.35/bulb per month for a 36-month period. In addition, customers are limited to a maximum of 100 bulbs. As in the Residential Smartlight program the lease may be stopped by the customer at any time for any reason. Due to the large number of bulbs often at one location, BED makes the effort to ensure that bulbs either remain in place or are returned when the accounts are over. [R#7]

BED's DSM Portfolio (continued)

The primary method of marketing the Commercial Smartlight program has been via the Energy Advantage program and through day-to-day customer and energy service contacts. The program is targeted at smaller commercial customers who do not normally work with lighting suppliers, giving these customers "no money down" access to energy-efficient lighting products which is otherwise difficult and costly to obtain. BED continually enhances the program by offering an expanded lighting product line and by accommodating more installations. In order to increase public awareness of the program, BED retrofitted the local Community Boathouse, a public recreational facility, and the main auditorium of City Hall. [R#2,9]

NeighborSave: The NeighborSave program began in 1990, providing energy-saving measures and information directly to BED residential customers. Installers travel door-to-door in selected neighborhoods. During a 30-40 minute visit in each home he or she installs faucet aerators, low-flow showerheads, water heater insulation blankets, and compact fluorescent lamps (using the Smartlight lease mechanism) into residents' homes at no charge.

Installers also briefly survey the occupants regarding their energy usage, lighting habits, and appliance information. Installers work with customers to identify and install the "right" compact fluorescent product in the appropriate locations, attempting to optimize the number of lights installed. After the survey installers inform customers about BED's incentives for retrofitting water heaters and weatherization measures. They also insulate hot water pipes and distribute a customized package of energy efficiency educational materials. Questions about energy efficiency are answered on the spot and customers are sometimes referred to other DSM program efforts appropriate to their situation. [R#2,3]

In the program's early years it was advertised through local newspapers, advertisements on local buses, countless posters, and TV and radio campaigns emphasizing the financial advantages of the program to customers by using quotes from program participants. Additional information has been added to BED's Smartlight lobby display at the utility's headquarters.

A doorhanger with a postage-paid return card was circulated through the City. Telephone marketing was used to set up appointments with customers who contacted BED and to seek other customers' participation. NeighborSave operated intensively during the summers of 1990 and 1991. During that time BED reached almost 40% of all eligible customers. [R#2]

Heat Exchange: In September 1989 the U.S. Department of Energy awarded BED a \$125,000 grant to develop and implement a pilot program for residential heat fuel-switching. Using the results of this pilot program, BED initiated a full-scale residential electric heat conversion program. The full-scale program began in April 1991 and had a goal of reaching 1,500 of the 2,200 electrically-heated homes in the City. Approximately 70% of conversions to date have been to natural gas. The program places a special emphasis on rental housing because 68% of BED's electric space heat customers are renters. [R#3,8]

Heat Exchange is attractive to both renters and landlords because heating bills are reduced drastically. Benefits to tenants are obvious, but owners also benefit because it is easier to attract and keep tenants with non-electric heat. With this program BED has the potential to reach all remaining residential customers who have electric heat because a ban on electric heat in new residences was passed in 1991.

Participation in the program begins with a free energy audit conducted by a BED contractor and a BED energy services specialist. A summary report is provided to the customer which includes details of the contractor-designed heating system as well as any necessary weatherization work. Interested customers then have the option of selecting a loan or rebate. If the customer finances the work with a BED loan, BED oversees the project. If the customer selects the rebate option, the customer is responsible for dealing with the contractors. Rebates can be up to \$1,000 and can represent up to 50% of the project cost, though the rebates have averaged approximately 20% of project costs. With a loan the customer pays 60% of the first-year savings estimate every year for five years. Any remaining balance is paid by BED. Loans and rebates are monitored by a customized Paradox database. [R#2,3,8]

The largest Heat Exchange project to date was the Northgate housing complex. Northgate was the first tenant-organized buy-out under the Federal Housing and Urban Development Corporation Housing Preservation Guidelines. Through creative financing and a strong effort by the residents, community funds were raised from nine sources to buy the project and create Northgate Housing Incorporated. As part of the buyout the Northgate task force raised a total of \$8.1 million which was spent on building rehabilitation, with approximately \$2.1 million spent on energy efficiency improvements. Included in the improvements was the replacement of electric baseboard heaters with natural gas-fired, hydronic baseboard heaters. This fuel-switching, or “heat exchange,” took place from September 1989 through August 1990. BED contributed \$267,000 directly to the effort.[R#3,8]

In September 1990, the U.S. Department of Energy awarded a second grant to BED for \$54,800 to support the efforts with energy efficiency at Northgate and to use it as a fuel substitution demonstration. The purpose of the grant was to document and disseminate the success of Northgate in reducing the costs of living in subsidized housing to affordable levels.[R#3,8,10]

