Austin, Texas
Comprehensive Municipal DSM
Profile #95

Executive Summary

The City of Austin, Texas has proven that adversity related to power supplies can be fully exploited for advantage. From its investment in the South Texas Nuclear Project and award of $120 million in a lawsuit over the plant, Austin has developed one of the most impressive demand-side management programs in the country. The programs are comprehensive and thorough, ranging from commercial loans to residential direct assistance, from tree planting to thermal energy storage systems. Perhaps most telling is Austin's Green Builder program, awarded at the Earth Summit in Rio de Janeiro, which factors other resource efficiency aspects into its new construction program. Green Builder may represent a wave of the future, incorporating DSM into a broader context including water management, recycling, and taking a careful look at the embedded energy and environmental costs of building materials.

The structure of demand-side management in Austin is quite unique. The City has an Electric Department, but elected to establish its energy efficiency initiatives under the auspices of the Environmental and Conservation Services Department (ECSD), a separate City agency. The ECSD is autonomous from the Electric Department, allowing it the freedom to implement a wide array of beneficial programs, even working with the local natural gas utility, Southern Union Gas, to implement a range of gas technologies programs. The ECSD and the Electric Department are formally linked in two ways: Most of ECSD's programs are funded directly by the Electric Department. The two city agencies are working together to develop their first integrated resource plan for future resource requirements.

Another key feature of Austin's energy efficiency work is the keen focus on social aspects of efficiency and the quality of life. An evaluation of its low income Direct Weatherization program, for instance, found that besides saving money the program's participants also managed to increase their comfort level closer to the City-wide average. As was expected, these lower-income utility customers kept their homes colder in the winter and hotter in the summer and the program allowed these customers to improve their comfort and save money simultaneously. ECSD has also spent time and resources quantifying the economic impacts of its energy efficiency programs, examining the economic benefits and multipliers of saving money in the community and investing in energy efficiency, boosting employment and product sales in the local economy. The City also developed an externality cost model to quantify the avoided emissions created by its energy efficiency programs, a focus that resulted in Austin being the first municipality in the country to receive sulfur dioxide emissions allowances under the federal Clean Air Act Amendments of 1990.

AUSTIN, TEXAS
Comprehensive Municipal DSM

Sector:	*Residential and Commercial*
Measures:	*Wide spectrum of efficiency improvements from weatherization, low flow showerheads, and water heater wraps to high efficiency lighting, motors, appliances, and HVAC equipment*
Mechanism:	*Home energy rating systems propelling market transformation in new construction; commercial and residential audits, rebates, and loans*
History:	*Legal settlement provided financial impetus for DSM in 1985; ECSD began operations in 1986; first IRP process began in 1991*

1993 PROGRAM DATA

Energy savings:	*29 GWh*
Lifecycle energy savings:	*440 GWh*
Capacity savings:	*23 MW*
Cost:	*$8,502,000*

CUMULATIVE DATA (1989-1993)

Energy savings:	*149 GWh*
Lifecycle energy savings:	*2,237 GWh*
Capacity savings:	*310 MW*
Cost:	*$41,169,000*

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. 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.

The City of Austin is the capital of Texas and is located in the southeast central portion of the state with a population of 476,908. It is an "intellectually stimulated" city, with fully 32% of its total labor force having 16 or more years of education. (The City also prides itself as being "America's live music capitol!") Austin is home to the University of Texas campus and major corporations such as Motorola, IBM, Advanced Micro Devices, and Texas Instruments. State government is the single largest employer in Austin with more than 20,000 employees at the University of Texas alone. Although high-tech manufacturing is considered to be the catalyst for future growth in Austin, government positions have historically been the stabilizing factor in local employment.[R#12]

The City of Austin Electric Utility (City or the "Electric Department") is a municipal utility that serves customers in Austin as well as the surrounding communities of West Lake Hills and Rollingwood. Its electric service territory encompasses 184 square miles within the City of Austin and 237 square miles of surrounding Travis and Williamson counties. The utility provides electric service to 291,785 customers of whom approximately 256,000 are residential, 34,000 are commercial or industrial, and less than 1,000 are classified as "other," meaning industry and government.[R#3]

In 1993, The City of Austin Electric Utility earned revenues of $474.3 million. The average rate for residential customers was 7.29 ¢/kWh, 6.86 ¢/kWh for commercial customers, 5.39 ¢/kWh for industrial customers, and 6.11 ¢/kWh for the government sector.[R#3]

