Seattle City Light
Low Income Electric Program
Profile #20, 1992

Executive Summary

"In some ways, Seattle is an Ecotopia," noted a Seattle City Light official, an Ecotopia where a long term commitment to low income weatherization is possible and a successful track record has indeed been proven. In addition to Seattle's progressive orientation, Seattle City Light has benefitted from Bonneville Power Administration's Energy Buy Back Program, whereby the utility's cost for conservation programs is partially offset by BPA's acquisition of conservation resources throughout the Northwest region.

The Seattle City Light (SCL) low income weatherization programs described in this profile are jointly administered, with the City's Department of Housing and Human Services (DHHS), and are targeted at two discrete sectors: single family and multifamily. For single family homes, the City provides the Low Income Electric Program (LIEP). For multifamily structures, the City offers the Multifamily Conservation Program (MFCP).

The City of Seattle, and Seattle City Light in particular, has had a long history with low income weatherization programs. In 1981 the City Council adopted an ordinance enabling the programs. Since then, some 15,109 low income units have been weatherized: 9,673 single family units, 836 multiplex units (2-4 apartments), and 4,600 multifamily units. Weatherization of these homes has resulted in average annual energy savings per home of 3,100 kWh, 1,308 kWh, and 1,640 kWh respectively. In terms of total cumulative savings, the low income programs to date have saved 250 GWh, and will create lifecycle savings of 1,160 GWh.

The programs' expenditures support the City's commitment to weatherization. Qualified LIEP participants are granted up to $3,300 per single family home, $4,000 per duplex, $5,000 per triplex, and $7,000 for a fourplex. For the MFCP, there is no per unit ceiling on expenditures. Total annual costs of the programs have ranged from just over a million dollars in 1981 to a high of over $6 million in 1983, to $2.7 million in 1991. Of the $41 million spent to date, fully $27 million has gone into expenses directly related to the installation of the efficiency measures.

Using two city agencies to deliver a program has its advantages and disadvantages. On the up side is a diversity of talents. SCL has a long track record with demand-side management and with effectively delivering and evaluating programs. DHHS, on the other hand, is an agency devoted to social services and thus ideally suited to reach out to and serve Seattle's low income population. Among its abilities are translation services including Chinese, Laotian, Russian, Vietnamese, Cambodian, and Ethiopian for program participants.

Low-Income Electric (& Multifamily) Program

Utility:	Seattle City Light
Sector:	Residential
Measures:	"Mandatory" measures include ceiling, under-floor, heating duct, and electric water heater insulation, and water heater setbacks. A range of "optional" measures are installed where appropriate.
Mechanism:	Direct installation of measures for qualifying customers
History:	Started in 1981; multifamily component added in 1986

1991 Program Data

Energy savings:	2,644 MWh
Lifecycle energy savings:	78 GWh
Peak capacity savings:	4.53 aMW
Cost:	$2,747,560

1981 - 1991 Program Data

Energy savings:	250.8 GWh
Lifecycle energy savings:	1,160 GWh
Capacity savings:	28.80 aMW
Cost:	$40,789,014
Participation rate:	39%

Conventions

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

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

Utility Overview

Seattle City Light (SCL) is the largest municipal electric utility in the Pacific Northwest. It provides power to more than 331,000 customers. SCL's service area covers 131 square miles and contains a population of 669,394. Eighty-nine percent of SCL's customers are residential. These customers account for 38% of total electric sales and 39.6% of the total electric energy revenues. SCL's commercial customers purchase 37% of its total energy sales, accounting for 36.8% of total electric energy revenues. Industrial customers account for 16% of sales and 13.4% of revenue. Governmental customers account for 9.7% of sales and 10.2% of revenues.[R#8,9]

Electric space heat and water heat are prevalent in SCL's service territory, making SCL a winter-peaking utility. Air conditioning is rare in homes, but common in commercial buildings throughout the year.

SCL experienced a 1.8% decline in total service area sales, from 8,997 GWh in 1990 to 8,833 GWh in 1991. This may be explained by a warmer than average winter and the closing of one of SCL's largest industrial customers for a portion of the year. Average annual residential electric energy consumption, however, remained essentially flat with usage of 11,250 kWh per customer in 1990 and 11,321 kWh per customer in 1991.[R#9]

SCL owns 75% of its hydro-based resource mix and purchases the remainder from the Bonneville Power Administration and other utilities. SCL purchases power from BPA through a long-term contract expiring in 2001. During 1991, purchases through this contract averaged 159 MW. SCL also has long term contracts and purchases power from two public utility districts (PUDs), three irrigation districts, and a power exchange corporation. During 1991, the total power available under these contracts averaged 122 MW. Other power transactions are conducted under short term agreements and interchanges of secondary power with utilities in response to seasonal resource and demand variations.[R#8,9]

SCL 1991 STATISTICS

Number of Customers	331,457	
Electricity Sales	8,833	GWh
Revenue from Electricity Sales	$271.5	million
Peak Demand	1,815	MW
Generating Capacity	1,883	MW
Reserve Margin	3.76%	
Average Electric Rates		
Residential	3.21	¢/kWh
Commercial	3.02	¢/kWh
Industrial	2.61	¢/kWh

[R#1]

Utility DSM Overview

The City of Seattle's efforts in encouraging energy efficiency have included many conservation programs aimed at residences and business as well as establishing progressive energy codes. The City has also developed an energy code which requires specific levels of energy-efficiency in new residential and commercial construction. Seattle City Light has been actively pursuing energy consevation as an alternative to developing new generation since 1977. Seattle City Light has developed and implemented a number of programs that provide information and financial incentives to encourage customers to increase the energy-efficiency of their dwellings, facilities, or processes.

SCL's first DSM program was called "Blanket Seattle," a residential water heater insulation and setback program. Although the program ended in 1983, it accounts for 31.3% of all residential DSM programs' 855 GWh of cumulative energy savings over the 1977-1990 period. The other large energy savers were the Low-Income Electric Program (discussed in this profile and responsible for 22.4% of the energy savings), the Home Energy Check Program (16.5%), and the Home Energy Loan Program (13.7%).[R#7]

DSM Overview Table	Annual DSM Expenditure (x1,000,000)	Annual Energy Savings (GWh)	Annual Capacity Savings (aMW)
1977	$3.2	0.116	0.10
1978	$3.5	1.796	0.21
1979	$4.8	8.978	1.02
1980	$4.4	17.618	2.01
1981	$13.0	29.693	3.39
1982	$22.3	78.906	9.01
1983	$21.4	123.719	14.12
1984	$13.9	136.650	15.60
1985	$15.0	159.655	18.23
1986	$15.3	178.827	20.41
1987	$15.5	189.179	21.60
1988	$17.1	200.204	22.85
1989	$16.5	202.837	23.15
1990	$13.6	212.031	24.20
1991	$17.1	238.095	27.18
Total	$196.8	1,778.304	203.00

[R#7,16]