To date the Heat Exchange program has required very little marketing by BED since substantial publicity and public comment surrounded the development of the 1990 municipal bond funding authorization vote. As a result, nearly 1,000 units of housing (two-thirds of BED’s target market) were in line for the program when it went full-scale in May, 1991. Furthermore, BED has placed regular progress reports in customer newsletters since that time. This has allowed BED to meet and exceed its targets and to focus on the neediest customers. Word-of-mouth generated by satisfied customers has also provided a solid means of bringing in new customers at a rate greater than originally anticipated. Ideally, BED hopes to wind the program down slowly in order to run the program at a maintenance level in the future capturing the remaining electrically-heated units over time.[R#2]

Residential Construction: The Residential Construction program is designed to help builders and developers exceed

the required Burlington “Guidelines for Energy-Efficient Construction” and take advantage of the highest efficiency electrical equipment available. The program offers design assistance, technical review of all electricity saving measures, descriptions of recommended energy-efficiency improvements, information on savings from the recommended improvements, and cash rebates for certain measures.

The program begins with a BED Energy Services Specialist reviewing a customer’s building plans. The specialist then recommends the most energy-efficient products available and also performs an analysis to determine the customer’s benefit from investing in higher efficiency products. The specialist also provides the customer with a written report detailing efficiency improvements and including a payback analysis with details on the potential for a BED rebate or subsidy determined on a case-by-case basis.[R#2]

Commercial Construction: The Commercial Construction program was designed similarly to the Residential Construction program to assist customers in exceeding Burlington’s required “Guidelines for Energy-Efficient Construction” when they build or renovate their facilities.

After a designer has become familiar with the requirements, an Energy Services Specialist works with the customer to review the initial building concept design and identifies potential energy-efficiency improvements. BED staff analyze the various measures to determine their cost-effectiveness or else provide funding for an engineering firm to evaluate the measures. The staff also provide design services for cost-effective projects and assistance in locating manufacturers, consulting engineers, local distributors, project managers, and contractors. After all the findings have been reviewed and cost-effectiveness determined, BED presents the customer with a report on the energy-efficiency measures that qualify for the program. Then BED inspects the customer’s project throughout the construction phase. Upon operational completion of all work and pending all approvals, BED offers subsidies when appropriate to shorten the payback time of these measures. Financing at favorable interest rates is also available. [R # 2] ↩

STAFFING REQUIREMENTS

Tom Buckley is the Director of Energy Services and has headed up the Department since 1986. Mr. Buckley reports directly to BED's Resource Management Director. Loren Doe is in charge of large commercial and industrial DSM projects. Ron Manganiello runs BED's DSM programs for small C&I customers. Chris Burns heads up BED's residential DSM programs, and Craig Kieny, the Director of Resource Planning, is responsible for developing and updating IRPs. [R#3,5,6,7,8]

Each of these staff members devotes full-time efforts to their prospective programs. Kelly Wright, Energy Services Administrator, and Sharon Sweeney, Resource Management secretary, also work full time for Energy Services to assist in the administration and implementation of BED's DSM programs. The entire energy services staff totals six full-time equivalents.

Recently BED has dedicated two new positions solely to DSM monitoring, evaluation, and planning. Patty Richards, DSM Evaluator/Planner and Mary Austin, DSM Analyst, are responsible for monitoring DSM program operations, measuring the impact and process of DSM programs, and coordinating planning functions. The new area is intended to provide an objective view to assure the overall effectiveness of implemented DSM measures and programs, and to provide valuable input and guidance into the development of future DSM programs. ■

CASE STUDY: UNIVERSITY HEIGHTS

The developer of an 80-unit apartment complex planned incandescent lighting for the interiors of each unit. BED met with the developer and offered a 50% rebate on the fixture cost if the developer installed permanently wired compact fluorescent fixtures in cost-effective locations in each apartment. With a \$7,409 BED rebate the final cost to the developer for the fluorescent lighting system was \$11,831, equal to the cost of a comparable incandescent system. However, the annual energy cost with the incandescent system was \$2,891 while the fluorescent system cost \$616 per year. This resulted in a \$2,275 per year cost savings providing a profit to the building manager in just over five years.

CASE STUDY: HANDY'S CORNER STORE

When a local grocer wanted to expand his business, Burlington's Building Inspection Division suggested that the owner contact the BED Energy Services staff for recommendations on how to save on utility costs. Though the owner's new refrigeration unit met the "Guidelines for Energy-Efficient Construction," a BED specialist suggested an enhancement that could save the owner over 30% of winter refrigeration costs.

BED analyzed the potential savings of the enhancement, assisted the contractor in sizing the equipment, and provided a direct subsidy of \$1,100 towards the \$6,500 cost. This brought the simple payback of the project down to one and a half years. BED also paid for the installation. The owner could then easily commit to repaying the remaining \$5,400 over the next 36 months, or 75% of the projected electricity cost savings during that period.