Peak demand for 1993 was 1,581 MW while Austin's nominal generating capacity 2,420 MW, creating a reserve margin of 53%. This reserve margin, however, decreased to 28% due to the February 1993 closure of the South Texas Project (STP) nuclear plant. The City is a 16% owner in the South Texas Project, a nuclear plant that previously provided 400 MW of capacity to Austin but has yet to reopen. (Recently the City advertised its share of STP in The Wall Street Journal.) In 1993, the Electric Utility sold 6,967 GWh of electricity with sales for 1993 down 2.3% from 1992. From 1986 through 1992 the utility's annual growth rate in terms of energy sales has ranged from a high of 5.5% in 1986 to a low of 1.4% in 1987.[R#3]

All of Austin's electricity comes from utility plants at least partially owned by the City. The City is a 50% owner in the Fayette Power project, a coal-fired plant which provides 570 MW of capacity and is located in La Grange, Texas. The Decker Power Station is a gas-fired plant with 910 MW of capacity where the City also has a 300 kW photovoltaic installation.[R#3]

AUSTIN 1993 STATISTICS

Number of Customers	*291,785*	
Electric Revenues	*$474.3*	*million*
Energy Sales	*6,967*	*GWh*
Peak Demand	*1,581*	*MW*
Generating Capacity	*2,420*	*MW*
Reserve Margin	*53*	*%*
Average Electric Rates		
Residential	*7.29*	*¢/kWh*
Commercial	*6.86*	*¢/kWh*
Industrial	*5.39*	*¢/kWh*
Government	*6.11*	*¢/kWh*

The City's Holly Street Power Plant is a gas-fired plant with oil backup that currently provides 540 MW of capacity but which has drawn the ire of nearby residents. They want to close and permanently decommission the plant because of its downtown location and proximity to residential neighborhoods. The City has issued a request for proposals for 300 MW of capacity. If this much capacity can be cost effectively supplied, the Holly Street plant may be closed, leaving the Electric Utility with a comfortable 20% reserve margin.[R#14]

Incorporated in 1839, the City of Austin Electric Utility operates under a Council-Manager form of government with the City Council appointing the City Manager who is the chief administrator and executive officer of the City. The City Council consists of a Mayor and six council members elected for three-year, staggered terms. The City Council is the direct governing body for the utility and the City Manager's duties include the supervision of all City departments.[R#14]

Austin's residents are keenly involved in political issues and environmental issues in particular, ranging from air quality to water to land use. There are also many non-profit groups in the area including Greenpeace and other citizen action and ratepayer groups. The Sierra Club is perhaps the strongest of the local environmental action groups. Each of these organizations has played an integral role in shaping the utility's future, and particularly in supporting the role of the City in promoting a wide range of energy and environmental services to the City's population. ■

Utility DSM Overview

In December 1973, the City of Austin was admitted to the South Texas Nuclear Project (STP) with a 16% ownership share. Other project participants were Houston Lighting and Power Company, City Public Service of San Antonio, and Central Power and Light Company. The goal of the project was to license, construct, and operate two 1,250 MW nuclear generating units which were scheduled to go on line in 1989. There was much debate as to whether Austin should participate in STP. Although the public was opposed, the City Council voted to participate. The City viewed the plant as a cheap, long-term, reliable source of energy.[R#3]

In December 1981, project participants filed suit against Brown & Root, the architectural/engineering firm responsible for building the twin reactors at the plant. The suit charged Brown & Root with substandard work and breach of contract. Concurrently, in November 1981, the citizens of Austin authorized the City Council to sell its interest in STP. Austin has been trying to sell its share in the plant ever since but has been unable to do so.

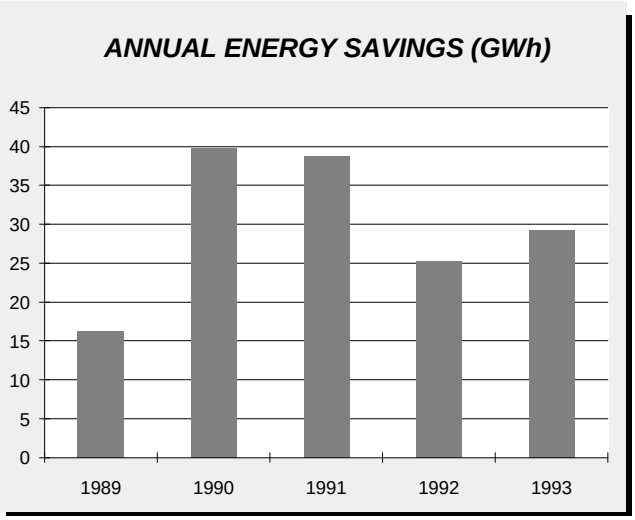
A settlement was reached in December 1985 and Austin's share of the settlement was $120 million to be paid over a seven-year period. Austin's City Council designated $60 million of these proceeds to be used to fund Austin's energy efficiency programs which would be implemented by Austin's Environmental and Conservation Services Department (ECSD), a City agency separate from the utility which began its operations in 1986. (The other $60 million from the lawsuit was earmarked for utility debt relief.) ECSD's insulation from the Electric Department has been a critical factor in Austin's success with DSM and pioneering efforts described herein.[R#3]

