Washington Electric Cooperative
Direct Install Program
Profile #89

Executive Summary

Washington Electric Cooperative, Inc. (WEC) is a rural electric cooperative located in middle-eastern Vermont and has a service area density of 6.3 customers per mile of line. WEC began its DSM efforts in 1992 and now implements an impressive roster of seven DSM programs. WEC's total DSM expenditure for 1993 was equal to nearly 6% of its gross revenues and its DSM budget for 1994 represents 10% of projected gross revenues, a commitment and level of investment unparalleled by most other utilities.

The key driver for WEC's aggressive DSM stance was Vermont Public Service Board Docket 5270 which required gas, electric, and combined utilities to file integrated resource plans every three years and also removed many of the financial disincentives to investing in energy efficiency. In turn, WEC's Board of Trustees recommended that the Co-op aggressively pursue DSM. The fact that WEC has high avoided costs has made DSM a viable option for the Co-op; the Co-op's high electricity rates, in turn, have boosted program participation.[R#5]

As a central component of its DSM roster, WEC introduced a direct installation program in which the utility pays 100% of the equipment and installation costs for lighting and water heating retrofit measures. The program, which is the subject of this profile, relies on customer inquiries and telemarketing to identify and schedule retrofits. The program's contractor, Vermont Energy Investment Corporation, arranges installations based on geographic proximity. Then at the time of site visits, retrofit opportunities are identified, and cost effective replacement options are selected by energy specialists guided by a unique lighting protocol and approved by customers. WEC offers an assortment of dozens of varieties of lighting products and literally stocks hundreds of lamps and fixtures on the truck, and both lighting and water heating efficiency measures are implemented on the spot.

The success of the program can be measured in a number of ways. First, the program has resulted in a very high level of measure persistence, with fully 95% of the lamps installed still in place. Second, the program has garnered a very high customer satisfaction level thanks in large part to the flexibility provided to customers in terms of their selection of lamps to be installed. Third, the program has already achieved high levels of participation within its target universe. Fully 26% of WEC's eligible customers have already participated in the 2.5-year old program Fourth, the program is on target in meeting its goals as energy savings in 1993 almost tripled projected savings.

WASHINGTON ELECTRIC COOPERATIVE
Direct Install Program

Sector: *Residential*

Measures: *CFLs and fixtures, tungsten-halogen lamps, lighting product accessories, R-11 tank wraps, R-4 tank wraps, low-flow showerheads, faucet aerators, timers, and meters*

Mechanism: *As determined on a site by site basis, a WEC contractor installs cost- effective lighting & hot water heater conservation measures at no charge to the customer*

History: *The Direct Install program began in 1992 and continues today*

1993 PROGRAM DATA

Energy savings:	*398 MWh*
Lifecycle energy savings:	*3,302 MWh*
Peak capacity savings:	*284 kW*
Cost:	*$210,700*

CUMULATIVE DATA (1992 - 1993)

Energy savings:	*808 MWh*
Lifecycle energy savings:	*4,594 MWh*
Peak capacity savings:	*416 kW*
Cost:	*$305,600*

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.*

Washington Electric Cooperative, Inc. (WEC) is a member-owned rural electric Cooperative located in East Montpelier, Vermont. The utility's service territory covers 250 square miles and is located in middle-eastern Vermont. The Cooperative serves members residing in 41 Vermont towns within four of Vermont's 14 counties. The utility is 54 years-old and is governed by a nine-member Board of Trustees elected by the Cooperative's voting members. The utility has 40 full-time employees, 8,349 customers, and a service area density of 6.3 customers per mile of line, making it one of the most rural utilities in New England.[R#1,2]

For 1993 WEC had electric revenues of $6.25 million and sales of 55.25 GWh. The residential sector accounted for the large majority of sales with 47.79 GWh, while sales to the commercial/industrial sector, street lighting, and other groups totaled 7.46 GWh. The utility is winter peaking with a 1993 peak demand of 13.2 MW and an available capacity including purchases of 15.4 MW, creating a reserve margin of 17%. Residential customers had average rates of 11.68 ¢/kWh while commercial/industrial customers had average rates of 11.14 ¢/kWh.[R#1]

WEC 1993 STATISTICS

Number of Customers	*8,349*
Number of Employees	*40*
Electric Sales	*55.254 GWh*
Electric Revenues	*$6.25 million*
Winter Peak Demand	*13.2 MW*
Generating Capacity	*15.4 MW*
Reserve Margin	*17 %*
Average Electric Rates	
Residential	*11.68 ¢/kWh*
Commercial / Industrial	*11.14 ¢/kWh*

Almost all of WEC's power is purchased, with 58.35 GWh purchased in 1993 and 2.77 GWh generated by WEC's 1 MW Wrightsville hydroelectric plant, located on the North Branch of the Winooski River in Montpelier, Vermont. WEC buys electricity from a diverse group of power sources whose production resources are as far away as the provinces of Ontario and Quebec in Canada, hydropower sites in far western New York State, a coal-fired site in lower New Hampshire, and the Vermont Yankee Nuclear Plant located in southern Vermont. Other power sources include the McNeil wood-chip plant in Burlington, Green Mountain Power's gas turbine located in Berlin, Vermont, and Central Vermont Public Service.[R#1,2] ■

WEC began its DSM programs in 1992 spending $203,396 and saving 359,661 kWh while shaving 238 kW of coincident peak demand. In 1993, annual DSM expenditures increased to $364,154 and annual savings totaled 803,075 kWh and 434 kW of coincident peak demand. WEC's total DSM expenditures for 1993 were equal to 5.8% of gross revenues. The Cooperative's DSM budget for 1994 is $745,000, equal to a high 10% of projected gross revenues. By comparison, leading DSM utilities in terms of DSM expenditures as a percentage of gross revenues spend approximately 6% of gross revenues annually on their demand-side management activities.[R#3]

The Cooperative's DSM roster was designed as part of a collaborative process between WEC, the Vermont Electric Cooperative, the Vermont Department of Public Service (DPS), and non-utility parties. The Vermont Energy Investment Corporation (VEIC) provided technical assistance to the collaborative and spearheaded the early design efforts from 1989 through 1991. The Board of Trustees of the Cooperative was also active in the design of the DSM programs primarily through its subcommittee, the Energy Management Committee (EMC). The EMC represents member interests and maintains a vital connection to the programs. [R#4,5]

WEC CURRENT DSM PROGRAMS

Residential
Moderate Use / Direct Install
New Construction
High Use
Efficient Appliances & Products
Commercial
Small Commercial
Other
Farms
Schools

There were several factors that contributed to WEC's planning and implementation of an aggressive roster of DSM programs. First, the composition of the Co-op's Board of Trustees had evolved from a traditional supply-side orientation to embracing the use of DSM as a resource. In addition, the Co-op recognized a clear shift in the regulatory environment towards DSM. Also, due to the fact that WEC purchases virtually all of its power, the Co-op's cost per unit of electricity and therefore avoided costs are quite high, opening the door to a range of cost-effective DSM opportunities. WEC has approximately 10 sources of power, with some "take or pay" contracts and other contracts negotiated on an as-needed basis.[R#5]