SCL DSM PROGRAMS 1991

RESIDENTIAL

Home Energy Check Program

Home Energy Loan Program

Low-Income Electric Program

Multifamily Conservation Program

Residential Efficiency Standards

COMMERCIAL & INDUSTRIAL

Commercial Incentives Pilot Program

Energy Code Major Projects Requirement

Energy Management Survey Program

Energy Smart Design Program

General Service Efficiency Standards

Lighting Design Lab

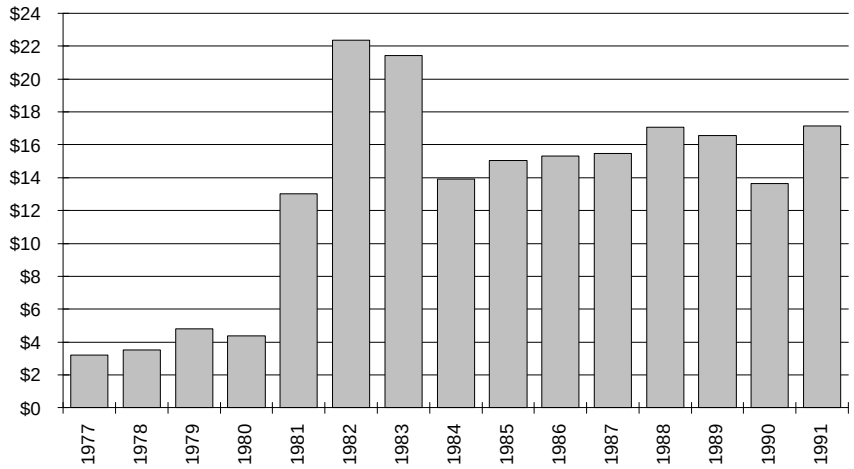
Street and Area Lighting Program

SCL's first commercial DSM program was its Lighting Survey Program which began in 1979 and ended in 1983. This program was responsible for only 4.3% of the 654.7 GWh of cumulative energy savings generated by SCL's commercial/industrial DSM programs. The largest energy savers were the Energy Management Survey Program (28.7%), the Street and Area Lighting Program (24.5%), and the discontinued Walk-Through Survey Program (16.0%).[R#7]

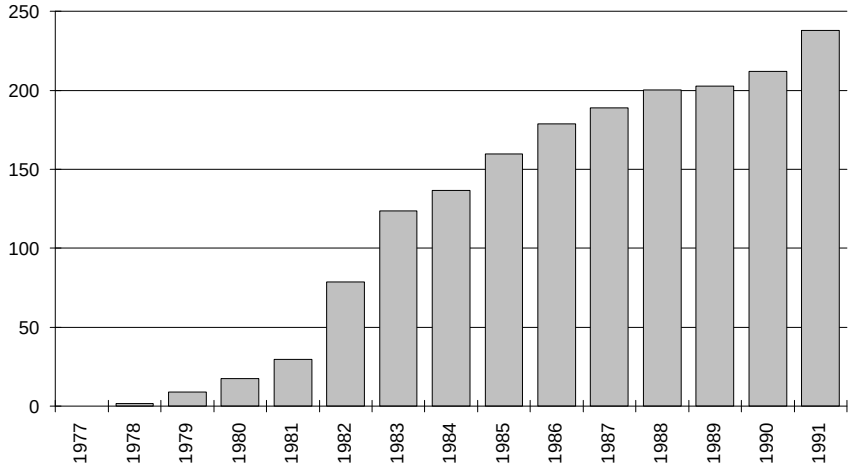
Staffing levels for SCL's DSM programs have changed a great deal over time. In 1977, 7.5 full-time staff were assigned to energy conservation programs. In 1991, the Energy Management Services Division, which is responsible for developing, implementing, and evaluating SCL's DSM programs, employed 91 full-time staff.[R#8]

Between 1977 and 1991, SCL spent just under $130 million on its direct demand-side management program expenditures. Over this period, these programs saved 1,778 GWh in annual energy savings and 203 average megawatts.[R#7,17] When counting overhead (including program planning, evaluation, etc.) SCL budgeted a total of $196.8 million between 1977 and 1991. In 1991, SCL budgeted $17.1 million, or 6.4% of total energy revenues on its DSM programs, one of the highest levels in the country. These programs include five programs in the residential sector and seven in the commercial and industrial sectors.

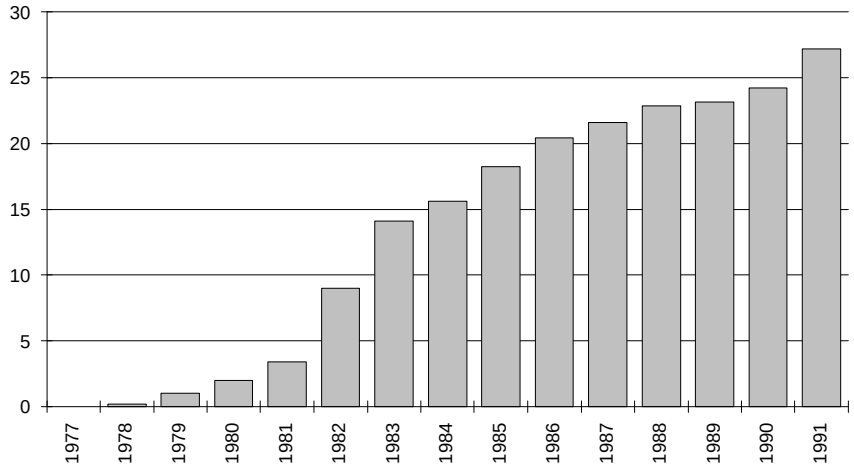
ANNUAL DSM EXPENDITURE ($1,000,000)



ANNUAL ENERGY SAVINGS (GWH)



ANNUAL CAPACITY SAVINGS (aMW)



Program Overview

The Seattle City Council authorized the Comprehensive Residential Weatherization Program (CRWP) in 1981. The CRWP was enabled by a city ordinance whose purpose was to authorize the creation of programs which acquire energy savings through the installation of conservation measures, particularly weatherization measures, in electric space-heat residential buildings. The Low-Income Electric Program (LIEP) and the Multifamily Conservation Program (MFCP) were created under the CRWP to weatherize the dwellings of low-income homeowners and renters so that they have the financial means to meet other living expenses such as food, shelter, and clothing.

NOTE: MFCP also provides weatherization services to standard income customers. This profile will only consider the MFCP component related to low-income customers. Where "MFCP" is written in this profile it refers only to the program's low-income component.

When LIEP began, eligible customers were homeowners who heated their homes electrically and had annual incomes less than or equal to 90% of the average income in the Standard Metropolitan Seattle Area (SMSA). Multiplex buildings (2-4 units) were also eligible if the owner lived in one of the units. In 1985, eligibility was changed to less than or equal to 70% of the state median income for homeowners and a provision was added to provide weatherization for renters whose income was 125% of the federal poverty level or less. LIEP was originally designed to operate for ten years (between 1981 and 1990) and to weatherize 19,700 homes. It is now projected to run until the year 2000.