Since BED is a municipal department in a relatively small city, its staff have the unique ability to market its Residential and Commercial Construction programs on an individualized basis. BED can insure that each and every builder and developer is informed of the program's existence as projects pass through the technical and planning reviews as well as the building permit and construction processes. This one-on-one process is integrated into the operations of the Burlington Planning Department and Commission which communicates initial expectations and ensures they have been considered before approving plans; the Department of Public Works Building Inspection Division which administers the permit process and provides field inspections; and BED which provides technical assistance and guidance to meet the goal of adopting the best available technology on a life-cycle cost basis. [R#2]

Monitoring and Evaluation

MONITORING

BED follows routine procedures for tracking all of its programs. Monthly tracking reports are generated which show the month's activity as well as cumulative year-to-date activity. These reports provide management guidance throughout the year and allow tracking vis-a-vis specific program goals. In turn, the monthly reports are used to develop the annual DSM reports which BED uses internally and to present to the City's Electricity Commission and the State's Public Service Board.

One clear advantage of a leasing program is that when it is fine-tuned it provides a built-in data recording mechanism. Data collected from the Smartlight leasing program, for example, is entered into a database on a daily basis which then triggers a line item on customers' bills for lease payments. Reports on the program's progress are issued to management on a real-time basis. From this, monthly reports are generated and then this information is tilled into annual reports.

BED is able to monitor participation in the Top Ten, Neighbor\$ave, Energy Advantage, and the Construction programs relatively easily. When specialists get back from field audits, they enter engineering-based savings estimates into a Lotus spreadsheet and then into a Paradox database. No end-use metering or monitoring is currently undertaken for these programs.

For the Heat Exchange program the loans and rebates are monitored by computer also using the customized Paradox database. From this BED produces a monthly Heat Exchange Program Report, listing cumulative activity, including residential project status, along with a cost savings analysis for all completed projects. The productivity of the energy auditors is not difficult to track because BED must sign off on every Heat Exchange project.[R#3]

BED monitors the prices charged by the heating contractors but does not monitor the customer/contractor relationship. BED acts as an agent, bringing the customer and contractor together, but once the customer signs the Heat Exchange agreement, a traditional customer/contractor relationship ensues. BED provides a final inspection and arranges for a required safety inspection by the building inspector prior to making payments. To date, this arrangement has not led to an major problems.[R#39]

EVALUATION

In the Spring of 1993, BED, as required by the PSD, issued a request for proposals to evaluate its DSM programs. Subsequently, Resource Management International, Inc. (RMI) was retained to carry out impact and process evaluations of these programs. (The impact evaluation is still undergoing revisions and is not yet publicly available.)

The main objective of the impact evaluation was to estimate monthly energy savings and coincident peak demand savings. Other objectives were to examine the appropriateness of engineering assumptions and methods, measure persistence, assess the extent of free ridership, and assess whether program goals are being achieved.[R#11]

The overall purpose for the process evaluation was to conduct an investigation and analysis of BED's program implementation, essentially assessing the effectiveness of program delivery and operation, and to identify ways in which to implement programs at a pace which is manageable given BED's resources. The process evaluation objectives included review of program marketing, determination of program quality, identification of participants' acceptance and satisfaction, review of program tracking systems, and assessment of program delivery and design.[R#11]

The major procedures and methods used in carrying out the analysis consisted of a quantitative analysis, in-depth personal interviews with utility program staff, review of program tracking databases, and customer surveys.

PROCESS EVALUATION FINDINGS

Over 81% of the participants of the Smartlight program surveyed reported that they were satisfied with the program. Less than 10 percent of the respondents articulated some level of dissatisfaction with the program, and dissatisfaction dealt mainly with the technical aspects of the compact fluorescent lamps. Reasons for this dissatisfaction are consistent with the well-known and obvious drawbacks of lamps such as size, shape, weight, start time, and level of brightness.[R#11] ☞

Monitoring and Evaluation (continued)

Similar to satisfaction, Smartlight's program delivery collected very high ratings. Ninety-eight percent of survey respondents agreed that participation in the Smartlight program was easy. Concerning persistence, 81% of the Smartlight participants surveyed had all or some of the lamps still in place at their residences at the time of the survey. For those who didn't have the original compact fluorescent bulbs in place, 82% replaced the bulbs while 17% removed the bulbs and did not replace them at all. [R#11]

The evaluation also found that BED customers have a very high awareness level of the Smartlight program. This may be partly a function of the fact that the program has been in existence since 1989. Of the residential non-participants surveyed, 71% were aware of the BED Smartlight lease option. [R#11]

Over 86% of the participants surveyed reported that they were satisfied with BED's Neighbor\$ave program. Less than 10 percent of the respondents articulated some level of dissatisfaction with the program. Similar to the Smartlight program, Neighbor\$ave program delivery received high ratings. Ninety-seven percent of survey respondents agreed that participation in the Neighbor\$ave program was easy. Ninety percent of the measures were still in place at the respondents' residence. Of the residential non-participants surveyed, over half, 58 percent were aware of the program. [R#11]

Ninety-nine percent of Heat Exchange participants interviewed were satisfied with their new heating system, including 80% who were very satisfied. Only 5% of respondents found program participation difficult. While 23% of Heat Exchange participants surveyed became aware of the program through a BED bill insert, one-third reported that they heard of the program through condominium associations, homeowner associations, realtors, and other agencies. Virtually all of the converted heating systems are still in place. [R#11]