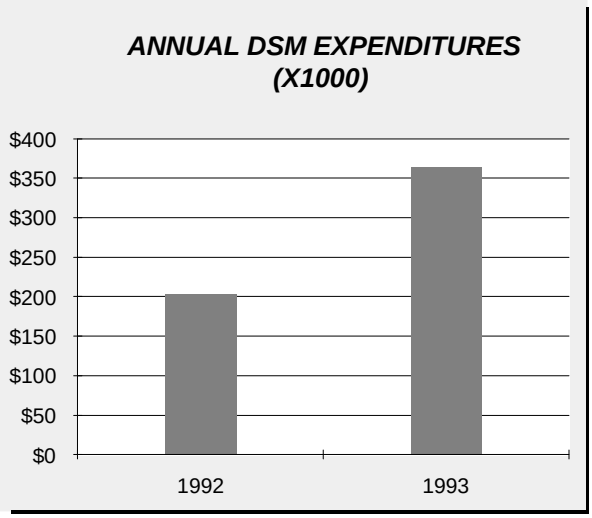
DSM OVERVIEW	ANNUAL DSM EXPENDITURE (x1000)	ANNUAL ENERGY SAVINGS (MWh)	ANNUAL WINTER PEAK CAPACITY SAVINGS (KW)
1992	$203	360	238
1993	$364	803	434
Total	$568	1,163	672

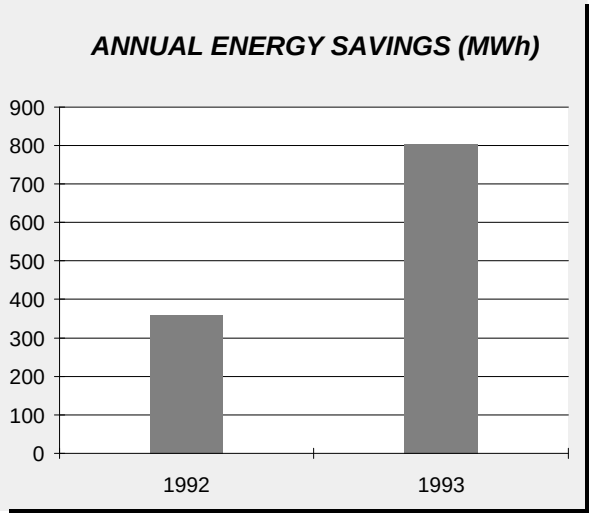
For the first two to three years of implementation, the capital for DSM programs is being provided by the Cooperative. Eventually WEC hopes to finance a portion of the programs' budget from the Rural Electrification Administration (REA) or other funding sources. The REA, a federal agency under the U.S. Department of Agriculture, provides capital at favorable interest rates to cooperatives for a variety of activities including DSM. For Washington Electric Cooperative, the process of obtaining funding from REA is ongoing. Initially WEC applied for a "Section 12 Deferral program loan," which made capital available for energy conservation programs. The loan application occurred prior to the 1992 Energy Policy Act, which changed the types of projects eligible for such funding.[R#4,5,8]

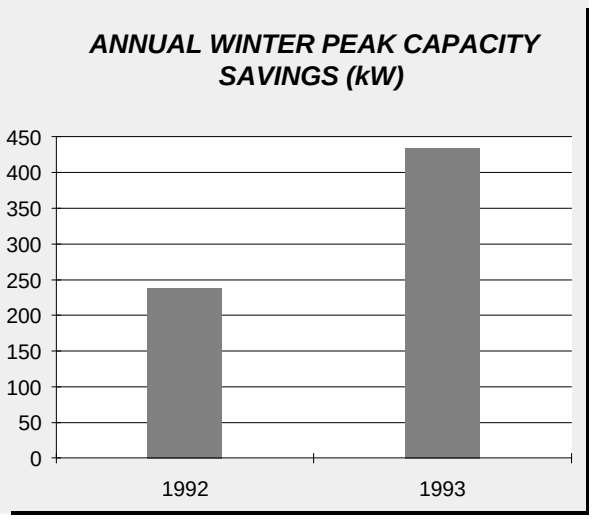
The Cooperative currently offers 7 DSM programs including Residential Moderate Use/Direct Install (the subject of this profile and referred to as the Direct Install program), New Construction, Residential High Use/Energy Improvement Services, the Efficient Appliance program, Small Commercial, a Farm program, and a Schools program.[R#3]

The New Construction program provides a comprehensive package of services for WEC members, from pre-construction design and technical assistance to a comprehensive home energy rating and certification, to incentives for lighting and hot water conservation measures.[R#2,3]

The Residential High Use/Energy Improvement Services program, identifies and installs, or arranges for the installation of a comprehensive package of electric efficiency measures which are determined to be cost effective on a site-specific basis. This program is targeted at members whose annual usage exceeds 7,000 kWh (typically customers with







electric space or water heating), but participation is not determined solely by electricity usage. Measures include lighting retrofits, electric water heater conservation measures, weatherization, and replacement of electric space and water heating systems with an alternative fuel. Members receiving major retrofits share the cost with WEC and pay an amount equal to 250% of their first year net energy savings. For low-income customers this co-payment requirement is waived.[R#2,3]

The Efficient Appliance program consisted of three sub-programs during 1993. The first component was WEC's direct mail efficient lighting program which offered members efficient lighting products at discounted prices. The second component was the statewide Blue Ribbon efficient refrigerator/freezer program, which offered a $30 rebate for the purchase of a new refrigerator or freezer exceeding 1990 federal efficiency standards. This component was discontinued after the first quarter of 1993 due to the revised federal efficiency standards. The third component provided for the free removal of operating refrigerators and freezers during the month of November, 1993. WEC also offered a metering service to members to identify high energy use refrigerators and freezers. In terms of participation, the Efficient Appliance program is second only to the Direct Install program.[R#2,3]

The Small Commercial program is a direct install retrofit program in which the utility contacts customers, performs an audit, and then arranges for the direct installation of the recommended measures. Installed measures include lighting, water heating, space heating, and refrigeration. Fuel switching from electric space and water heating to alternate fuel systems may be included where it is cost effective. [R#2,3]

The Farm program is aimed at rural dairy farms and provides audits, arranging of retrofits, and education. A total of 31 farms received audits during 1992 and 1993, and two installations were completed. Installed measures include lighting, water heating, motors and controls, and custom measures.[R#2,3]

The Schools program targets the 10 schools on the WEC system. Installed measures include lighting and lighting controls, efficient motors, electric hot water conservation or conversion to another fuel, and other electrical equipment. Although no schools participated in 1993, there was one program participant in 1991.[R#2,3] ■

Program Overview

The Residential Moderate Use/Direct Install program (referred to hereafter as the Direct Install program) represents an aggressive effort to capture energy savings among the moderate use residential sector through both energy-efficiency improvements in lighting and domestic hot water conservation measures. An ambitious goal was set to reach 80% of all eligible WEC members in six years, and the program is presently on track to reach its goal. The Co-op is the first rural electric cooperative to introduce a DSM program of this breadth.[R#4]

The Direct Install program is the most mature of the Co-op's seven DSM programs. When plans for DSM got underway in 1989-1990, the priority was to reach the residential sector, which comprises 90% of the Co-op's customer base. The market for the Direct Install program, aimed at customers with moderate levels of electricity usage, was known to be large. The average WEC residential member uses 620 kWh monthly or approximately 7,440 kWh annually. This pattern of moderate usage is due in large part to the fact that fewer than 1% of customers are currently using electric baseboard heat. Most customers use oil, wood, liquid propane, or kerosene for heat. (A customer appliance saturation survey conducted by WEC in 1989 found that only 3% of residential customers have primary electric space heat, although 15% use electric space heat as a secondary heat source. The same survey also found that 49% of residential customers have electric hot water heaters and that 69% of these heaters were not controlled to reduce peak impacts.)[R#4,5,11]

The Direct Install program began in March 1992 and provides residential customers who have moderate electric usage (approximately 2,500 kWh/year to 7,000 kWh/year) with audits and installation of cost effective energy-efficient measures at no charge. Virtually all participants receive cost effective lighting measures through the program and those who heat hot water in the home with electricity are also eligible for water conservation measures. A team of energy specialists telephones members, makes appointments to visit their homes, performs on-site surveys, assesses the information, then installs the conservation measures free of charge regardless of customers' income levels.[R#3,4,5]