Qualified LIEP applicants are eligible to receive a grant of up to $3,300 per single family building, $4,000 per duplex, $5,000 per triplex, and $7,000 per fourplex. The grant is designed to provide 100% of the costs of an energy audit; insulation, ventilation, and other infiltration measures; installation of measures; and inspection of all work performed. Specific measures installed vary with the needs of each structure. A dwelling may be weatherized only once; however, program participants who move may apply to have their new dwelling weatherized provided that they continue to meet the income requirements.

The key participant benefits of LIEP are:

- no cost for measures or their installation,
- lower heating bills,
- increased comfort,
- improved property value without property tax increase,
- quality workmanship and product safety assured by Dept. of Health and Human Services inspection, and
- a written, one-year warranty provided by the contractor.

In January 1986 MFCP was introduced to install energy-efficiency measures, especially weatherization, in multi-family structures of five units or more. MFCP provides a grant to audit a building, supply and install measures, and inspect all work performed. There is no per unit or per building cost limit, but simply an annual program budget ceiling. In addition to insulation measures, MFCP provides efficient-flow showerheads and other water heating efficiency improvement measures, insulated windows, and energy-efficient lighting for common areas (as of 1987). In order for a building to be eligible for MFCP, at least 75% of its units must be electrically heated and inhabited by households whose annual incomes are 125% of the federal poverty level or less. MFCP is projected to operate until 1997.

The owner of a structure weatherized through MFCP benefits by:

- more comfortable living spaces for tenants, thus lower turnover,
- increased property value without increase in property taxes, and
- lower electric bill due to energy-efficient lighting in common spaces.

Tenants of multi-family buildings benefit from increased comfort, lower space and water heating costs, and no rent increases due to the improved weatherization.

Implementation

MARKETING

Marketing efforts for LIEP and MFCP are rather small scale, albeit ongoing activities. These include television advertising, print advertising in community and ethnic newspapers, direct mailings, bill stuffers, and community outreach. This combination of media was deemed necessary to reach the largest percentage of eligible customers. According to Fisher Broadcasting Company, which owns a Seattle television station, using any one of these media would result in only reaching about 20% of eligible customers.[R#1] Telemarketing is conducted to contact all customers who have responded to direct mailings and to reschedule customers who have cancelled their appointments for various reasons.

Outreach efforts are targeted at the elderly, people with disabilities, the working poor, low-income tenants, limited or non-English speaking households, families with small children, and single heads of households. Monthly presentations are given to community based agencies. Other outreach activities include: "doorbelling," postering businesses, publishing announcements and advertisements in newspapers, maintaining information booths at community festivals, and contacting day care providers, schools, food banks, and local social service agencies.

During the winter of 1990-91, the DHHS along with other energy assistance agencies conducted energy workshops aimed at households that had received shut-off notices for not paying their heating bills and who were then eligible for Emergency Low Income Assistance. The workshops included energy use and weatherization information and credit counselling. The customers' eligibility for LIEP was determined on-site.

Marketing materials have been produced including energy kits and a variety of items with the program's phone number on them such as balloons, stickers, magnets, and bookmarks. Many of these items were designed to reach households with small children. Many multi-family building owners learn of MFCP from other owners who have had their buildings weatherized, from trade shows, or from tenant inquiries resulting from television advertising. Marketing efforts for 1992 have included television advertising, advertising in all ethnic community newspapers, and mailing 32,500 direct mail pieces.

DELIVERY

As part of the Comprehensive Residential Weatherization Program adopted by the City, the Seattle City Council directed Seattle City Light (SCL) to implement LIEP through the City's Department of Human Resources (DHR), a human service agency with experience in providing services to the low-income population. DHR delivered LIEP and MFCP from 1981-1990. In 1991 the Department of Community Development was responsible for delivery. In 1992 the Department of Housing and Human Services (DHHS) was given the responsibility. SCL has retained responsibility for all aspects of funding, goal setting, oversight and performance monitoring, compliance with building code and Bonneville Power Administration (BPA) specifications, receipt and acceptance inspections, coordination of participation with other SCL programs, and budget reconciliation.

The DHHS utilizes seven private, licensed and bonded contractors to install the weatherization measures. The delivery process is as follows.

Program advertisements direct customers to call a central intake telephone number in order to request LIEP or MFCP services. Personnel who answer this telephone pre-screen callers for income eligibility and ask the callers whether they own or rent their home and how their home is heated. Eligible homeowners are then scheduled to meet with an outreach representative at one of five neighborhood service centers. They are sent a reminder letter explaining exactly where to go and what to bring to the appointment. (There are actually eleven neighborhood service centers, set up by the City, where citizens can pay bills and tickets, obtain pet licenses, etc. Five of these centers are utilized by DHHS personnel for applicant interviews.)

At the meeting, the homeowner completes a LIEP or MFCP application with the assistance of an outreach representative. Additionally, the BPA requires that DHHS staff provide booklets to all applicants informing them about radon hazards. Building owners are required to sign forms stating whether or not they would like to have their building monitored for radon before any weatherization work is done. LIEP and MFCP applications are not processed until these forms are completed.

DHHS staff receive training in handling customer concerns about the health effects of weatherization, especially those involving radon, cancer, moisture build-up, and mildew. A variety of written material is also available addressing these concerns.

Outreach workers deliver completed applications to the DHHS central office for processing. At the central office, the applications are reviewed for accuracy and completeness. Applications may be denied if the customer does not meet the income requirements, if the building has been put up for sale, if the building has already been served through the program, if portions of the building have been required to meet Residential Efficiency Standard (RES) 5.1 requirements and have not complied, or if a RES 5.1 waiver has been put on the property title. [Note: the Residential Efficiency Standard applies whenever new or expanded electric service is requested from SCL. The standard requires portions of structures that have electric space heat to be weatherized at the owners' expense and inspected by SCL before new or expanded electric service will be provided.]

Some applications are put "on hold" pending structural repairs to the dwelling or because the customer did not submit all necessary forms. Buildings participating in LIEP and MFCP must meet current code. Structural repairs necessary prior to LIEP and MFCP participation are the responsibility of the building owner although MFCP provides an allowance of up to $250 per building for minor repairs.[R#12] When appropriate, extensive building rehabilitation may be coordinated with other DHHS programs.

The process of delivering services to rental customers is slightly different than for homeowners. When rental customers request services, the owners of the buildings in which they live must first sign a landlord covenant before weatherization work will be performed. The covenant is a five-year agreement with the City in which the landlord agrees to continue renting the property to low-income tenants, to not raise the rent on the basis of the weatherization improvements, and to not remove the weatherization materials for the term of the covenant.

After the landlord covenant has been signed, tenants are notified that their landlord has agreed to allow the City to weatherize their building. The tenants are then checked for income eligibility. At least two-thirds of the tenants must have incomes at or below 125% of the federal poverty level in order for the building to be eligible.