Eighty-eight percent of program participants agreed that the Energy Advantage program's overall delivery was a success and found program participation easy. The process evaluation found that no HVAC measures or lighting installations have been removed. [R#11]

The process evaluation also focused on four of the Top Ten projects and found customer awareness, motivation, and satisfaction high among all participants. Staff for all the installations were very satisfied with all aspects of their participation in the program. High marks were given to the BED Energy Services staff for their timely efforts. [R#11] ■

Program Savings

SAVINGS OVERVIEW	ENERGY SAVINGS (MWh)	CUMULATIVE SAVINGS (MWh)	LIFECYCLE SAVINGS (MWh)	CAPACITY SAVINGS (MW)	CUMULATIVE CAPACITY SAVINGS (MW)
1991	4,660	4,660	69,900	1.05	1.05
1992	5,383	10,043	91,511	1.80	2.84
1993	9,198	19,241	128,772	2.63	5.48
Total	19,241	33,944	290,183	5.48	

Data Alert: BED tracks its programs on a fiscal year basis. Fiscal year 1991, for example, begins July 1, 1990 and ends June 30, 1991. Although BED has tracked program expenditures since fiscal year 1990, no individual program savings are available for that year. Savings in this section are derived from fiscal years 1991 through 1993 and have not been adjusted for free ridership.

PROGRAM SAVINGS

In 1993 BED's savings resulting from all of their DSM programs combined totaled 9,198 MWh and 2.63 MW. Annual energy savings from 1992 to 1993 increased by nearly 71% from 5,383 MWh to 9,198 MWh. From 1991 to 1993 BED's programs have resulted in total annual energy savings of 19,241 MWh, cumulative capacity savings of 5.48 MW, and

lifecycle energy savings of 290,183 MWh based on a varying weighted average measure lifetime for each year. [R#2]

The individual program that resulted in the greatest energy savings for 1993 was the Top 10 which saved 4,376 MWh and 1,113 kW of capacity. The program with next highest level of energy savings for 1993 yet the highest capacity savings of all the programs was Heat Exchange which saved 3,281 MWh and 1,157 kW of capacity. The program with the least amount of savings for 1993 was Residential Smartlight with 108 MWh and a capacity savings of 700 kW. This small amount was due to some savings being attributed to the Neighbor\$ave and Energy Advantage programs. With a weighted average measure life of 18 years, the Heat Exchange program produced the highest lifecycle energy savings of all the programs at 59,058 MWh. The New Construction program is excluded from the program savings because there was not enough activity reported at the time. [R#2]

1993 SAVINGS BY PROGRAM	ENERGY SAVINGS (MWh)	AVERAGE MEASURE LIFE (Yrs)	LIFECYCLE SAVINGS (MWh)	CAPACITY SAVINGS (MW)
Top 10	4,376	13	56,888	1.113
Energy Advantage	997	14	13,958	0.253
Comm. Smartlight	214	3	642	0.550
Res. Smartlight	108	5	540	0.700
Neighbor\$ave	222	8	1,776	0.490
Heat Exchange	3,281	18	59,058	1.157
Total	9,198		132,862	2.634

Program Savings (continued)

PARTICIPATION RATES

Participation for each program is defined as the number of customers with installations performed. For the Top 10 program BED has found it relatively easy to get its largest customers to participate because longstanding relationships between the utility and its large customers were already established. With a total of 24 installations to date out of a market eligibility of 30, this program has resulted in average energy savings of 275,667 kWh per participant. Participation has steadily increased over the past three years from two in 1991, to five in 1992, and 17 in 1993, creating an 80% participation rate. While participation for this program has increased, actual savings per participant have decreased from 476,000 kWh in 1991 to 257,412 kWh in 1993. [R#2]

The Energy Advantage program has a participation goal of 1,500 commercial customers out of a possible 2,300. The program's participation through 1993 of 141 has resulted in savings of 10,539 kWh per participant. So far BED has achieved a 6% participation rate after about 2 1/2 years of implementation. Participation has dramatically increased over the past three years from six participants in 1991 to 47 in 1992 and 88 in 1993. While participation for this program has increased each year, savings per participant have decreased from 22,000 kWh in 1991 to 11,330 kWh in 1993. This per participant savings decline for the Top 10 and Energy Advantage programs suggests that many of the larger more cost effective installations have already been retrofitted. However, if a proposed schools program goes into effect, this downward trend will cease.