One of the interesting program design attributes relates to the interface between the Direct Install program and the High Use program. While the Direct Install program and Residential High Use program target different customer groups, there is not a strict cut off in terms of electricity usage. For example, customers whose use exceeds 7,000 kWh but do not have electric space heat or electric hot water may be eligible for the Direct Install program. The energy specialist determines which measures are cost effective on an on site basis, in turn this determines whether the customer is considered part of the Direct Install or High Use program. All participants (High Use and Direct Install) receive cost-effective lighting measures. The decision whether to install hot water heater conservation measures or recommend fuel switching for electric water heaters or electric space heating is made on site by the energy specialist using a decision-tree methodology. In general, fuel switching candidates are classified as High Use participants, while customers receiving hot water energy conservation measures are typically considered Direct Install participants.[R#3,4,5,7]

Finally, the Co-op and VEIC have continued to study how to further improve program implementation and expected savings and as a result the program has evolved in its two and a half year history. First, Washington Electric Cooperative's avoided costs increased since the program's inception, allowing for the threshold lamp burn time (a lamp's daily hours of operation) to be reduced while still achieving cost effective retrofits. Second, WEC now offers customers an expanded product line of lamps and fixtures. Thus customers have a greater choice of lamps, allowing for a wider variation in lumen output and color quality, and in turn increasing customer satisfaction and ultimately measure persistence. The expanded products available have also allowed for better penetration of lamps, as more varieties are available to suit a greater number of applications. This increased applicability has allowed WEC to avoid potential lost opportunities from skipped retrofit possibilities. By encompassing a wider range of technologies than many other residential lighting programs, WEC has been able to get more savings per home, a critical impact given the utility's high overhead costs related to its dispersed rural service territory. ■

MARKETING

All of WEC's DSM programs are marketed under the banner of "Efficiency Saves." In September 1991, WEC mailed all of its members an eight-page brochure describing the seven DSM programs that would be available beginning in 1992 and their eligibility requirements. This brochure was met with a great deal of member interest.[R#5]

Presently the Direct Install program is marketed through ongoing articles and references in the Cooperative's monthly newsletter, "Co-op Currents." These articles discuss program features as well as broader energy-efficiency issues. The Direct Install program's process evaluation, discussed in greater detail in the next section, found that 45.2% of participants surveyed for the evaluation first heard of the program through the newsletter, while 16.7% of respondents heard about the program from VEIC, 10.7% were alerted by a neighbor, and the remaining 27.4% learned of the program through "other" sources.[R#4]

Once aware of the program, many members have called WEC and requested to participate in the program. Additional leads for the program are obtained as members call the Co-op to discuss service problems and/or high bills which indicate an energy audit may be appropriate. These leads are forwarded electronically to VEIC at least once per month and often more frequently.[R#4]

While customer call-ins are addressed with priority, the program is primarily marketed using a direct telemarketing approach. VEIC develops telemarketing leads from lists provided by the WEC database. Of the average 68 direct install site visits performed by VEIC per month, 41 are the result of telemarketing and the other 27 are the result of customers who contacted the utility themselves.[R#3,4,5,7]

DELIVERY: THE STEP BY STEP PROCESS

The Direct Install Program is implemented by the Vermont Energy Investment Corporation which has used four energy specialists to implement the program to date. New energy specialists go through a two-week training period, during which 75% of their time is spent in the field accompanying experienced energy specialists, and the remaining 25% of training is done in the VEIC office. Energy specialists also have meetings at VEIC's headquarters every 45 days or so to be updated on any program changes.

(While energy specialists might be considered "auditors," they do not conduct Class A home energy audits which cover whole-house thermal considerations. Instead VEIC energy specialists concentrate on electricity saving measures in line with the program's primary objectives. Furthermore, energy specialists also install measures, and thus might be more literally defined as "auditor/installers.")

Telemarketing and arranging site visits: VEIC energy specialists telephone members to describe the program, pre-screen for eligibility, and schedule visits. Pre-screening is designed to determine whether members will likely be placed in the Direct Install or High Use program, and is based on questions pertaining to usage patterns, number of household members, and types of space and hot water heating.[R#4]

Each VEIC energy specialist in the program is assigned a geographic area which corresponds to specific Co-op substations. The energy specialist then recruits members for the program within the boundaries of his or her assigned territory. Scheduling priority is given to the leads generated by the Co-op from member inquiries. In over 90% of such cases, the appropriate energy specialist is able to set up a site visit from these leads. The next step is for the energy specialist to fill in his or her schedule through telephoning members whose names appear on a master list who live in the same general area.[R#4,5]

Energy specialists often work from their homes, telemarketing and scheduling visits. Energy specialists are able to complete up to four site visits per day, although three is more typical since a visit generally requires more than two hours. At the time of the audit/installation, ☞

the energy specialist tours the member's home room by room, asking questions about each lamp (function, daily hours of use, etc.) as lighting measures are the initial focus of each audit. Energy specialists use a Hewlett Packard palm-top computer as a data entry tool for tracking of all program-specific information.[R#4,5]

Using the lighting protocol in the field: A lighting protocol table developed by VEIC serves as the backbone of the Direct Install program design and is used to identify all cost effective lighting retrofit opportunities. This lighting protocol table, presented in partial form on page 10, covers more than 100 products that have been screened and ranked by cost effectiveness using the net benefits calculated using the societal cost test for cost effectiveness. The protocol takes into account burn time (the lamps' hours of operation), lamp wattage to be replaced, percent of incandescent lumens provided by the replacement product, the product name, and net benefits.

WEC strongly believes in pursuing cost effectiveness of installed measures on a site-by-site basis. Typically direct installation residential lighting programs have used simple economic installation rules based on a series of average values and assumptions, such as a minimum usage in hours per day. WEC thinks greater benefits can be achieved through the WEC lighting protocol table which identifies the socket- and product-specific threshold conditions to achieve cost effectiveness. This protocol recognizes unique retrofit opportunities occur at varying hours of use per day and that the cost of specific retrofit product options should be considered.[R#7]

Working with customers to select the best retrofit products: Product selection during site visits is guided by the lighting protocol table. The energy specialist makes recommendations to customers of appropriate lighting products to be installed, and presents the technical option yielding the greatest net benefits first. If the member is not satisfied with the energy specialists first recommendation, the energy specialist works his or her way down the lighting protocol table (but staying within the appropriate burn time and wattage replacement guidelines) until an acceptable measure is found.

Throughout this measure selection process, the energy specialist bring lamps in from the truck to demonstrate to the customer their appearance and output. The program is based on a test and test again procedure until the customer is completely satisfied with both lamp appearance and performance. For example, if a 75-watt incandescent bulb with a two-hour burn time was being replaced, the energy specialist would look on the lighting protocol table and see that a 22-watt quad compact fluorescent lamp (CFL) is the most cost effective option with net societal benefits of $47.54. (Please refer to the rows in bold type in the protocol presented on page 10.) However, this lamp provides only 85% of the light output of the lamp it is designed to replace. If this is not acceptable to the customer, or if the customer is not satisfied with the lamp for any other reason, the energy specialist moves down the table to a 22-watt circular CFL with a rated lumen output 124% that of the 75-watt incandescent lamp, and which still provides net benefits of $45.82. This process continues until the customer is completely satisfied, assuring measure persistence and durable program savings. Energy specialists typically have an 800-piece inventory on the truck.[R#4,5,7]

The lighting protocol table was developed by VEIC for WEC and is based on WEC's avoided costs. Thus its values cannot be transferred to other utilities without modification. It is presented to illustrate the process by which energy specialists work with customers to achieve acceptable replacement lamps and the greatest net societal benefits. The full protocol includes both indoor and outdoor lighting and burn times ranging from one-half hour per day to four hours of use per day.