Once eligibility of a multi-family building has been determined or a LIEP application has been approved by the DHHS central office, several further steps are involved in providing LIEP and MFCP services to the customer. These steps may require up to six visits by program personnel and contractors to an applicant's home or building.

The first visit is by energy conservation representatives (ECRs) of the DHHS who are sent to an eligible building to conduct an energy analysis. Through this analysis the ECRs determine which weatherization measures are needed in the building. The ECRs then write a detailed work order of the required measures and decide which contractor will do the work, based on contractor availability. The ECRs submit the building file, including work order, to a supervising ECR who reviews it to confirm compliance with technical requirements and then submits it to the Grants and Contracts (G&C) Unit. The G&C unit reviews the file for compliance with financial requirements and then releases the work order to the appropriate contractor. Contractors are obligated to complete the installations within 30 days of receiving the work order (except for MFCP window installations which are allowed 65 days).

After receiving a work order, the contractor contacts the customer to schedule an appointment to do a pre-site visit. At this visit the contractor evaluates the building to determine if it is structurally sound and if all of the measures included on the work order can actually be installed. After this visit, the contractor contacts the customer to schedule the installation of measures. For LIEP participants, only weatherization measures are installed, usually requiring only one contractor. For MFCP participants, weatherization measures, water heating efficiency measures, and miscellaneous measures (common-area lighting, insulated windows, etc.) may be installed requiring as many as three different contractors and three different visits to a customer's home. When the installation is complete, the contractor submits a contractor work report to the DHHS stating that all measures included on the work order have been installed. An ECR from DHHS then conducts a very thorough inspection of the dwelling, with the contractor in attendance, confirming that all measures are

installed and that all installations meet state and city energy codes. ECRs from SCL also conduct inspections of a sample of LIEP and MFCP buildings.

After a multi-family dwelling has passed its inspection, the signed covenant for that building is filed with the County assessor's office and attached to the property's official record. If a property is sold before the agreement expires, the covenant will appear as a lien on the property. In order to complete the sale, the original owner must reimburse the City for a pro-rated portion of the value of the weatherization measures or the new owner must agree to assume the requirements of the covenant.

MEASURES INSTALLED

The programs distinguish between "mandatory measures", which are applied to all installations, and "optional measures" which are installed at the discretion of the program's administrators. Measures installed in all LIEP dwellings (mandatory measures) include: ceiling, under-floor, and heating duct insulation, electric water heater insulation, and water heater thermostat setbacks. Optional LIEP measures include: wall insulation, floor insulation in basements, caulking and weatherstripping, and smoke detectors.

Conservation measures available to all MFCP participants include: ceiling, under-floor, and wall insulation; insulated replacement or conversion windows; efficient showerheads, water heater wraps, temperature setbacks, pipe and duct wraps; and efficient lighting in common areas.

STAFFING REQUIREMENTS

Staff are required at DHHS and SCL to administer the two low income programs. Naturally staff at both agencies have other responsibilities but estimates of full-time equivalents (FTEs) are presented as rough approximations for the program. Note that in addition to the two agencies' staff who run the program, are contractors who actually perform the installations.

DHHS

Pamela Green, Supervisor of the Energy Intake and Outreach Unit of the DHHS, estimates that approximately 16 staff, in terms of full time equivalents, are responsible for all facets of the program.[R#13] These staff are managed by an overall program manager and are divided into three units: outreach and intake, audit and inspections, and grants and contracts. The Outreach and Intake Unit performs community outreach and program intake (filling out forms). The Audit and Inspections Unit conducts energy audits of applicants' homes and inspections of completed installations. The Grants and Contracts Unit at DHHS is responsible for invoicing, paying contractors, releasing work orders, monitoring translation contracts, writing grant requests, and handling requests for proposals for contractors to install measures.

SCL STAFF

Labor hours expended by Seattle City Light on administration and program support for LIEP and the low income component of MFCP are equivalent to about two full time staff equivalents annually. The functions performed include telephone intake and referral, schedule coordination, inspection, recording of audits for compliance with funding requirements, management, secretarial support, strategic planning, and evaluation (0.25 FTE per year in itself as performed over the past three years). In all, at least eight separate people perform these functions.[R#12]

In particular, SCL staff work out Memoranda of Agreement between Seattle City Light and DHHS which spell out program designs, participant eligibility, eligible measures, measure specifications, program procedures, financial and programmatic reporting requirements, staffing, budget and program levels, and compliance with BPA requirements. SCL staff interact on a daily basis with DHHS staff, providing oversight and consultation on specific building projects. For example, SCL coordinates work orders with DHHS for LIEP customers simultaneously going through SCL's HELP program for windows. SCL staff perform monthly monitoring using financial and programmatic reports which focus on average costs, specification compliance, eligibility, waiting lists, etc. SCL staff also represent the program to BPA and at year end close out funds and reconcile program budgets with expenditures and funds carried over to the next fiscal year.

Monitoring and Evaluation

MONITORING

While the DHHS is responsible for implementing LIEP and MFCP, SCL is responsible for monitoring program performance and evaluating progress toward the program goals and objectives. Monthly monitoring is carried out on mandatory financial and programmatic reports, focusing on average costs, specifications compliance, eligibility, waiting lists, etc.

EVALUATION

In 1983, Seattle City Light conducted a comprehensive evaluation of LIEP which included energy savings analyses, a survey of program participants, and a cost-effectiveness analysis. The persistence of energy savings for measures installed through LIEP was not directly evaluated, however, data gathered in an eight-year longitudinal evaluation of the Home Energy Loan Program (HELP) have been useful inputs to LIEP.

Since 1983, the SCL evaluation unit's focus on low-income programs has shifted to the potential in multi-family buildings. Between 1984 and 1991, ten reports have focused on multifamily R&D and pilot program efforts. A longitudinal impact evaluation tracking the persistence of participants' savings from 1987 through 1991 and first-year savings for 1992 participants is now underway.

Customer perceptions of LIEP and MFCP have been gathered from non-participants and participants. Non-participants have been asked their perceptions of the program and are screened for eligibility (on a one-to-one basis) at community and neighborhood outreach presentations. Reasons for non-participation have included: mistrust of government programs; a sense of pride which kept the customer from admitting eligibility; perception that they do not qualify; and personal ability to perform the weatherization work more quickly than the DHHS.

Participants' opinions of LIEP and MFCP have been gathered through several annual surveys. These surveys have averaged a thirty-three percent response rate. Their results indicate that program participants are appreciative of the work performed, are warmer and more comfortable, and have experienced a reduction in their heating costs. Some participants have expressed dissatisfaction in the length of time the program requires, the messiness of the installation, and the frequent appointments necessary to receive services. All complaints voiced on these surveys are followed up by staff by phone and/or by visiting a customer's home to resolve any outstanding problems or concerns.