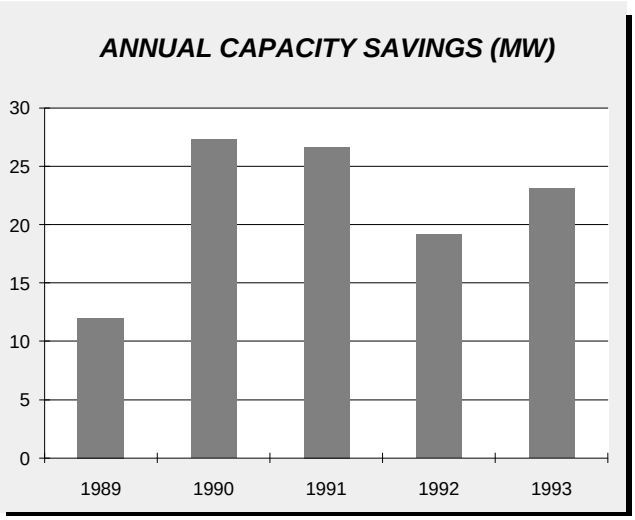
Through 1991 the settlement was the sole funding for Austin's energy efficiency efforts. Then in 1992 the City Council decided to use the remaining unbudgeted funds ($30 million), which had previously been earmarked to fund energy efficiency programs, to buy-down the utility's outstanding bond debt. The Council then required the Electric Utility to fund energy efficiency programs carried out by ECSD. Thus energy efficiency funding is now secured through the utility's electric rates which provide an average of $8 million annually (with $15.4 million – a dramatic increase – planned for fiscal year 1995) for energy efficiency programs.[R#1]

The City began its first integrated resource planning (IRP) process in 1991. Integrated resource planning in Austin is a joint responsibility of the Electric Utility and ECSD. This collaboration is performed through a committee with representatives of ECSD's Evaluation Group and the Electric Department. To date there have been few conflicts, largely because the City Council has passed the resolution mentioned above which is explicit about the City's long-term energy savings goals. The first IRP was intended to be completed by the end of 1993 but a great deal of staff time was required to deal with the potential closing of the Holly Street plant, so the completion date has been delayed.

While the lawsuit settlement and controversy over the STP was the financial and social impetus that jumpstarted energy efficiency in Austin, there are several factors that currently keep demand-side management strong. DSM continues today for a number of reasons including the key role that has been carried out by Mike Myers, Manager of the Energy Services Division; his staff; the high education level of the people of Austin; their basic support for energy efficiency as a resource option; and the thorough political support of the Austin City Council. In fact, Austin's first DSM initiatives began as early as March 10, 1983 when the City Council adopted its "Conservation Power Plant Plant," a plan which outlined the City's goal

DSM OVERVIEW	ELECTRICAL DSM EXPENDITURE (x1,000)	ENERGY SAVINGS (GWh)	CAPACITY SAVINGS (MW)	GAS DSM EXPENDITURE	GAS SAVINGS (MCF)
1989	$8,028	16.2	12.00	$156,007	6,444
1990	$8,770	39.7	27.29	$285,924	10,702
1991	$7,748	38.7	26.63	$289,252	8,196
1992	$8,121	25.2	19.12	$374,086	12,913
1993	$8,501	29.3	23.05	$392,103	8,776
Total	$41,168	149.1	108.09	$1,497,372	47,031





to achieve 553 megawatts in energy demand savings by 1996. The savings were to be achieved by implementing a variety of energy efficiency programs and investing in and constructing renewable energy projects.[R#1,14]

A unique feature of ECSD is that it implements both electrical and gas DSM programs to promote maximum efficiency in the use of the City's energy resources and to provide the lowest overall economic and environmental costs possible to Austin ratepayers. ECSD's gas DSM programs, administered under the title Gas Technologies, had expenditures for 1993 totaling $392,103. (See Profile #94: The City of Austin, Gas Technologies program) Over the course of seven years the City of Austin has allocated $1.76 million in gas DSM programs, or roughly 4% of comparable electrical DSM funding.[R#11]