Addressing fixtures where cost effective: In addition to compact fluorescent lamps (both integral and modular) and tungsten-halogen lamps, the program also installs compact fluorescent lamp fixtures where appropriate and cost effective. Fixture replacements are often cost effective in kitchen ceiling applications and for outdoor locations. (Between one-third and one-half of all fixtures are used outdoors to replace incandescent flood lamps.) Where cost effective, energy specialists show members what the fixtures look like in catalogs or product specification sheets or when stocked, bring in the fixtures from the truck for a customer's visual inspection.[R#7]

When a fixture has been selected, two options exist: First, the customer can sign a waiver releasing the Co-op from any liability associated with wiring and safety, and can install the fixture on his or her own, taking complete

responsibility for the installation. With this option, VEIC staff generally call after six weeks to assure that the fixture has indeed been installed. If the customer does not elect to perform the installation independently, WEC will arrange for an electrician to install the fixture for the member. Note that all fixtures are screened based on the fixture costs plus installation costs. Therefore, whenever a customer does his or her own installation, the measure is only that much more cost effective to the utility. To date about 50% of fixture installations have been done by customers themselves.[R#7]

Addressing water heater retrofit measures: For members with electric water heaters, the VEIC energy specialist performs a domestic hot water analysis using the palm-top computer to estimate kWh loads. VEIC prescreens members for the Direct Install or High Use Program using a matrix which correlates the size of the water heater with the number of occupants in the home. During the audit the energy specialist collects additional site-specific information using a spreadsheet survey tool developed by VEIC which is contained on the palm-top computer. The energy specialist inputs data related to water usage among household members, flow rate, tank size, level of insulation and temperature of the area where the tank is located to estimate kWh savings.

If it appears that electric hot water usage is particularly high, the energy specialist will conduct further analysis to ascertain whether it is cost-effective to place the member in the High Use Program which provides utility-sponsored fuel switching to solar, oil, wood, liquid propane, or kerosene. For those customers, no water heating efficiency measures are installed as part of the initial site visit. On the other hand, regardless of the decision related to the electric hot water heater, the energy specialists provides all the other services for which the customer is eligible (typically an array of lighting products), regardless of whether the services fall under the High Use or Direct Install program. If the fuel switching is later determined not to be cost effective upon further analysis, the energy specialist goes back to the home and installs the water heating conservation measures for the electric hot water heater on a second visit.[R#4,5,7]

Arranging timer control installations where appropriate: For the limited number of customers with electric water heating who do not qualify for the High Use Program, hot water conservation measures including tank wraps, pipe wraps, low-flow showerheads, temperature set-back, and timer controls are installed. While five of the six measures are installed/performed at the time of the site visit, timer controls are addressed differently. If the customer falls within the narrow band of cost effectiveness between eligibility in the High Use Program and the threshold hot water use, the energy specialists make arrangements for timer controls to be installed by the Co-op. These controls are essentially timers that turn off the hot water heater during WEC's peak period which occurs in the winter between 5:30-8:30 pm. The timer control option is fully explained to the customer and is only installed with the customer's full understanding and consent. Later, if the customer finds that the timer interferes with his or her hot water use and is an inconvenience, WEC will remove the timer without delay.[R#7]

Logging retrofit measures and obtaining customer sign-off: After the carefully selected measures are installed, the energy specialist records the measures in a participant summary sheet on his or her palm-top computer from which a participant sign-off sheet is created, which when signed by customers indicates their acceptance of installed measures and their intent to use the equipment. The palm-top computer is also used to provide customers with an estimate of dollar savings from the newly-installed measures.[R#4,5,7]

Providing customer education and appliance meters: While in the customer's house the energy specialist also educates the customer about the conservation measures installed as well as other measures the customer may want to install on his or her own. Similarly, the energy specialist surveys major end-uses in the home and compares the level of estimated kWh consumption with actual billed usage to identify abnormalities. If there are any discrepancies the energy specialist tries to identify the responsible end-use(s). For example, the energy specialist might find an old, inefficient refrigerator or other major electricity users. In such cases the energy specialist provides customers with a meter and asks them to write down the daily kWh usage so the energy specialist can calculate the operating cost of the unit.

These services are not provided with every site visit but instead are offered when appropriate as determined by the energy specialist. In some cases these demon- ☞

PARTIAL WEC LIGHTING PROTOCOL
BASED ON MARCH 1993 AVOIDED COSTS (INDOOR LIGHTING)

BURN TIME (HOURS)	*LAMP WATTAGE TO BE REPLACED*	*% OF INCANDESCENT LUMENS*	*PRODUCT NAME*	*NET BENEFITS*
	25	147%	7W "Twin" CFL	$14.48
	40	102%	9W "Twin" CFL	$29.19
		98%	9W "Quad" CFL	$24.69
	60	87%	13 W "Twin" CFL	$46.39
		84%	13 W "Quad" CFL	$42.00
		117%	22 W "Quad" CFL	$27.21
		87%	15W Globe, M, AIO	$7.97
		87%	15 W "Quad" CFL	$7.81
		87%	15 W CFL, E, AIO	$1.45
	75	**85%**	**22 W "Quad" CFL**	**$47.54**
		124%	**22 W "Circular" CFL**	**$45.82**
		78%	16 W CFL, E, AIO	$8.49
		85%	20W "Quad"	$7.98
		85%	20 W "Triple bi-ax"	$3.91
		125%	25 W Drum Fixture	$2.79
		110%	23 W "Triple bi-ax"	$2.34
2.0	100	116%	30W Circular CFL	$61.35
		78%	28W "Quad" CFL	$55.43
		116%	30W Circular CFL	$55.22
		87%	26 W Drum Fixture	$34.11
		75%	27 W "Quad" CFL	$12.78
		87%	26 W Dimondlite	$8.83
		131%	39 W Drum Fixture	$1.44
		82%	72 W Tungsten	$1.06
	120	87%	32 W Circline	$45.58
		131%	39 W Drum Fixture	$30.59
	150	76%	39 W Drum Fixture	$72.26
		82%	54 W Circline	$61.83
		104%	52 W Drum Fixture	$35.68
		124%	72 W Circline	$32.33
	200	76%	52 W Drum Fixture	$98.31
		91%	72 W Circline	$94.97

strations will lead the customer to replace the particular high-consumption end use, often an inefficient refrigerator. The program's process evaluation found that two of the members who were surveyed and who had placed test meters on appliances suspected to be highly-inefficient, replaced the end-use. Five members (or 83% of relevant respondents) planned to continue to use the appliances, while another member plans to replace the appliance with a more efficient unit within the year.[R#3,4,5]

MEASURES INSTALLED

Measures installed in the program include electronically and electromagnetically-ballasted compact fluorescent lamps and fixtures, tungsten-halogen lamps, and a range of lighting product accessories including socket extenders, Y sockets, harps, harp adapters, reflectors for globe lights, and acrylic diffusers for bare porcelain sockets. Virtually all participants receive high efficiency lighting products, with each participant to date receiving an average of nine lamps.

Lighting measures are virtually universal to the program and there is no numerical limit as to the number of measures that can be installed in a given home. All told, 47 different lighting products have been installed in customers' homes to date including both integral and modular compact fluorescent lamps. Note that fully 10% of the electronically-ballasted, and 70% of the electromagnetically-ballasted CFLs installed to date have been modular, allowing customers to simply and inexpensively replace the bulb at the end of its life while extending the use of the more expensive lamp ballast and base.[R#10]

Fully 20% of the lamps installed have been tungsten-halogen bulbs. Approximately two-thirds of all participating homes have had at least one tungsten-halogen bulb installed, although as the sample lighting protocol table indicates, these bulbs are seldom, if ever, the first choice based on cost effectiveness. However, whenever the preferable CFL products are not applicable, tungsten-halogen bulbs are installed to avoid lost opportunities that other program designs might have missed.[R#4,5,10]

Water conservation measures includes two sizes of R-11 tank wraps, R-4 pipe wraps, 1.5 gallon per minute showerheads, faucet aerators, and timers for hot water tanks. Energy specialists also set back water heater thermostats when appropriate. Finally, appliance meters are provided to interested members so that they can measure the energy use of appliances that appear to be major energy users.