In addition to energy savings, the other societal benefits of LIEP and MFCP are also important to SCL and DHHS as they are municipal agencies established to provide services in the public interest. Evaluation of the programs therefore includes an examination of the "net change in social welfare" due to the program. In this vein, a "Residential Weatherization Study", not an evaluation per se but a research and planning study, was conducted which identified the increased comfort associated with having a warmer home as one of the most important participant benefits of LIEP and MFCP.[R#5]

DATA QUALITY

Overall the two low income programs profiled in this report have been quite well documented and the data quality is quite high as a result of impact evaluations for both LIEP and the MFCP. A few notes follow:

- SCL does not use engineering estimates for savings. No deratings for "snapback" or "takeback" are used as this is considered insignificant. Second, no attrition factors are employed for savings. SCL uses a 30-year life for all measures other than lighting to which it assigns a 16-year life.

- In 1986, the DHHS began implementing MFCP, began offering LIEP to customers living in one to four unit rental buildings in which the owner was not living, and lowered the income requirements for LIEP from 90% of the SMSA median to 125% of the federal level making the requirements more restrictive. Prior to 1986, MFCP was not offered, only homeowners and renters living in owner-occupied single family and multiplex buildings could participate in LIEP, and the income limit for LIEP was higher and more inclusive. A change in the way cost data was reported also occurred in 1986, but its effect is first evident in the 1985 data. Prior to 1986 costs were reported for the year in which the work was completed. Beginning in 1986, costs were reported for the year in which the funds were committed. For this reason, some funds allocated in 1985 but invoiced and paid in 1986 were reported in 1985, causing 1985 expenditures to appear unusually large.

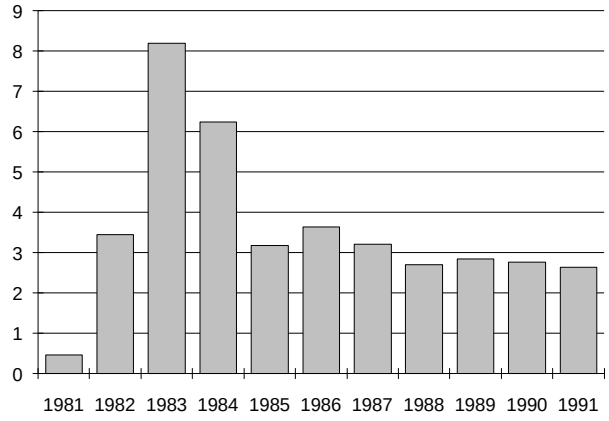
- Energy savings data for multiplex buildings and single-family building were aggregated between 1981 and 1986.

Program Savings

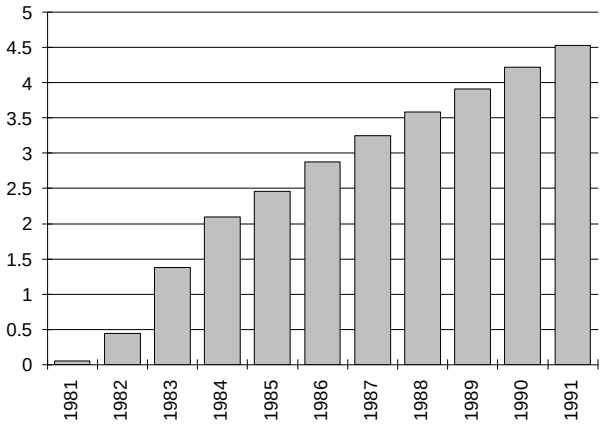
Savings Overview Table	LIEP Annual Energy Savings (MWh)	Multifamily Annual Energy Savings (MWh)	Total Annual Energy Savings (MWh)	Cumulative Energy Savings (MWh)	Lifecycle Energy Savings (GWh)	Annual Capacity Savings (aMW)	Cumulative Capacity Savings (aMW)
1981	459	0	459	459	14	0.052	0.052
1982	3,451	0	3,451	3,910	104	0.446	0.498
1983	8,194	0	8,194	12,104	246	1.382	1.880
1984	6,242	0	6,242	18,346	187	2.094	3.974
1985	3,174	0	3,174	21,521	95	2.457	6.431
1986	3,422	219	3,640	25,162	109	2.873	9.304
1987	2,195	1,012	3,207	28,368	92	3.251	12.555
1988	1,417	1,287	2,705	31,072	76	3.586	16.141
1989	1,556	1,283	2,839	33,911	80	3.909	20.050
1990	1,397	1,364	2,761	36,672	78	4.225	24.275
1991	1,191	1,454	2,644	39,317	78	4.527	28.802
Total	32,699	6,618	39,317	250,841	1,160	28.802	

[R#7,16]

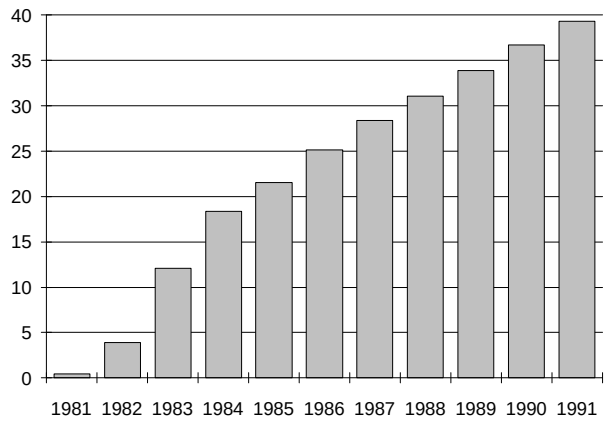
ANNUAL ENERGY SAVINGS (GWH)



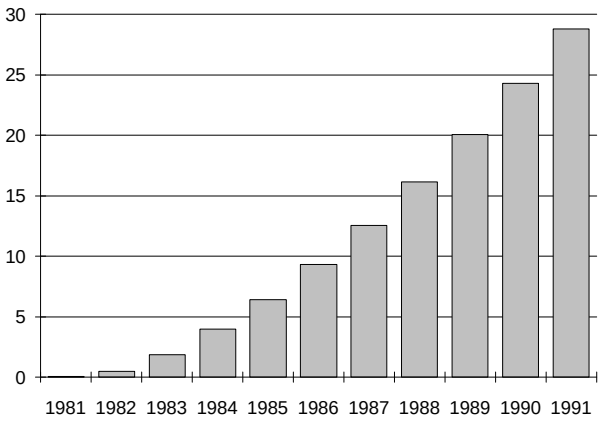
ANNUAL CAPACITY SAVINGS (aMW)



CUMULATIVE ENERGY SAVINGS (GWH)



CUMULATIVE CAPACITY SAVINGS (aMW)