The convenience for customers in dealing with a single agency for energy efficiency gives the City of Austin an opportunity to better serve its residents with optimal cost effectiveness. ECSD provides a range of services including information about energy efficiency and provision of financial incentives for installation of energy-efficient equipment.[R#1]

By now, energy efficiency has become institutionalized in Austin. ECSD staff has developed a strong rapport with many different groups in the community who support the ongoing initiatives with energy efficiency and even "green building" for sustainability. Thus DSM has been driven not only by ECSD, but by ongoing political support that has resulted from the favorable attitude of the voters towards energy efficiency.

The current Council-approved goal for ECSD is to save approximately 270 MW between 1994 and 2002, or approximately 30 MW annually on top of the possible 300 MW replacement capacity from both demand and supply-side resources related to the Holly Street plant. The proposed budget for FY 1995 is approximately $15 million with a goal to save 40 MW. Without the jumpstart of funding from the STP settlement, however, it is very unlikely that Austin would have been able to implement the scale of DSM programs that it has.

Austin is clearly at a turning point in terms of resource planning. Although its utility presently has a large reserve margin there are several wild-card issues which threaten this security and which in turn bolster the importance of DSM as a resource. Austin's reserve margin could diminish rapidly and completely in the next few years for two reasons: First, the South Texas Project may continue to have operating delays or problems lessening if not eliminating Austin's 400 MW share of the plants' output. Second, the possible accelerated closure of the Holly Street plant could strip another 540 MW of capacity from Austin. If these two scenarios occur concurrently, Austin's reserve margin could shrink to essentially zero in a matter of years. Another factor relates to a downtown transmission bottleneck. The 69 kV transmission line serving the inner city is overburdened, a situation that must be rectified by increasing transmission capacity or reducing demand in the downtown core.[R#1]

Since 1989 the City of Austin has spent $41.2 million on DSM resulting in consumption savings of 149.1 GWh and 108 MW of capacity. Total DSM expenditures for 1993 were $8.5 million, resulting in 25.2 GWh of energy usage and 23.1 MW of capacity savings.[R#18,19,6] ■

Austin's Current Portfolio of DSM Programs

Austin's ECSD currently offers fifteen DSM programs that use a broad range of mechanisms designed to capture energy savings through greater levels of efficiency for the City's customers. Programs range from customized rebates, free weatherization, and thermal energy storage to home energy rating systems, gas technologies, and tree shading.

Energy Star Homes program: Austin's most progressive residential programs have been the Energy Star Home Rating and Green Builder initiatives. (See Profile #11: City of Austin, Energy Star Rating) The Energy Star program began in 1985 and spawned the more comprehensive Green Builder program in 1993. The Energy Star program uses market forces to encourage energy efficiency improvements that in turn promote the construction and purchase of energy-efficient homes through a rating system. The program consists of two main components: rating and marketing of new homes. In recent years builders have taken over much of the marketing responsibilities using Energy Star ratings as a selling point for homes. The program has succeeded in creating home buyer demand for energy-efficient homes and builders have responded enthusiastically. Any new homebuilder in Austin's service territory is eligible to participate.[R#12]

Until early 1994, energy-efficiency ratings were based on plans submitted to ECSD by builders. The roots of savings were based on a computer modeling program called the Building Energy Thermal Analysis. This computer program was designed specifically for the Energy Star program and uses data about the home to generate a rating based on savings compared to a home built to minimum City energy-code standards. The program generates ratings from one to three stars, with one star denoting a home slightly above code, while three stars signifies state-of-the-art, energy-efficient homes. A zero rating denotes a home built to the Austin energy code. One star homes are projected to save 5% in energy costs over a standard home, two star homes save 12.5% above code, and three star homes are expected to save 20% in energy costs over a standard home.[R#9,12]

Beginning in March 1994 ECSD opted to dramatically restructure the program in order to simplify the process and alleviate the burden of rating homes on ECSD staff. Originally, two full-time staff were required to spend eight hours every day performing ratings and they simply couldn't keep up with the level of new construction in the Austin area. Now the burden has shifted from ECSD staff to builders themselves who use checklists to comply with various efficiency levels, still using a star system. (ECSD staff now perform limited inspections in the field to guarantee savings and program compliance.) This will not only streamline the process, but will also serve to educate builders about the specific technologies they must use to achieve energy-efficiency levels. While there has been some trepidation about turning the process over to builders, the City's code enforcement officials have agreed to allow ECSD to use the new system. Note that the new system also shifts the type of information promoted by the program, from computer analysis performed in ECSD's offices to checklists of technologies that can make a difference in the field. Naturally the Energy Star program has benefitted from its earlier incarnation, providing a foundation for this latest program evolution.[R#9,12]