STAFFING

The Direct Install program is administered by WEC's Residential Program Administrator who devotes all of his time to the Direct Install program. WEC's Director of Energy Management Services (EMS) who joined WEC as the Director of the newly-founded EMS division in 1991, spent more than 50% of his time on the Direct Install program until 1993. Currently he devotes 10% of his time to the program.[R#4,5]

Washington Electric Cooperative's General Manager has also been involved in the Direct Install program since its inception. In his current position, he is the key liaison between the Energy Management Committee (EMC) and Co-op staff as well as the liaison with the Vermont regulatory bodies. He meets with the EMC once or twice per month to discuss the program goals, budgets, and all aspects of its implementation. In spite of these numerous tasks, he estimates that he devotes less than 1% of his time to the program.[R#4,5]

VEIC also has a program manager devoted to the Direct Install program who is responsible for field implementation of the program. The program manager wrote the VEIC proposal for the program and administers the Direct Install program as well as the High Use program. Combined the two programs require 40% of his time. Currently VEIC has three full-time energy specialists implementing the program.[R#4,5] ■

MONITORING

WEC's tracking system for the Direct Install program is a Clipper database management system which is related to both dBase and FoxPro. The database includes basic information on all residential members of the Co-op with additional data for members who participate in the Direct Install and High Use programs. Categories tracked include participation, installed measures, as well as energy savings and program costs. While program savings estimates are primarily based on engineering estimates, a small amount of post installation metering of specific end-uses has been performed. WEC is just now starting to use lighting and motor loggers to track usage and calculate savings for its DSM programs.[R#4,5]

The palm-top computers used by energy specialists not only help to identify the lamps to be installed and analyze hot water usage, but are also used as the starting point for program tracking. All data entered into the palm-top is then transferred into the database of the VEIC program manager once a month. In turn, he places this data on a diskette which is mailed to WEC and then electronically transferred into the WEC database.[R#5,7]

EVALUATION

An independent process evaluation of the Direct Install program was conducted by Hamilton Consulting (HC) and the Energy Research Group (ERG) and was published January 21, 1994. This evaluation used an assessment of the program database and materials, telephone surveys of participating and nonparticipating members, and on-site assessments of member homes. In addition, interviews were conducted with WEC staff, the Vermont Energy Investment Corporation staff, and a non-utility party to gather viewpoints from various perspectives. The following topics were covered in the interviews: individual roles, program goals, program operation, program changes, marketing, resources, database, outreach to members, VEIC audits/installations, program measures, installation standards, participant satisfaction, and recommendations for program improvement. The evaluation cost $30,000 (unlevelized) and took three months to complete.[R#4]

A total of 135 residential members were surveyed. Of this number, 84 participant surveys and 51 nonparticipant surveys were conducted. From these participants the Energy Research Group (ERG) conducted on-site assessments in 30 customer homes which included a visual inspection of the measures installed, administering a short member survey, and an informal discussion of program participation. [R#4]

The process evaluation revealed some very interesting findings related to customer satisfaction and measure persistence, while it also presented several inconclusive analyses discussed below.

Customer satisfaction: Customer satisfaction with the program has been remarkably high with more than 80% of the surveyed participants "satisfied" with the program. Fully 57% of survey respondents were "very satisfied" with the program. Only 3% of survey respondents were "dissatisfied" with the program, with one-third of these, a single customer representing 1% of survey participants, "very dissatisfied."[R#4]

Measure persistence: Customer satisfaction is closely related to the next major process evaluation finding: The program has achieved highly commendable and enviable levels of measure persistence, an important program attribute considering other utilities' experiences with direct installation programs and dramatic drop-offs in measure persistence and thus program energy savings. WEC's Direct Install Program, in contrast, has had a measure retention rate of 95%. Only 5% of the lamps installed have been taken out of service for one reason or another.

Eighteen percent of members surveyed, however, claim to have removed one or more lighting products, while two-thirds of these removed only one lighting measure. The reasons for measure removal cited were premature measure failure, broken and damaged lighting products, complaints about lamp flicker and delay in coming on, insufficient light output, and excessive light output. WEC staff also point out that lighting products installed in the program are guaranteed against premature failure for a year, a program attribute that may cause an even more

impressive measure retention rate in future evaluations. [R#4,7,9]

Free ridership: The HC evaluation was quite inconclusive regarding the issue of free ridership but provided an interesting lesson regarding evaluations. In particular, the free ridership issue underscored the fact that the responses an evaluator gets can be largely influenced by the response the participants suspect the questionnaire seeks. The survey found that for 0-10% of lighting measures installed, program participants claimed to be free riders. This was highly counterintuitive as the participants who considered themselves free riders were predominantly senior citizens and low-income customers, those least able to pay for the advanced energy-efficient technologies.

The evaluation suggested that causes for this disparity included participants' lack of knowledge of the high initial cost of the measures and a response bias in which customers provided the answer they believed the interviewer wanted to hear. Free ridership estimates for water conservation measures range from a low of 13% for high performance showerheads to a high of 20% for faucet aerators. These estimates are thought to be somewhat high for the same reasons attributed to estimates of free ridership for lighting measures.[R#4,7,9]

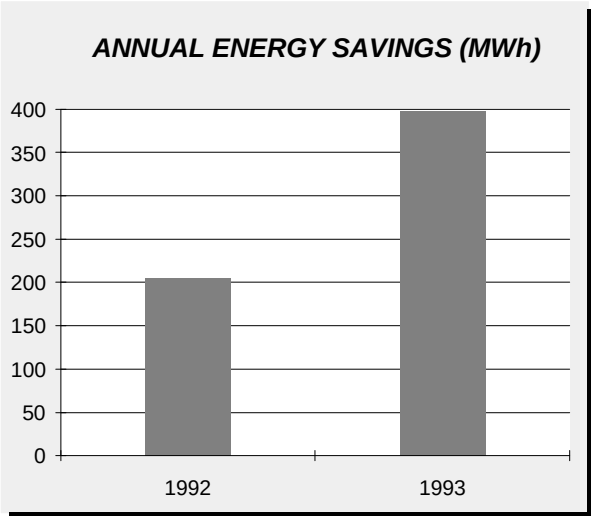
Free drivership/spillover effect: Similarly, the process evaluation was not conclusive abut the program's "spillover" effect, or what others call free drivership. The process evaluation did query participants about whether they intend to continue to use energy-efficient products when the ones installed wear out. Nearly 80% of the survey respondents claim that they intend to replace all or some of the measures with similar high efficiency products. Fewer than 10% indicated that they will not replace any of the measures and 11% are unsure. While these responses are encouraging, no empirical data yet supports these claims.[R#4]