Participation Table	Single Family Units	Multiplex Units (2-4 Units/Bldg.)	MFCP Units (5+ Units / Bldg.)	Total Units	Energy Savings per SF Unit (kWh)	Energy Savings per MP Unit (kWh)	Energy Savings per MFCP Unit (kWh)
1981	135	0	0	135	3,400	0	0
1982	1,015	0	0	1,015	3,400	0	0
1983	2,410	0	0	2,410	3,400	0	0
1984	1,836	0	0	1,836	3,400	0	0
1985	1,024	0	0	1,024	3,100	0	0
1986	1,104	0	264	1,368	3,100	0	825
1987	625	197	929	1,751	3,100	1,308	1,089
1988	385	171	894	1,450	3,100	1,308	1,440
1989	425	182	891	1,498	3,100	1,308	1,440
1990	400	120	832	1,352	3,100	1,308	1,640
1991	314	166	790	1,270	3,100	1,308	1,840
Total	9,673	836	4,600	15,109			

[R#7,16]

After eleven years of operation (1981-1991), LIEP and MFCP saved a cumulative total of 250.8 GWh of electrical energy and 28.8 aMW of electrical capacity. In 1991 the program added first year energy savings of 2.6 GWh and average capacity savings of 4.5 average MW.[R#7,17]

SAVINGS PER PARTICIPANT

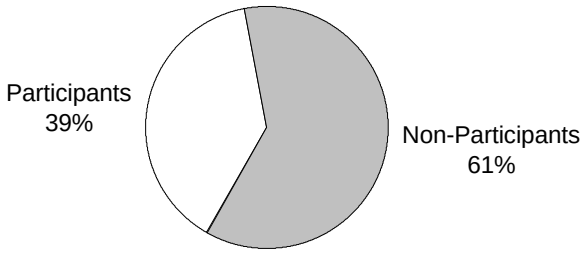
These first year savings indicate that each single family building saved an average of 3,100 kWh, each multiplex unit saved an average of 1,308 kWh, and each multifamily unit saved an average of 1,640 kWh in 1991. (Note: multiplex buildings contain two to four units and multifamily buildings contain five or more units.)

MEASURE LIFETIME

Average lifetimes of all measures are estimated at 30 years except common-area lighting measure lifetimes which are estimated at 16 years. Weighted averages of the lifetimes of the savings measures installed each year were used in determining lifecycle savings and the cost of saved energy.

PARTICIPATION RATES

Low income customers tend to be relatively mobile and thus determining the participation rates for LIEP and MFCP is somewhat problematic. (Residents of municipal and county



housing authority buildings, on the other hand, tend to be very stable over time.) Second, there has been a bit of contention between various city agencies (SCL, DHHS, and the Office of Management and Budget) regarding the "market pool", or number of eligible customers. Third, SCL changed the eligibility requirement for LIEP in 1986. Thus

many of the homes weatherized between 1981 and 1985 would no longer be considered eligible for LIEP, rather, they would be served by the Home Energy Loan Program.

An Office of Management and Budget study published in 1990, which neither Seattle City Light nor the Housing and Health Services agency endorsed, presented information on the market pool for LIEP and examined the saturation of weatherization measures throughout the single family housing stock in the Seattle Area. The study estimated that 58% of the single family homes eligible for LIEP had been weatherized. Another 23% (or 2,320) of eligible homes were expected to participate in the program between 1990 and 2000 and at that point, when the participation rate would be about 81%, the report found, the program ought to be discontinued.[R#5,14]

The market pool, or number of eligible housing units, as of 1989 for LIEP, according to SCL, consisted of 8,600 single family dwellings and 2,600 multiplex units, for a total LIEP eligibility of 11,200. Note that SCL has retrofitted 9,673 single family homes already, for an apparent participation rate of 112%, and 836 multiplex units for an apparent participation rate of 32%, and an overall LIEP participation rate of 94%. When LIEP homes that are currently considered ineligible, which were retrofitted between 1981 and 1985, are backed out of the market pool, then a total of 7,653 eligible homes have been retrofitted. Of these, 6,817 are single family homes and 836 are multiplex. Thus LIEP has served 79% of the single family market and 32% of the multiplex market, for a total LIEP penetration of 68%.[R#12]

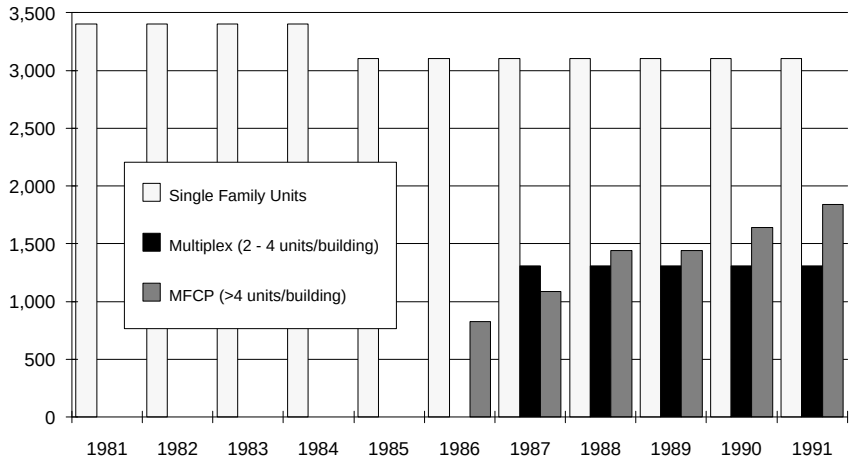
The eligible population for the low income component of MFCP is 1,050 buildings which account for 20,500 units.[R#7] Between 1986 and 1991, 4,600 apartments were served, or 22.4% of the eligible population.[R#7,17]

When all the eligible low income units are aggregated together their total equals 31,700 units of all kinds. To date, a total of 12,253 units, or 39% of the overall eligible low income housing stock has been retrofitted.

PROJECTED SAVINGS

Program plans for 1991-1993 call for ramping down LIEP from 368 buildings in 1991 (500 units), to 293 buildings in 1992 (417 units), to 106 buildings (200 units) in 1993. In terms of the low income part of MFCP, the plans call for treating a flat number of 60 buildings each year (900 units per year).[R#12] LIEP runs through the year 2000, while the low income aspect of MFCP runs through 1997.