AUSTIN DSM PROGRAMS

Residential

Home Energy Audits
Appliance Efficiency Program
Whole House Rebates
Home Energy Loan
Direct Weatherization
Multifamily Audits/Rebates
Green Builder/Energy Star Rating
Trees For Energy
Gas Technologies

Commercial

Commercial Energy Management Partnership
Custom Rebate
Small Business Rebate
Municipal
Thermal Energy Storage
New Construction

The Green Builder program: The Green Builder program is one of the most progressive DSM programs in the country and uses market forces to encourage environmental considerations and improvements in the building of new single family

homes. The program rates new residential homes in four areas: water, energy, building materials, and solid waste. It assigns a "sustainability" rating to each home based upon that home's impact on local and regional ecologic and economic systems. A general marketing campaign is designed to create buyer demand for increasingly improved levels of sustainable building, fostering an understanding of the added value associated with recommended efficiency options. Additional services of the program include technical seminars, information on new and existing residential construction, a quality control service to builders and homebuyers, presentations to outside groups on "earth-friendly" building, and networking with industry professionals.[R#9]

Builders are encouraged to join the program through general program marketing. Active solicitation occurs through local builders' associations and trade groups. With appropriate public marketing builders are motivated to seek the highest rating possible to achieve a market advantage. Any builder producing homes within Austin's service area is eligible to participate. Builder responsibilities include attending enrollment and technical seminars, providing program staff with the information necessary to perform the rating, rating all homes, and making the rating available upon request.[R#9]

A primary goal for the future of the Green Builder program is expansion to the commercial sector. In fact many commercial builders have approached ECSD even though no formal program exists and no marketing has been done. Green Builder specifications are beginning to be written into local requests for proposals for commercial construction, providing an indication of the program's market transformation influence. The Green Airport program, which has the potential for extensive energy savings through efficient building techniques, is also currently underway.

To support the Green Builder program, ECSD published the Sustainable Building Sourcebook. The Sourcebook is designed to encourage the implementation of environmentally-responsible practices in home building. While concentrating on the residential sector, the Sourcebook's recommendations are also relevant to commercial new construction. Although the Sourcebook focuses on Austin (regulatory issues, installation guidelines, etc.), much of the information is transferable to other areas and as such Austin has made an invaluable contribution to sustainable construction practices nationwide, raising awareness of the building materials that become permanently embedded in new homes.[R#2,10]

Topics covered in the Sourcebook include water, energy, building materials, and solid waste. Specific design considerations discussed include composting toilets, water-pervious materials, Xeriscape landscaping (which includes soil analysis, appropriate plant selection, efficient irrigation, and use of mulches), greywater irrigation using sub-surface distribution, harvested rain water, passive solar design, radiant barrier venting, earth-sheltered design, solar heating and cooling systems, photovoltaics, gas water heating, earth materials, straw bale construction, and compost systems. Over 1,000 copies of both the Sourcebook and Green Builder Guidelines have been distributed to date.[R#10]

In 1994, the City Council passed a resolution requiring municipal buildings to follow sustainable guidelines which have been developed, and that these guidelines be used for the development of a voluntary Green Building program for commercial buildings. The Council has also supported a program whereby local youths learn to build "green buildings" which in turn become affordable housing, a most successful and encouraging program enhancement.

Home Energy Audits: ECSD assists residential customers in arranging home energy audits so that they may then receive low interest loans or rebates from the City of Austin. Prior to October 1990 audits were provided for free. Since then the audit process has been turned over to the private sector and audits are now performed by contractors who charge customers directly for their services. ECSD provides audit forms free of charge to all local contractors and these forms are used as the basis for customers to receive subsequent program funding. Following an energy audit customers submit the results of the audit and recommended work to ECSD to assure later program incentives before work can begin.[R#9]

Whole House Rebate program: After a home energy audit has been performed, customers receiving approval may be eligible for the Whole House Rebate program or the Home Energy Loan program. The Whole House Rebate program provides rebates for customers who weatherize their homes. Rebates are offered for air infiltration reduction, attic insulation and ventilation, shading, solar control, duct repair and insulation, and HVAC equipment and servicing. Rebates range ☞

from $150 to 35% of the total job cost. Customers replacing their air conditioner or heat pump at the time of weatherization may also qualify for a bonus rebate which is a higher rebate than the one offered through the Appliance Efficiency program.