In 1993, the Commercial Smartlight program resulted in savings of 3,267 kWh per participant for 59 installations out of a total eligible market of 2,300 commercial customers. This represents a 2.5% participation rate for the first year of program activity. The Residential Smartlight program had 294 installations in 1993 resulting in 367 kWh of savings per participant. To date the Residential Smartlight has resulted in savings of 440 kWh per participant for 2,375 installations out of a possible eligible market of 14,400 residential living units. This represents a 17% participation rate. [R#2]

1993 PARTICIPATION BY PROGRAM	NUMBER OF PARTICIPANTS	ENERGY SAVINGS PER PARTICIPANT (kWh)
Top 10	17	257,412
Energy Advantage	88	11,330
Com. Smartlight	59	3,267
Res. Smartlight	294	367
Neighbor\$ave	506	439
Heat Exchange	379	8,657
Total	1,343	

To date 7,309 homes and apartments out of a total eligible market of 14,400 residential living units have been visited through the Neighbor\$ave program. The program's 51% participation rate has resulted in 805 kWh of savings per participant. Program participation peaked during the summers of 1990 and 1991 with over 2,000 installations each

PARTICIPATION BY PROGRAM TO DATE	NUMBER OF PARTICIPANTS	ANNUAL SAVINGS PER PARTICIPANT (kWh)
Top 10	24	275,666
Energy Advantage	141	10,539
Com. Smartlight	59	3,627
Res. Smartlight	2,375	440
Neighbor\$ave	7,309	805
Heat Exchange	1,295	9,640
Total	11,203	

summer implemented by 24 field personnel, 4 telemarketers, and 2 supervisors, all of whom were college students. BED representatives still visit about 500 homes annually for the Neighbor\$ave program. BED handles roughly 10 installations per week. In 1993, 506 installations resulted in 439 kWh of savings per participant.

The Heat Exchange program has had 1,295 installations to date out of a possible 2,200 all-electric heated living units, with average annual savings of 9,640 kWh per participant. This represents a remarkable 59% participation rate. In 1993, 379 installations were performed resulting in 8,657 kWh of savings per participant. The Heat Exchange program's participation has remained stable over the past few years.[R#2]

FREE RIDERSHIP

Although BED has not adjusted savings for free ridership, preliminary evaluation results have provided some insights. For instance, when Smartlight program participants were asked if they had decided to purchase compact fluorescent bulbs before the Smartlight bulb lease option was presented to them, fewer than 10 percent said yes. Ninety percent would not have purchased similar bulbs without the program. This indicates relatively low free ridership.[R#11]

It was determined that the Neighbor\$ave program has a free ridership of less than 10 percent. This means that this amount of participants made a decision to purchase measures beforehand, without an incentive.

For the Heat Exchange program, 53 percent of participants reported that they would have made the heating system switch with no incentive. This suggests a high level of free ridership, so BED is currently reevaluating this information to determine its validity as it seems intuitively too high.

Free ridership in the Energy Advantage is relatively high. Of twelve surveyed participants, one HVAC, three lighting, and two Smartlight participants said that they decided to make the improvements before their involvement in the program. When

asked if they would have installed the measures if BED did not offer the audit, technical assistance, or financial assistance, 18 percent said they would.[R#11]

The Top Ten program had virtually no free ridership. Most participants said that none of the expenditures would have been possible without the loan offered through the program.

MEASURE LIFETIME

BED calculates a combined weighted average measure lifetime for all six programs which achieve energy savings, ranging from 15 years for 1991, 17 years for 1992, to 14 years for 1993. These lifetimes are used by BED to determine the lifecycle energy savings for all programs combined.

As presented in the 1993 Savings By Program table, a weighted average measure lifetime for each individual program has also been calculated by BED. This calculation takes into account all the varying measures installed for each program.[R#2]

However, in its latest IRP, BED has assigned a 20-year lifetime to all of its DSM measures. This places a high value on building persistence guarantees in DSM projects.

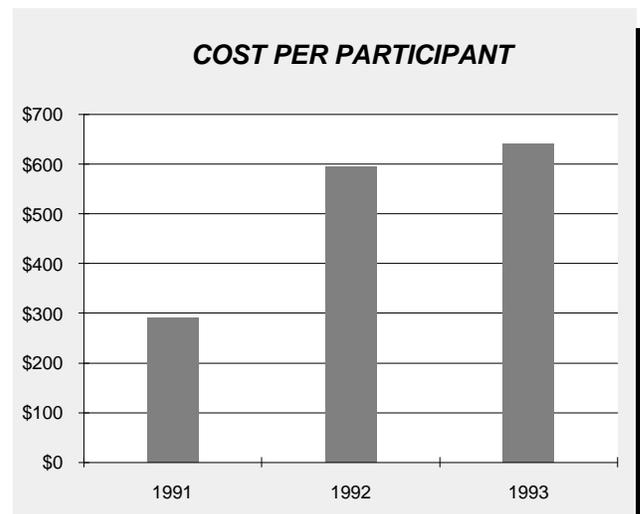
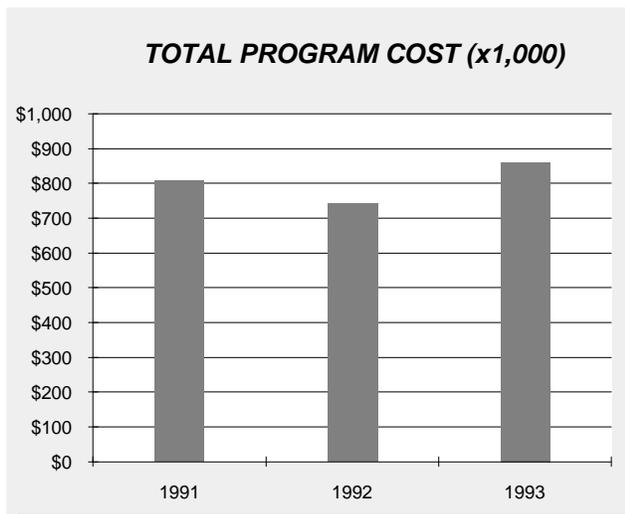
PROJECTED SAVINGS

Overall, DSM results in 1993 well exceeded BED's expectations. The total number of participants was slightly ahead of predictions while both energy savings and overall expenditures were well ahead of projections.