ANNUAL ENERGY SAVINGS PER CUSTOMER (kWh)



Cost of the Program

Cost Overview Table	Measure Installation	Administration (Dept. of Housing & Human Services)	Administration (Seattle City Light)	Total Cost	BPA Funding	BPA Funding as % of Total Program Cost	Net Program Cost to Seattle
1981	$152,744	$211,793	$669,359	$1,033,896	$0	$0	$1,033,896
1982	$2,139,336	$1,026,074	$16,761	$3,182,170	$784,910	25%	$2,397,260
1983	$4,634,052	$1,307,445	$109,207	$6,050,704	$2,199,269	36%	$3,851,435
1984	$3,305,563	$1,516,383	$99,231	$4,921,177	$0	0%	$4,921,177
1985	$2,697,520	$1,623,915	$123,688	$4,445,123	$49,996	1%	$4,395,126
1986	$2,437,495	$1,189,357	$120,653	$3,747,505	$1,381,764	37%	$2,365,742
1987	$3,152,733	$1,091,996	$69,055	$4,313,783	$646,239	15%	$3,667,544
1988	$2,622,552	$1,089,886	$37,134	$3,749,572	$503,339	13%	$3,246,233
1989	$2,422,549	$1,106,227	$66,041	$3,594,817	$666,314	19%	$2,928,503
1990	$2,061,615	$889,555	$51,537	$3,002,707	$433,353	14%	$2,569,354
1991	$1,779,199	$908,572	$59,789	$2,747,560	$639,847	23%	$2,107,713
Total	$27,405,358	$11,961,201	$1,422,455	$40,789,014	$7,305,030	18%	$33,483,984

[R#7,16]

In LIEP's first eleven years of operation and MFCP's first six years of operation, SCL's net costs were over $33 million, with an average total expenditure per LIEP home of $2,888 and an average total expenditure per MFCP unit of $2,082. The total 1991 expenditures amounted to $2,747,560. This funding is provided by Seattle City Light which receives some reimbursement from the Bonneville Power Administration through its Weatherwise Program. Between 1981 and 1991, BPA reimbursed SCL for 18% of the aggregate expenditures (8.6% of total administrative costs and 21.1% of the cost of weatherization measures).[R#7,17]

COST EFFECTIVENESS

LIEP and MFCP serve a larger function than simply saving energy. They also provide a needed social welfare service. In so doing, the programs bear extra costs that are not incurred by standard-income residential programs. Examples of these costs include the effort of establishing the eligibility of potential participants and the costs of making repairs to dwellings. Establishing eligibility is labor intensive and adds to the administrative cost. In 1991, the aggregate cost of saved energy for LIEP and MFCP, calculated at a 5% discount rate, was 6.81 ¢/kWh. Seattle City Light uses a 3% discount rate which results in a cost of saved energy of 5.35¢/kWh.

COST PER PARTICIPANT

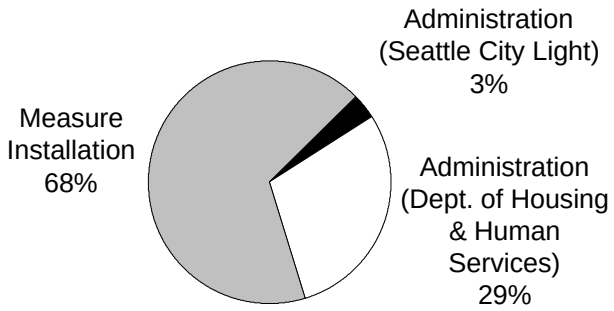
The average cost per participant has, for the most part, been declining over the life of these programs. In 1981 the average cost per LIEP household was an unusually high $7,658 (due to start-up costs and few initial participants). Second year LIEP costs were $3,135 per unit. Tenth year costs were $2,551 per unit. In 1991, the cost per average LIEP participant was $2,888. For MFCP customers the total program cost, when divided by the total number of residential units, equals $2,082 per unit, with the rate remaining essentially flat over the seven-year life of the program.[R#7,17]

FREE RIDERSHIP

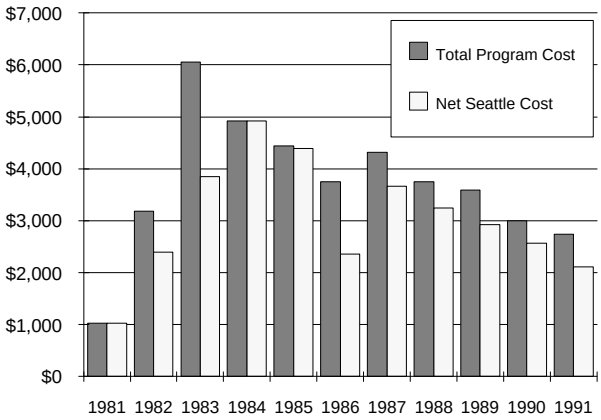
As with most other low-income programs, free ridership is not of much concern and is certainly not factored in as a derating to the savings data presented. Customers who meet the eligibility requirements for the program are unable to pay for even the most basic weatherization measures on their own.

COST COMPONENTS

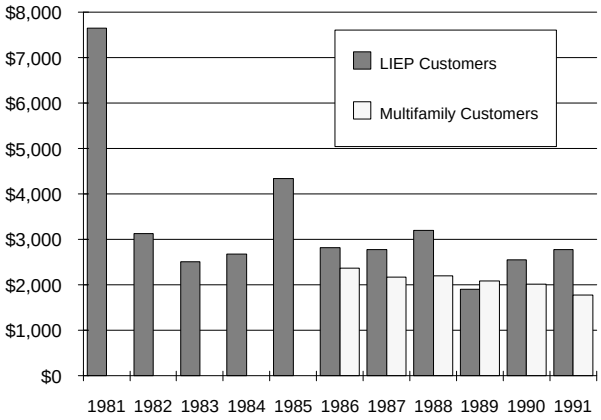
For the 1991 program year, the costs of the Low-Income Electric Program were due to the following three areas: 65% installation of measures, 33% administration by the Department of Housing and Human Services, and 2% administration by Seattle City Light. For the MFCP, the cost of measures installed was 77% of the MFCP total cost, DHHS administrative costs were 21%, and SCL's administrative costs were 2%. Of the total cost of the low income programs for 1991, $2,747,560, Bonneville paid a total of $639,847 or 23%. [R#17]



TOTAL PROGRAM COST (x1,000)



COST PER PARTICIPANT



Cost of Saved Energy (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%
1981	11.49	13.03	14.65	16.36	18.15	20.01	21.92
1982	4.70	5.33	6.00	6.70	7.43	8.19	8.98
1983	3.77	4.27	4.80	5.36	5.95	6.56	7.19
1984	4.02	4.56	5.13	5.73	6.35	7.00	7.67
1985	7.14	8.10	9.11	10.17	11.28	12.44	13.63
1986	5.25	5.95	6.70	7.48	8.30	9.14	10.02
1987	7.07	7.98	8.94	9.95	11.00	12.10	13.23
1988	7.36	8.29	9.28	10.31	11.40	12.52	13.68
1989	6.71	7.56	8.46	9.41	10.40	11.43	12.49
1990	5.75	6.48	7.26	8.07	8.92	9.80	10.72
1991	5.35	6.06	6.81	7.59	8.42	9.27	10.15