Home Energy Loan program: With the Home Energy Loan program, after an energy audit is performed customers who are interested in making their homes more energy efficient are eligible for low interest loans of up to $6,000 for a single-family home or $9,000 for a duplex. Interest on the loans ranges from 0% for three or five year loans to 2% for seven years. Loans can be used for air conditioner/heater replacement, air infiltration control, solar screens/film, attic insulation, attic ventilation, duct repair and insulation, and air conditioner servicing.[R#9]

Direct Weatherization program: The Direct Weatherization program is targeted at low income customers and also provides for the weatherization of single-family houses of elderly and disabled customers. The rational for the program stems from the fact that energy costs comprise a sizable portion of the annual income of households that are dependent upon social security and other governmental assistance programs. For this reason, a weatherization program was designed to lower the share of energy costs in participants' monthly expenses.[R#9,15]

The primary objective of the Direct Weatherization program is to lower customers' utility bills and increase their comfort level by improving the energy efficiency of their homes. Additionally the program aims to provide information to low income customers about energy efficiency.[R#5]

All work is performed at no cost to the customer, however, clients must meet income eligibility guidelines to qualify for the program. Work is carried out by a contractor selected through the City's competitive bidding process.[R#15]

The energy improvements include the installation of attic and ceiling insulation, solar screens, water heater wraps, low flow showerheads, and air infiltration measures such as caulking and weatherstripping. Energy-related repairs such as duct work and window and door replacement are included to address substandard housing conditions. In addition, vented space or wall heaters are installed for customers who have no heat or have space heaters that are hazardous. If a customer has a central heating or cooling system, then the contractor performs the Mechanical Air Distribution and Interacting Relationships (MADAIR) process. This is a process whereby the contractor fixes leaks in ducts, vents, and around heating and cooling systems.

Eligibility for the Direct Weatherization program services is based on federally established income guidelines and residency within the Austin Electric Utility service area. In a 1989 marketing study it was estimated that there were approximately 35,000 to 40,000 low income households in the utility service area that were eligible to receive assistance under this program. Income guidelines are built on a sliding scale to accommodate different sizes of households. This scale is adopted from guidelines established by the U.S. Department of Housing and Urban Development (HUD). Eligible households must have incomes at or below 50% of the median income established for their household sizes. Elderly (60 years and older) and disabled citizens are assigned priority status for participant selection by setting the income threshold at 80% of median income or lower. Eligibility for the program is verified through tax returns, food stamps receipts, and payroll records.[R#15]

Potential participants are recruited through several avenues including ECSD's established relationships with various community agencies and citizens groups. Such avenues include presentations to community groups, recruitment by auditors and weatherization contractors, and word-of-mouth communications. Limited advertising supplements such as billboards and flyers also play a role. A customer also can call ECSD customer service center at "499-STAR" to get details about the program.

Once communication with a customer is made a service representative first will go over the income guidelines of the program with the customer and then mail him or her an application. After the customer fills out the application along with the supporting income documents, eligibility is determined by program staff within one to two weeks. If qualified, a participant receives a visit by an energy representative (auditor) and contractor. At no charge to the participant, the representative makes recommendations on what energy improvements are needed. Once the home analysis is complete, weatherization work is scheduled with one ECSD's weatherization contrac-

tors within four to six weeks.[R#9]

The contractor, determined by a competitive bidding process, then contacts the customer, explains the scope of the work, and schedules a convenient time to do the work. Upon completion of the weatherization measures the contractor notifies ECSD and arranges for final inspection. An energy representative from ECSD then reviews the work to see if the audit recommendations and ECSD's performance standards have been followed. Payment to the contractor is contingent upon customer and inspector approvals. On a per-home basis the average cost of the program has been roughly $1,200.[R#9,15]

Note that emphasis is placed on neighborhoods; for instance over 100 homes were completed in the Holly neighborhood with plans in motion to do another 50.