The utility's 1994 savings projections are slightly less than savings accrued in 1993. Net annual savings from all the programs combined are projected to decrease. Tom Buckley, Director of Energy Services, says a change in savings might only be slight resulting from the downsizing of the Heat Exchange program coupled with a shift from the residential to commercial sector.[R#2] ■

Cost of the Program

COSTS OVERVIEW	ADMIN. (x1,000)	INCENTIVE (x1,000)	AUDIT (x1,000)	EVALUATION (x1,000)	DIRECT COST (x1,000)	TOTAL COST (x1000)	COST PER PARTICIPANT
1991	\$248	\$321	\$101	\$8	\$130	\$808	\$290
1992	\$229	\$291	\$106	\$48	\$68	\$741	\$595
1993	\$141	\$452	\$127	\$97	\$42	\$861	\$641
Total	\$618	\$1,064	\$334	\$153	\$240	\$2,410	



BED spent a total of \$2.41 million on its DSM programs between 1991 and 1993. Expenditures have fluctuated slightly over the years generally in a downward trend, with 1990 expenditures at \$907,000, 1991 at \$808,000, 1992 at \$741,000, and 1993 expenditures totaling \$861,000. The 1993 expenditures were higher than expected because program participation was significantly greater than projected. [R#2]

COST EFFECTIVENESS

The Results Center calculations of the annual cost of saved energy are shown in the accompanying table. This calculation is presented at various discount rates ranging from 3-9% and based upon annual savings and cost figures for the six programs which have achieved energy savings. At a 5% discount

rate the programs have an average cost of saved energy of 1.21 ¢/kWh from 1991-93. This ranges from a low of 0.95 ¢/kWh in 1993 to a high of 1.67 ¢/kWh in 1991. On an annual basis, the cost of saved energy has consistently been well under 2 ¢/kWh in each year of the program.

COST PER PARTICIPANT

The Results Center has calculated the utility cost per participant for each year of the program based on total annual expenditures and the number of installations performed each year. This calculation revealed that the cost per participant has increased each year, from a low in 1991 of \$290 per installation to a high of \$641 per installation in 1993. However the Top 10 program alone cost the utility an average of \$29,878 per partici-

1993 COSTS BY PROGRAM	ADMIN. (x1000)	INCENTIVE (x1000)	AUDIT (x1000)	EVALUATION (x1000)	DIRECT COSTS (x1000)	TOTAL COSTS (x1000)
Top 10	\$58	\$199	\$38	\$13	NA	\$307
Energy Advantage	\$19	\$76	\$32	\$19	NA	\$145
Com. Smartlight	\$1	\$0	NA	\$0	\$1	\$2
Res. Smartlight	\$6	\$14	NA	\$21	NA	\$41
Neighbor\$ave	\$14	(\$27)	NA	\$22	\$15	\$24
Heat Exchange	\$44	\$189	\$58	\$23	\$26	\$340
Total	\$142	\$452	\$127	\$96	\$42	\$861

part from 1991 to 1993. The increase in this program's participation and corresponding increased costs are largely responsible for the increase in average cost per participant for the entire DSM roster.

BED has also tracked the annual customer-incurred costs. This number significantly increased each year from \$389,183 in 1991, to \$912,421 in 1992, to \$1,849,508 in 1993. (The 1993 figure includes an average cost per customer of \$45,094 for the 17 participants who participated in the Top 10 program, as well as a \$1,927 cost per participant for the 379 participants of the Heat Exchange program.) When these programs are factored out, a more accurate cost for the other four programs is assessed. In 1994 total participant costs are projected to decrease to \$1,599,888.

COST COMPONENTS

Overall, 44% or \$1,064,000 of utility costs have gone towards program incentives from 1991 to 1993. Administrative costs have accounted for 26% of total utility costs at \$618,000. Audit costs have accounted for 14% of total costs for the utility at \$334,000. Evaluation costs of \$153,000 accounted for 6%. Direct costs, meaning utility hardware costs, comprised \$240,000 or 10% of total costs.