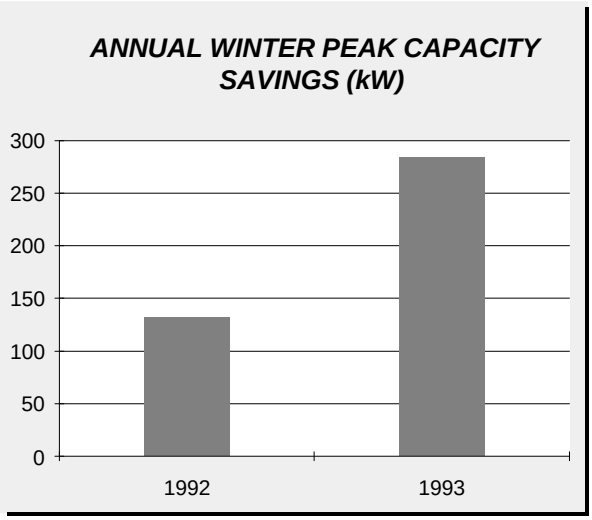
Takeback of savings from increased use: The process evaluation also discussed the "takeback" of energy savings which might result from increased use given customer awareness of the energy efficiency of the measures installed through the program. The evaluation suggested that any takeback would be related to lighting, resulting in customers leaving lights on longer since they use less energy. Over 90% of the program's survey respondents, however, reported no change in the number of hours that they used the lamps. Five percent claimed to use the lamps more, but this takeback of program savings appears to be offset by 5% who claimed they used the lamps less.[R#4]

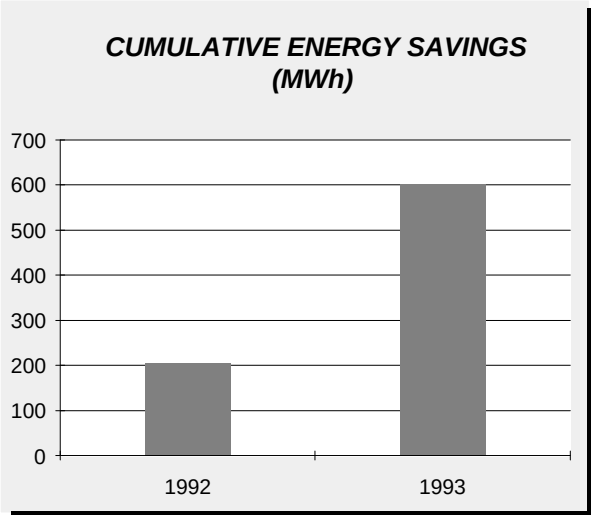
Program impacts related to energy bills: It is interesting to note that of the participants surveyed, 36.9% reported lower electric bills since joining the program. A total of 36.9%, however, reported that their bills had not gone down while the remaining 26.2% reported that it was too early to judge or they were not sure whether their bills had decreased. It should be noted however, that 61% of 1992 respondents reported lower kWh consumption, while 25% of 1993 participants reported lower consumption. This may be attributed to the fact that 1992 participants had experienced an entire winter of post-retrofit bills at the time of the survey, while the 1993 participants had not. In addition, the winter of 1993 was unusually harsh, leading to higher electricity consumption.[R#4,5] ■

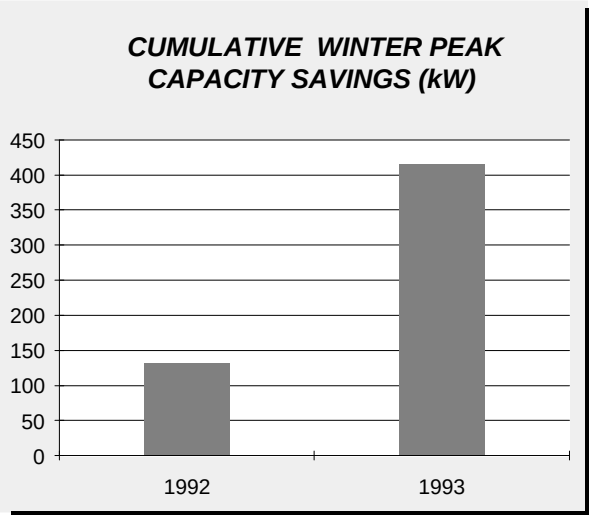
Program Savings

SAVINGS OVERVIEW	ANNUAL ENERGY SAVINGS (MWh)	CUMULATIVE ENERGY SAVINGS (MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	ANNUAL PEAK CAPACITY SAVINGS (kW)	CUMULATIVE PEAK CAPACITY SAVINGS (kW)
1992	205	205	1,292	132	132
1993	398	603	3,302	284	416
Total	603	808	4,594	416	



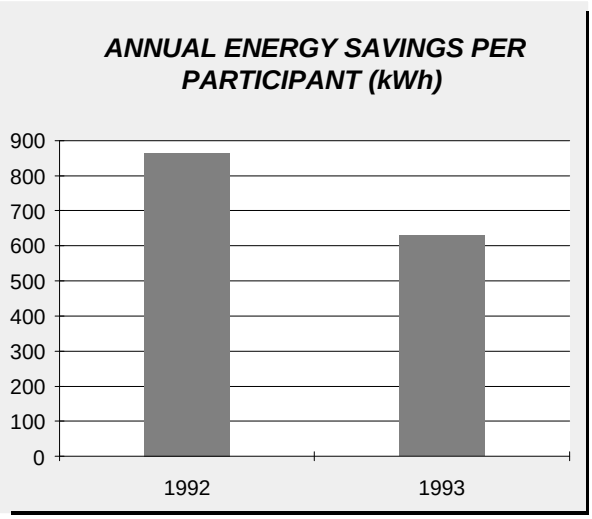




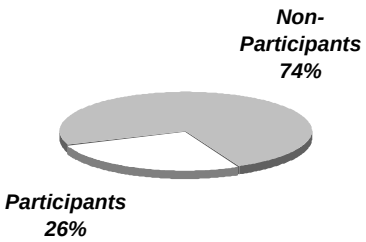


DATA ALERT: The savings reported are considered "net savings" under review by the Vermont Public Service Board and reflect adjusted engineering estimates based on actual numbers of lighting fixtures installed, actual wattage displaced, member-reported hours of use, and an assumed free ridership of 5%.[R#3,5,9]

PROGRAM PARTICIPATION	NUMBER OF PARTICIPANTS	PARTICIPANTS' ANNUAL ENERGY SAVINGS (kWh)
1992	237	865
1993	632	629
Total	869	



In 1993, the Residential Direct Install program accounted for annual energy savings of 398 MWh and peak capacity savings of 284 kW. Lighting measures accounted for 313 MWh (79%) of 1993 savings, while water heater conservation measures accounted for the remaining 85 MWh (21%) of savings. From 1992 through 1993 the program achieved total annual energy savings of 603 MWh and peak capacity savings of 416 kW. Lifecycle energy savings for the program total 4,594 MWh.[R#3]



PARTICIPATION RATES

Participants are defined as residential Cooperative members who receive an energy audit as well as installation of energy conservation measures. Direct Install program participation in 1993 increased to 632 customers, up from 237 participants throughout nine months in 1992. Of the 632 participants, 598 had lighting measures installed while 203 had water heater measures installed. With approximately 3,300 customers eligible for the program, WEC has already achieved a participation rate of 26% in just two years. During 1992 the program had annual energy savings per participant of 865 kWh, while 1993 savings per participant dropped to 629 kWh. Savings per participant in 1992 were higher because many of these early participants were high usage customers who were anxious to participate in the program. [R#3]

MEASURE LIFETIME

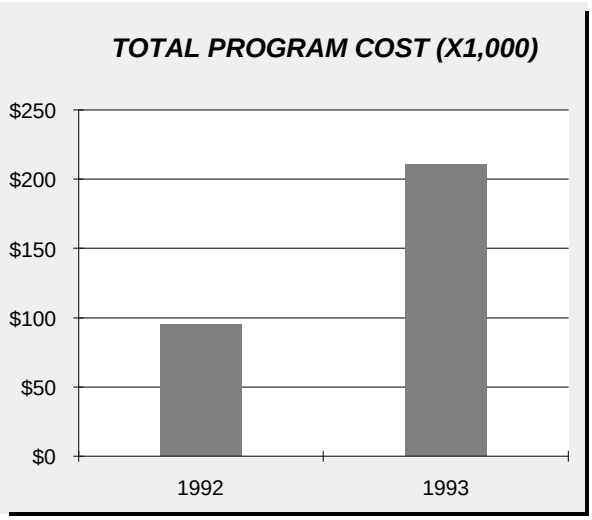
For 1992 WEC assigned an average weighted lifetime of 6.3 years to the Direct Install program, and in 1993 the average weighted lifetime was increased to 8.3 years. These measure lives are used to calculate lifecycle energy savings as well as the cost of saved energy presented in the next section.[R#3]