Appliance Efficiency program: The Appliance Efficiency program is Austin's oldest and largest DSM program. The objective of the program is to reduce the utility's summer peak load and lower customers' electric bills by promoting the purchase and installation of high efficiency equipment. This is done by providing rebates on air conditioners, heat pumps, and solar and other alternative water heaters. Appliance efficiency rebates are available to any customer of the Austin Electric Utility, including residential homeowners, builders, and small commercial customers, who purchase and install qualifying equipment. Rebates are paid to the participant on a sliding scale based on equipment efficiencies. Rebates average 25-50% of the marginal cost (from $25 to $530) of the high efficiency equipment.[R#13]

The program is very simple from the participant's perspective since HVAC contractors and other appliance dealers help customers with rebate applications and program guidelines. Rebate applications must be submitted within 60 days of installation. After qualifying equipment is purchased, a rebate application is signed by the participant and completed by the vendor. It is then sent to ECSD and within four to six weeks the participant receives a check in the mail.[R#13]

Trees for Energy program: Teamed up with the City's Forestry staff, this residential program promotes shading and thus energy savings from avoided air conditioning. City customers are provided up to two coupons to purchase selected species of shade trees. Species are promoted that are long living, reach sufficient height and width, and have moderate to rapid growth rate. Customers redeem coupons at participating nurseries which contribute to the coupon value. Each coupon is worth $15 toward the purchase of a tree of more than 10 gallons in size. This program is usually offered November 1 through April 30, which is the ideal planting season in Austin. The program is marketed by going door-to-door in selected neighborhoods.[R#9]

Gas Technologies programs: Austin also offers a variety of gas conservation programs in cooperation with Southern Union Gas. A Free Weatherization and Space Heater component is available for gas customers who are elderly, disabled, or low income. A rebate of $50 is offered to gas customers who install gas furnaces with an 80% Annual Fuel Utilization Efficiency Rating (AFUE) or higher, equipped with an intermittent ignition device. Homeowners, facility managers, and apartment owners who install gas combination heaters may be eligible for a $125 rebate. In conjunction with the City's Residential Energy programs water heater wraps and pipe insulation are installed in homes that are audited by a registered contractor. At certain times of the year, water heater wraps and pipe insulation are installed for free in homes in targeted neighborhoods. The Gas Technologies program also provides funding for efficient gas engine chillers for commercial customers as well and for the conversion of fleet vehicles to natural gas.[R#11]

Multifamily Energy Rebate program: This program provides multifamily properties with a free walk-through energy audit performed by an ECSD representative. Apartment projects may complete weatherization and air conditioning replacements for rebates. Rebates are offered for building envelope equipment such as ceiling insulation, window treatments, and air infiltration control; lighting including fixtures, ballasts, optical reflectors, occupancy sensors, and high efficiency lamps; and improved HVAC systems.[R#9]

Commercial New Construction: On new commercial construction or renovation projects, not all architects and designers are familiar with the latest in energy-efficient products. This program offers incentives in the forms of cash rebates and architectural and engineering design assistance. The ☞

design services are provided at no charge to the participant and promote the efficient use of energy in new commercial construction projects. These incentives reduce the added incremental cost of using high efficiency technologies.[R#9]

In addition to using high efficiency equipment, ECSD encourages businesses to lessen the possible negative environmental impacts in the construction or retrofit of new facilities. For example, they suggest using alternative building materials that have a high recycled content or low embodied energy to produce. Water conserving strategies and recycling opportunities for the entire business are also considered.

Projects that are considered new construction include complete build-outs, building shells, finish-outs, additions and major remodels that require the City of Austin's Energy Code approval.

The building owner or designated representative may apply for the incentive program by submitting a Participation Request form. There are seven prescriptive rebate categories currently available: interior lighting, building envelope, reflective roof coating or radiant barrier, thermal energy storage systems, air conditioning, electric motors, and natural gas technologies. Rebates are based upon summer peak demand savings. All eligible components must reduce peak electrical demand for a minimum of four hours during the summer peak demand period from 1:00 to 9:00 pm.[R#9]

Once a rebate application is approved, ECSD will issue a Letter of Intent that encumbers money for the project. Payment is made after all applicable inspections have been completed, invoices or schedule of values have been collected, and a Refund Agreement signed. The rebate application must total a minimum of $100 and maximum of $100,000 per facility.[R#9]

The Commercial Energy Management Partnership: The Commercial Energy Management Partnership is the umbrella name for Austin's commercial DSM offerings. ECSD offers technical and financial incentives to electric customers and qualifying Southern Union Gas customers. Rebates are offered in the following categories: lighting, building envelope, motors, refrigeration, air conditioning, gas technologies, and thermal storage. A walk-through audit is required for all rebate categories except motors and refrigeration compressors. After the audit, customers submit a rebate application to ECSD which in turn issues a letter of intent, itemizing the possible rebates. After installation, an inspection is required before rebates are paid. The minimum rebate is $25 per facility; the maximum rebate amount of $100,000 was repealed by City Council. Rebates exceeding $35,000 must be approved by City Council. Rebates are also available for new construction projects.[R#9]