The program with the highest overall cost to the utility for 1993 was Heat Exchange at \$340,000. The Top 10 program cost the utility \$307,000 in 1993. The programs combined accounted for 75% of all utility costs in 1993. Commercial Smartlight had the smallest 1993 expenditure with \$2,000. [R#2] ■

COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
1991	1.45	1.56	1.67	1.78	1.90	2.02	2.15
1992	1.05	1.13	1.22	1.31	1.41	1.51	1.61
1993	0.83	0.89	0.95	1.01	1.07	1.14	1.20
Total	1.05	1.13	1.21	1.29	1.38	1.46	1.55

Environmental Benefit Statement

AVOIDED EMISSIONS BASED ON 33,944,000 kWh SAVED from 1991-1993						
<i>Marginal Power Plant</i>	<i>Heat Rate BTU/kWh</i>	<i>% Sulfur in Fuel</i>	<i>CO2 (lbs)</i>	<i>SO2 (lbs)</i>	<i>NOx (lbs)</i>	<i>TSP* (lbs)</i>
Coal						
Uncontrolled Emissions						
A	9,400	2.50%	73,183,000	1,736,000	351,000	35,000
B	10,000	1.20%	78,037,000	672,000	227,000	168,000
Controlled Emissions						
A	9,400	2.50%	73,183,000	174,000	351,000	3,000
B	10,000	1.20%	78,037,000	67,000	227,000	11,000
C	10,000		78,037,000	448,000	224,000	11,000
Atmospheric Fluidized Bed Combustion						
A	10,000	1.10%	78,037,000	205,000	112,000	56,000
B	9,400	2.50%	73,183,000	174,000	140,000	11,000
Integrated Gasification Combined Cycle						
A	10,000	0.45%	78,037,000	138,000	22,000	56,000
B	9,010		70,196,000	50,000	17,000	3,000
Gas						
Steam						
A	10,400		42,566,000	0	97,000	0
B	9,224		36,965,000	0	231,000	11,000
Combined Cycle						
1. Existing	9,000		36,965,000	0	142,000	0
2. NSPS*	9,000		36,965,000	0	67,000	0
3. BACT*	9,000		36,965,000	0	9,000	0
Oil						
Steam--#6 Oil						
A	9,840	2.00%	61,608,000	933,000	110,000	105,000
B	10,400	2.20%	65,342,000	926,000	139,000	67,000
C	10,400	1.00%	65,342,000	132,000	111,000	35,000
D	10,400	0.50%	65,342,000	388,000	139,000	21,000
Combustion Turbine						
#2 Diesel	13,600	0.30%	81,771,000	163,000	253,000	14,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	97,080,000	250,000	329,000	73,000

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

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

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

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

* Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

Lessons Learned / Transferability

LESSONS LEARNED

Dedicated staff have made DSM a success at BED: A wide range of people and factors combined to make DSM a success at BED. Perhaps most important are the people. Tom Buckley, Director of Energy Services who has been at BED since 1986, has been the one constant in the Energy Services department. When Mr. Buckley arrived at the utility there was one energy specialist performing residential energy audits. Management realized that DSM was a growing area, hired Mr. Buckley, and between 1989 and 1991 all of BED's current DSM programs were rolled out on a full-scale basis.

BED regards its customers as owners and acts on their behalf: Another factor in favor of DSM is the relationship between the utility and its customers. BED refers to its customers as "consumer-owners" and places a high priority on their views and needs. Thus as BED's peak demand grew during the early and mid 1980s, the utility realized that electric heat was a major component of this peak and opted for a fuel switching program to reduce demand and save customers money off their electric bills.

Citizens in Burlington, in turn, have given their full support for energy efficiency: The people of Burlington have repeatedly demonstrated through bond issue votes and utility surveys that they actively support DSM even though energy efficiency services have increased their electric rates. Clearly the public realizes that the cost of energy efficiency – in economic and environmental terms – is less than the cost of supply-side alternatives. As BED has implemented full-scale DSM programs during the past five years and the people of Burlington have continued to support them, DSM has become institutionalized at the utility.[R#1]

Progressive politicians supported the social aspect of BED's DSM efforts, giving the utility a mandate: The views of the people of Burlington have also been reflected in the election of extremely progressive mayors from 1983 through the present who have also supported BED's DSM initiatives. Mayors Sanders and Clavelle have been champions of students and low-income residents who often were strapped with the highest electric bills in the area because they typically lived in poorly-insulated rental units with electric heat.[R#1]

Success has been measured in Burlington in terms of over-achieving goals: Overall, DSM results in 1993 well exceeded BED's expectations as have results for previous years. In 1993 this was due primarily to the completion of some very large projects which had been in the making for some time. In

addition, all of BED's retrofit programs have now reached a high level of maturity and customer acceptance, garnering high levels of participation and energy savings.