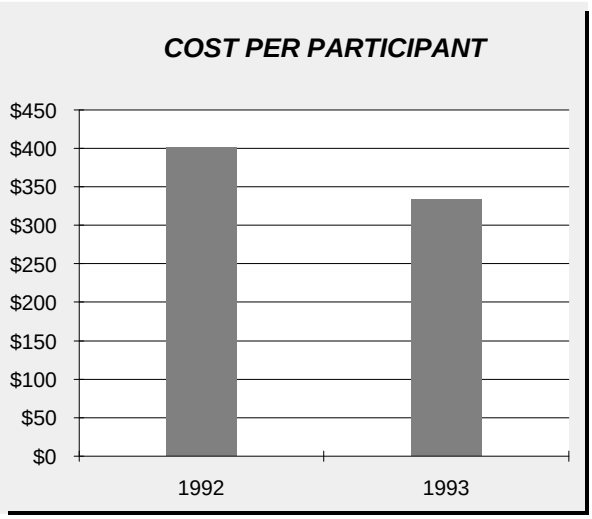
PROJECTED SAVINGS

WEC projects the program will achieve annual energy savings of 230 MWh and peak capacity savings of 213 kW in 1994. Program energy savings in 1993 almost tripled the projected savings of 141 MWh, while program peak capacity savings doubled the projection of 142 kW, due to the higher than projected participation levels.[R#3] ■

Cost of the Program

COSTS OVERVIEW	ADMINISTRATIVE (x1000)	INCENTIVES (x1000)	AUDITS (x1000)	EVALUATION (x1000)	TOTAL PROGRAM COST (x1000)	COST PER PARTICIPANT
1992	$40.5	$29.1	$25.4	$0.0	$94.9	$401
1993	$25.5	$79.8	$78.4	$27.0	$210.7	$333
Total	$65.9	$108.9	$103.8	$27.0	$305.6	





COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
1992	8.18	8.46	8.75	9.04	9.34	9.64	9.95
1993	7.30	7.63	7.95	8.29	8.63	8.98	9.33

The Cooperative spent $210,700 on the Direct Install program in 1993, up from 1992 expenditures of $94,900. Program expenditures increased between 1992 and 1993 in large part due to an increase in customer demand, which in turn necessitated an increase in staffing from one VEIC energy specialist to three.[R#3,5]

COST EFFECTIVENESS

Using an average weighted lifetime of 6.3 years for 1992, The Results Center has calculated a cost of saved energy for the Direct Install program of 8.75 ¢/kWh at a 5% discount rate. In 1993 the program was assigned an average weighted lifetime of 8.3 years and the cost of saved energy at a 5% discount rate dropped to 7.95 ¢/kWh. WEC believes that while these figures might appear somewhat high, they are cost effective for WEC because the Co-op has a high cost of purchased power. Because WEC purchases almost all of its power, the Co-op is subject to high demand charges which are also factored into the Co-op's cost-effectiveness calculations. In addition, a relatively high cost of saved energy is acceptable to WEC, because the Co-op uses a 20-year planning horizon for its Integrated Resource Plan, which estimates future avoided costs to be quite high.[R#5]

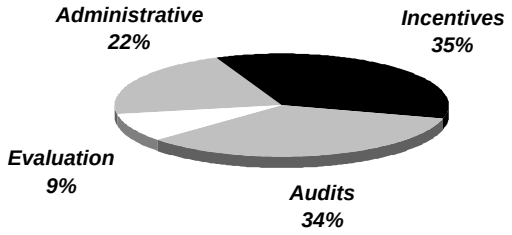
WEC has not calculated the cost effectiveness for the Direct Install program on a program-wide basis. Instead, cost effectiveness calculations are performed on a site specific, measure-by-measure basis as described in the Implementation section.[R#5]

COST PER PARTICIPANT

WEC's cost per participant for the Direct Install program declined from $401 per participant in 1992 to $333 in 1993. WEC believes that this drop is basically a matter of timing, although start-up costs are likely responsible for the higher first year cost per participant. The average cost per participant for both years of the program combined is $352.[R#3,5]

COST COMPONENTS

WEC divides Direct Install program costs between administrative costs, incentives, audits, and evaluation. Administrative costs include management, tracking, reporting, marketing, and program development and infrastructure and were higher in the first year reflecting program startup costs. Incentives consist of payments to customers and/or trade allies including direct installation costs and installed measures. Audit costs cover payments to utility staff or contractors for performing analyses, audits, inspections, and verifications, including direct install labor. (Naturally both incentive and audit costs increased roughly proportionately with increased customer participation.) Evaluation costs include all expenses related to program evaluation excluding tracking and reporting. Evaluation costs were zero in the program's first year, but were $27,000 in the second year reflecting the cost of the process evaluation discussed at length in the section on monitoring and evaluation.[R#3] ■



Environmental Benefit Statement

AVOIDED EMISSIONS BASED ON: 808,000 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%	1,742,000	41,000	8,000	1,000
B	10,000	1.20%	1,858,000	16,000	5,000	4,000
	Controlled Emissions					
A	9,400	2.50%	1,742,000	4,000	8,000	0
B	10,000	1.20%	1,858,000	2,000	5,000	0
C	10,000		1,858,000	11,000	5,000	0
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	1,858,000	5,000	3,000	1,000
B	9,400	2.50%	1,742,000	4,000	3,000	0
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	1,858,000	3,000	1,000	1,000
B	9,010		1,671,000	1,000	0	0
GAS:	**Steam**					
A	10,400		1,013,000	0	2,000	0
B	9,224		880,000	0	6,000	0
	Combined Cycle					
1. Existing	9,000		880,000	0	3,000	0
2. NSPS*	9,000		880,000	0	2,000	0
3. BACT*	9,000		880,000	0	0	0
OIL:	**Steam--#6 Oil**					
A	9,840	2.00%	1,467,000	22,000	3,000	2,000
B	10,400	2.20%	1,555,000	22,000	3,000	2,000
C	10,400	1.00%	1,555,000	3,000	3,000	1,000
D	10,400	0.50%	1,555,000	9,000	3,000	1,000
	Combustion Turbine-#2 Diesel					
A	13,600	0.30%	1,946,000	4,000	6,000	0
REFUSE DERIVED FUEL: Conventional						
A	15,000	0.20%	2,311,000	6,000	8,000	2,000

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

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

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

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

*** Acronyms used in the table**

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

LESSONS LEARNED

Cost effectiveness: The primary lesson learned by WEC and its program contractor, VEIC, is that it appears to be possible to run a direct installation program in which the utility pays 100% of the measure and installation costs in a rural area with a highly-dispersed customer base. While a complete impact evaluation will be prepared in late 1994, WEC and VEIC have implemented the program in what they suspect will be determined to be cost effective, by using their custom lighting protocol to keep the program within a reasonable band of cost effectiveness using the societal test.[R#7,9]

WEC's compound challenges of cost effectiveness: The program has been doubly challenging for a number of reasons on top of the overarching aspect of running the program in a rural area. Consider several other factors: The program's savings are primarily based on lighting savings, while many other direct installation programs have garnered significant savings from electric hot water heater efficiency measures. Secondly, WEC's members use relatively low levels of electricity given the lack of electric resistance space heating in the service territory. Third, another key feature of the program but one that further challenges the program's cost effectiveness, is that program eligibility is not based on members' incomes. While many direct installation programs have been focused on low and moderate income groups, the WEC program is open to all its customers.[R#9]