Environmental Benefit Statement

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
Coal	**Uncontrolled Emissions**					
A	9,400	2.50%	540,814,000	12,831,000	2,594,000	259,000
B	10,000	1.20%	576,684,000	4,967,000	1,675,000	1,242,000
	Controlled Emissions					
A	9,400	2.50%	540,814,000	1,283,000	2,594,000	21,000
B	10,000	1.20%	576,684,000	497,000	1,675,000	83,000
C	10,000		576,684,000	3,311,000	1,656,000	83,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	576,684,000	1,518,000	828,000	414,000
B	9,400	2.50%	540,814,000	1,283,000	1,037,000	78,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	576,684,000	1,021,000	166,000	414,000
B	9,010		518,740,000	370,000	124,000	25,000
Gas	**Steam**					
A	10,400		314,555,000	0	717,000	0
B	9,224		273,166,000	0	1,711,000	81,000
	Combined Cycle					
1. Existing	9,000		273,166,000	0	1,049,000	0
2. NSPS*	9,000		273,166,000	0	497,000	0
3. BACT*	9,000		273,166,000	0	69,000	0
Oil	**Steam--#6 Oil**					
A	9,840	2.00%	455,277,000	6,898,000	814,000	773,000
B	10,400	2.20%	482,869,000	6,843,000	1,024,000	497,000
C	10,400	1.00%	482,869,000	977,000	822,000	259,000
D	10,400	0.50%	482,869,000	2,870,000	1,024,000	158,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	604,277,000	1,203,000	1,868,000	102,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	717,406,000	1,849,000	2,434,000	541,000

Avoided Emissions Based on 250,841,266 kWh Saved (1981 - 1991)

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

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

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

*** Acronyms used in the table**

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

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

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

SEATTLE CITY LIGHT MARGINAL POWER PLANT

SCL is regulated by the Seattle City Council which does not require it to register a proxy power plant. Its effective source of marginal power is the Bonneville Power Administration which is responsible for providing SCL with the power necessary to meet its load growth. SCL purchases electrical energy from BPA through a long-term, firm power purchasing contract which will expire in 2001. During 1991, the power received through this contract averaged approximately 159 MW. Any energy saved through SCL's DSM programs most likely results in less energy purchased from BPA.

LESSONS LEARNED

The numbers are impressive. Seattle City Light in conjunction with other City agencies has racked up significant energy savings and has provided comfort and affordability to thousands of low income residents in Seattle.

There is no question, however, that what was envisioned to be a synergy between two city agencies has been a source of tension. Fuelling the tension is an ongoing question about the cost effectiveness of the delivery of the program. Providing a stark contrast to LIEP is SCL's HELP program, the standard income counterpart of LIEP, that SCL delivers with lower administrative costs than DHHS delivers LIEP. One means of addressing the discrepancy would be for SCL to accept bids to administer the low income program. DHHS, like others, could competitively bid on the job, highlighting its assets like any other bidder. Another method would be for DHHS to entertain competitive bids on a per-project basis, an approach which they are testing in 1992, a pilot which was very successful.[R#12,14]

On the other hand, DHHS has been highly successful at attracting funds (from both city and federal sources) and has administered the program with a high degree of social sensitivity.[R#14] DHHS has found, for example, that in order for a low income program to be effective an agency or utility must have positive, up-beat, and caring people on the phone who represent and "sell" the program. Second, it is important to have a centralized phone number for all social service programs to effectively refer callers to other applicable social programs.

The stigma of the "low-income" label affects customer participation in the program. As mentioned in the Monitoring and Evaluation section, some customers have not participated in LIEP or MFCP because pride has kept them from admitting that they are eligible. Similarly, surveys of participants have yielded comments from some that they were surprised because program staff treated them "with dignity" not "like welfare recipients."

Some tenants are reluctant to submit an application to the program because they are not certain that they will remain in the residence for a long period of time and do not care to do anything to benefit the landlord or future tenants. In general, however, more tenants than landlords call for weatherization services. The tenants are directly motivated by the size of their fuel bills and the personal discomfort they experience from living in a poorly weatherized apartment or house. Although more tenants make the initial request for services than do landlords, it is the landlord who makes the decision to weatherize and to sign the required five-year covenant.

Most property owners who hear of the program wish to participate. Some have refused, however, because they would not agree to the requirements of the landlord covenant. Since 1986 only 10% of the property owners who contacted the program were denied due to the incomes of their tenants.

DHHS has found that it cannot be assumed that customers are aware of the status of their own dwellings, and in particular the degree to which their homes are properly weatherized. This issue should be considered in developing a marketing plan for a similar program because incorrect perceptions have accounted for some non-participation in LIEP.

Program experience has shown that customers do not preplan for their weatherization needs, rather their immediate needs dictate when they investigate LIEP. Most calls requesting information about the program come during the fall heating season due to cold weather and high heating bills. This has created difficulty in the DHHS's ability to meet the needs of all who ask for weatherization measures to be installed. The DHHS has advertised the program in the summer in order to provoke interest in the program at that time, but thus far customers generally only call about the program when they are cold, or starting to get cold. Increasing staff seasonally has, however, been discouraged by the City's Office of Management and Budget.

Backlogs have been created by seasonal crunches and by general oversubscription to the MFCP side of the program. (MFCP has had a waiting list exceeding two years since the program began.) Many customers expect the weatherization measures to be installed before the winter, regardless of when they begin the process of receiving services. Naturally, some customers have been unable to get weatherization before the winter, creating dissatisfaction with the program.

According to the DHHS, "[In Seattle] low-income households are increasing and are estimated to increase faster than other income groups."[R#2] Through the requirements of the landlord covenant, LIEP serves the important function of helping to preserve the existing housing stock which is within the financial reach of low-income households.

TRANSFERABILITY

Seattle is in a rather unusual position. Politically and socially, "Seattle is sort of an Ecotopia," claims Linda Lockwood of Seattle City Light. This political, social, and environmental consciousness has and continues to provide support for low income programs despite their relatively high costs. Low income programs are not held to the same criteria as other resource acquisition programs -- cost effectiveness is low on the criteria. Second, Lockwood notes that few utilities enjoy the financial backing of an organization such as the Bonneville Power Administration. Without BPA funding for conservation, a municipality -- or even an IOU -- will find it harder to justify the low income programs discussed in this profile in economic terms. Currently BPA pays a significant portion of the cost of the program, and yet the program is still under the scrutiny of Seattle's Office of Management and Budget. Finally, Lockwood claims that the low income programs have become institutionalized and have taken on "lives of their own." Since they are established, and accepted, they are more permanent, their future is more secure.[R#14]

The Low-Income Electric Program, nevertheless, is well suited to be transferred to urban areas and other locations which have significant numbers of low-income residents. Delivery of the program may work best when conducted by a social service agency. Municipal utilities could involve their city's housing department as Seattle City Light has done, while investor-owned utilities could contract delivery to local community based organizations (CBOs) that provide other social services, as Southern California Edison has done with its Low-Income Relamping Program. (See Results Center Profile#2)

In setting up a similar program, care must be taken in determining the income requirements for eligible customers. For LIEP, an average of one-fourth of the customers who have requested services did not meet the program's income requirements. DHHS staff have been trying to raise the income guidelines to include more customers. The current guidelines do not allow for services to be provided to the "working poor," customers who are one paycheck away from being homeless.

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Special thanks to Debra Laurent Okumo and Pamela Green for their support and guidance throughout the development of this profile.