Programs must continually evolve; BED is now repositioning its programs to best serve its customers' needs today: Currently BED's Energy Services Department is adapting to the national changes in the electric utility industry. For instance, increased competition and low-cost self generation opportunities could threaten BED. Some of BED's largest customers are considering alternative self-generation or cogeneration options, potentially no longer buying power from the utility. Energy Services will commit resources needed to help them investigate energy efficiency projects and ways in which such projects can be structured to best benefit BED ratepayers. BED is also investigating alternative schemes for using the McNeil station's thermal potential for an expansion for cogeneration or district heating. This would not only provide another source of revenue for the utility, but could serve to retain some of its largest clients in the coming competitive era.[R#2]

As its DSM programs mature, BED is focusing more on trade allies who can be instrumental in market transformation, and less on direct incentives to end-users: BED is working harder with designers, builders, and developers of new and rehab construction projects to direct them to the most efficient use of energy in order to maximize BED's opportunity to acquire energy-efficient resources.

BED sees a need to focus more on electrotechnologies that can provide win-win solutions between energy efficiency and environmental responsibility: With the emergence of many new and highly-efficient electric technologies, BED will focus more effort on becoming expert at these applications and assisting customers in becoming more aware and adopting them when appropriate. Presently, plans remain in place to implement programs at current levels, satisfy customer expectations, and fulfill long-term resource needs.

Energy efficiency workshops have been successful at customer education and raising the awareness of energy efficiency for large customers in particular: Four BED-sponsored energy efficiency workshops targeted primarily at the facility managers for the Top 10's large customer group have been very successful. BED is planning to evaluate the energy impact of these efforts via customer surveys and correlation with bill analysis. It has been BED's observation that this customer group is the most sophisticated, eager, and best-equipped to accept and move ahead with DSM measures.

Although controversial, leasing CFLs has made sense in Burlington:

When BED's Smartlight program was conceived, conventional wisdom said that its cost recovery mechanism, leasing, would not work. But BED's idea was simple. Staff believed that by leasing compact fluorescent lamps to customers it would be possible for the utility to offer positive cash flow for the customers (where bill savings were greater than lease payments), while at the same time providing savings for the utility at low cost. This cost recovery system was not only progressive, but also successfully burgeoned into the largest program of its kind in the country. Possibly even more important than the sheer economic benefits of the program, it facilitated education to the customers, which in turn propagated future DSM measures and programs.

Now, as the market for compact fluorescent lamps grows and as products change, BED continues to see steady growth of consumer awareness. This has led to a continuing growth of the Residential Smartlight program, particularly in over-the-counter leases. BED considers itself to be "the CFL store" for its customers. In the past, results have been combined with the NeighborSave program, making predictions for the Smartlight effort difficult to isolate. This year BED developed individual predictions for future growth for the Residential Smartlight, NeighborSave, and Commercial Smartlight programs.[R#2]

Similarly, the highly contentious area of fuel switching has been successful in Burlington:

BED is especially proud of its innovative, pioneering DSM practice of promoting the cost-effective substitution of alternate fuels for electricity in its Heat Exchange program. This program literally sacrifices market share of electricity for the benefit of customers. While utility revenues have been lost, society and more specifically low-income customers, have benefitted financially. No major changes are being proposed for the Heat Exchange program which BED calls, "unquestionably the most successful fuel-switching program in the history of the electric utility industry." [R#2]

Close interaction with the City's Building Department has been useful for updating building codes and thus supporting new construction programs:

With both the Residential and Commercial Construction Services programs in place BED has the complete complement of tools needed to capture lost opportunities through a cooperative working relationship between their customers and the design and building communities. BED feels that a useful energy efficiency guideline cannot remain a static document. Technology changes rapidly, so BED has planned to update the Guidelines regularly with the Electric Department. While no explicit

schedule has been developed, BED suggests that every three to five years would be sufficient.[R#2]

TRANSFERABILITY

Burlington Electric Department has created a progressive and comprehensive set of DSM programs, many of which can be easily transferred to other jurisdictions, particularly municipal utilities that share BED's orientation whereby customers are considered owners of the utility. Furthermore, for utilities facing impending power shortages, BED's portfolio of programs and success with energy and capacity savings makes economic sense.

BED has taken substantial steps to make its customers needs its priorities, perhaps in ways that investor-owned utilities cannot given their orientation to their shareholders. On the other hand, given the competitive pressures in the electric utility industry today, BED's customer orientation is one that many utilities will want to study and ultimately adopt.

BED's pioneering work with Heat Exchange may not be easily transferred given the politics surrounding fuel switching and the utility's purposeful loss of revenues to support the needs of the City's population. Note of course, that the program was highly successful at reducing the system's winter peak demand, an issue faced by many northern tier utilities.

Smartlight's leasing mechanism also fits well into a restructured utility environment, shifting the costs of DSM off the utility's balance sheet and enabling customers to pay for their efficiency upgrades over time using an energy service charge. (Electricite de France is now operating much larger CFL leasing programs with marked success.) The Top 10 program is another initiative that will likely be highly transferrable to other utilities. By identifying and working intensely with a utility's largest customers, large energy savings can be garnered and utility allegiance fostered.

Fundamentally, BED provides municipal utilities with a broad and successful roster of DSM programs that can be implemented to fulfill communities' objectives. As long as local awareness and political support exist, there is no reason why other municipalities – and potentially other investor-owned utilities – cannot share Burlington's success in fulfilling the needs and desires of its customers while providing reliable power to its service territory.

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