The need to get maximum savings at each house: WEC and VEIC appear to have provided a formula for cost effective savings. Given the constraints listed above, WEC staff and contractors have worked hard to get maximum savings per house to support the program's high overhead costs. A large portion of the cost of DSM programs that deliver services directly to consumers is the cost of recruiting the participant and physically getting into the home. Thus, once in the home it becomes critical to identify and treat as many opportunities for cost-effective resource acquisition as possible. Every opportunity missed when in the door, represents a lost opportunity. This orientation has provided a key driving principle for the WEC program; energy specialists' top priority is to get maximum savings at every site.[R#9,10]

The use of the socket- and product-specific protocol: In order to accomplish this mission, the program's "socket- and product-specific protocol" which was developed by VEIC has proven to be an invaluable tool. Not only does it provide energy specialists with a quick and simple means of assessing the cost effectiveness (and thus eligibility) of retrofit measures, but it allows for the most cost effective measures to be installed first. Then if those measures are not satisfactory to the member, the protocol supports the energy specialists by providing a series of fallback options that allow customers to get technologies in place that they like, but which are also within the cost effectiveness guidelines of the program.[R#7,9]

The high number of lamps installed: Another key feature of the program relates to the number of lamps installed per home, an average of nine per home. (A paper by VEIC suggests that the actual average number of lamps is 9.3, resulting in participant savings of 502 kWh/year, and net benefits of $200 to WEC.) This level is dramatically above many other lighting programs implemented around the country.[R#9,10]

The high degree of measure persistence: Through the lighting protocol, the program has proved remarkably flexible. This attribute has allowed energy specialists to work with customers to make sure that the lamps specified and ultimately installed suit the home owner's needs. For instance, energy specialists make sure that the lumen output of the new lamps is adequate and that their color renditions are acceptable to the members. Using the "fit and size" practice made possible by the protocol and the program's design, customers have been remarkably satisfied with the program and have installed an average of nine lamps per home. Furthermore, the program's evaluation found that fewer than 5% of the bulbs have been removed, attesting to the fact that the program design works. Inversely, the program's 95% retention rate is unprecedented. The lesson learned is that by taking the time to specify the right lamp up-front, at the time of the energy specialist's visit to the home, it appears to be possible to get the right technology in place and to thus attain high levels of measure retention.[R#4,7,9]

The high degree of customer satisfaction: Finally, perhaps the greatest aspect of the program relates to cus-

tomer satisfaction. Customers are pleased with the program, surely a function of the utility's investment in their customers' energy efficiency, but also closely tied with the variety of products offered under the program (a roster that has been greatly expanded in the program's short history) and the interaction between energy specialists and home owners.[R#4,7,9]

TRANSFERABILITY

The WEC Direct Installation program appears to be quite transferable to other utilities with high avoided costs and high electricity rates. These characteristics can allow for a viable and cost effective direct installation program.

In fact, many utilities may be able to implement the WEC model even more cost effectively than WEC. Utilities with a more dense customer base, for instance, will likely bear lower overhead costs in delivering the program. Utilities whose customers use greater levels of electricity may also be able to garner greater electricity savings at lower costs. While the average annual electricity usage per residential customer for WEC was 7,584 kWh in 1992, the national average was 9,326 kWh in the same year, indicating that the savings potential for other utilities implementing such a program may be even higher. In short, WEC has proven the direct installation model in a worst case scenario. [R#5]

Perhaps even more important than the program design in terms of transferability, is the lighting protocol table which allows for a quick and simple means for energy specialists to provide a host of choices to customers while staying within cost effectiveness guidelines. Similar protocols have been developed for thermal measures to guide blower-door directed air sealing. Blower doors provide energy specialists with guidance and help them determine when it is no longer cost effective to continue air leakage reduction efforts. (Such protocols for use in conjunction with blower doors are called "economic stop" protocols.) Similarly, smart protocols for lighting and water heating allow energy specialists with a means of maximizing cost effectiveness without complex and time-consuming steps. Lighting protocols allow for greater program sophistication but are also simple to use as their data is reduced to simple tables which can easily be used in the field, without significantly complicating or lengthening the on-site analysis and installation process.[R#10]

A similar smart protocol for lighting has been adopted by Potomac Edison Power Company (PEPCO) for two of its programs. The protocol has been used there for PEPCO's multifamily retrofit program, "Apartments Plus," which to date has had over 20,000 participants. The program, which began in early 1993, started with eligibility restricted to low income customers but now has been expanded for its full customer base. The program is installing an unprecedented number of bulbs and is resulting in quite fantastic savings from lighting alone.

While Apartments Plus has promoted fewer lighting products than the WEC program, with only 13 compact fluorescent lamps and two tungsten-halogen lamps, program participant savings are impressive, with 8.0 lamps per customer installed (of which 87% were CFLs) and average annual participant savings reported at over 650 kWh/year, a staggering level of savings for apartment units. (This level of savings could be due to a high proportion of senior citizens who are home most of the time with lights on.)[R#9,10]

PEPCO is also using the protocol for its residential retrofit program called "Home Fitness." The program was piloted last year and will go full scale this year. In the pilot program, PEPCO reported installing an average of 13.3 lamps per Maryland home and savings of 1,082 kWh per participant.

The savings for both the Apartments Plus and Home Fitness programs, like the savings for the WEC Direct Install program, are based on adjusted engineering estimates, not formal impact evaluations. On the other hand, like the WEC program, the savings are based on the actual number of fixtures installed, the actual wattage replaced, customer-reported hours of use, and engineering estimates adjusted for utility-specific conditions, providing a relatively high degree of accuracy prior to comprehensive evaluation.[R#10] ■

References

1. Washington Electric Cooperative, Inc., "Financial and Statistical Report," Rural Electric Administration Form 7, February 7, 1994.

2. Washington Electric Cooperative, Inc., "Least-Cost Integrated Resource Plan, 1992 - 2011," February 1992.

3. Washington Electric Cooperative, Inc., "1993 Annual Report, Demand Side Management Programs," March 10, 1994.

4. Washington Electric Cooperative, Inc., "Process Evaluation of the Residential Direct Install Program," produced by Hamilton Consulting with the Energy Research Group, January 21, 1994.

5. William Powell, Director, Energy Management Services, Washington Electric Cooperative, Inc., personal communication, February - May 1994.

6. Joseph Bongiovanni, General Manager, Washington Electric Cooperative, Inc., personal communication, January - April 1994.

7. David Cawley, Vermont Energy Investment Corporation, personal communication, March - May 1994.

8. Peyton Collie, Product Engineer, Energy Research, National Rural Electric Cooperatives Association, personal communication, May 1994.

9. Blair Hamilton, Director of Technical Services, Vermont Energy Investment Corporation, personal communication, May 1994.

10. Blair Hamilton, Chris Neme, and Ken Tohinaka, "Smart Protocols to Avoid Lost Opportunities and Maximize Retrofit Program Impact," Vermont Energy Investment Corporation, Draft for the American Council for an Energy-Efficient Economy's 1994 Summer Study, May 1994.

11. Joseph A. Bongiovanni, David R. Cawley, and H. Blair Hamilton, "Beyond the Tank Wrap: Field Experience Implementing Domestic Hot Water Fuel Substitution in an Electric Utility DSM Program," Washington Electric Cooperative and the Vermont Energy Investment Corporation, Draft for the American Council for an Energy-Efficient Economy's 1994 Summer Study, May 1994.

Special thanks to Bill Powell and David Cawley for their guidance and support throughout the development of this profile.