The expanded commercial programs began in 1985 and replaced the utility's relamping program with the current roster of commercial programs. Austin tried to use Pacific Gas & Electric's commercial DSM efforts as a model. Currently ECSD only offers rebates for its commercial programs because loans and leasing programs are seen as a potential liability risk by the City Council. The commercial group is increasing its staff by three people and it is likely that incentive levels will be decreased in the near future. The program staff are looking into developing a voluntary partnership program that will request energy savings from the customer in exchange for technical and financial assistance over a set number of years.[R#1,9]

Thermal Energy Storage: ECSD in cooperation with the City offers rebates and long-term electric savings through a Time-of-Use Rate (TOU) to promote thermal energy storage (TES) installations (See Profile #52: TU Electric, Thermal Energy Storage). Thermal energy storage lowers customers' electric costs while reducing both demand and current operating costs for the City. Many building operators are seeking new strategies to reduce these cooling expenses without compromising tenant comfort.[R#9]

TES systems use conventional refrigeration equipment to produce cooling energy during off-peak hours and store it in tanks for on-peak use. This avoids the electric demand charges caused by the operation of refrigeration equipment during peak times. Several options are currently available:

Chilled Water Storage Systems use conventional chilled water air conditioning equipment connected to insulated storage tanks. Ice Storage Systems require chiller equipment capable of making ice. These systems can provide lower air temperature and less tank space. Ice storage often uses smaller fans, ducts, and pumps to move the air resulting in lower equip-

ment and air distribution costs. Phase-Change Storage Systems store cooling energy through a phase change of materials (i.e., from a liquid to a solid). These systems include eutectic salts, clath-rates or slush-based systems and may require no special equipment other than a storage tank. A TES system can cost less to operate than a conventional cooling system and new technologies have reduced these systems' space requirements significantly, making TES more feasible for use in buildings with space limitations.

All types of cool storage systems qualify for rebates. Before installation a feasibility study must be conducted to decide if TES is economically feasible and cost effective for a particular building. ECSD pays 50% of the study cost up to a maximum of $5,000. The study evaluates and identifies the electric demand shift from on-peak to off-peak hours and compares the installation and operating costs between a cool storage system and a qualifying high-efficiency electric air conditioning system.

ECSD provides a rebate of up to $150,000 for electric demand shifted from on to off-peak hours as follows: $300/kW for the first 200 kW shifted plus $250/kW for the remaining capacity shifted; 50% of the installation cost or whichever is less.[R#9]

The Municipal program: The City of Austin's service territory contains a large number of municipal buildings and facilities. These facilities range from the hospital and airport to the water and wastewater treatment facilities and the Electric Department itself. The City currently has over 600 accounts which are served through municipal electricity rates that are based upon a discounted energy charge with no demand charge. [R#21]

The majority of energy efficiency upgrades that ECSD implements at these facilities are energy management control systems. However, virtually any retrofit or energy efficiency measure is undertaken by ECSD to assist in producing a more energy-efficient facility ranging from engineering and architectural design assistance, lighting retrofits, and air handling upgrades to motors with variable speed drives, high efficiency chillers, and thermal energy storage units. For example, ECSD replaced three, 600 ton chillers at a local hospital with higher efficiency chillers. The City's wastewater treatment plant downsized its motors and installed variable speed drives, and the Austin Convention Center retrofitted its chiller with a thermal energy storage unit.[R#21]

Custom Rebate program: ECSD designed the Custom Rebate program to address the unique and specific needs of medium to large commercial and industrial businesses. Due to the specialized nature of most of these commercial energy improvement projects, a detailed energy analysis by a professional engineer may be required on each project submitted for consideration.

The program offers $200/kW-reduced to customers who invest in energy saving technologies for a wide range of applications including variable speed drive conversions, absorption dehumidification, refrigeration system improvements, process plant pumping modifications, photovoltaic/solar applications, fan speed modifications, cool air recovery, cold storage insulation, and condenser water heat recovery systems.[R#9]

Small Business Rebate: The Small Business Rebate program provides technical and funding assistance to businesses which consume 50 kW or less peak demand of electricity to encourage energy efficiency. Technical assistance in the form of energy audits, utility bill analysis and energy efficiency recommendations are available as well as rebates on high efficiency equipment. The primary purpose of this program is to target and emphasize the need to offer small business organizations a comprehensive package of energy efficiency services since often small businesses lack the capital as well as knowledge to implement any cost savings measures.[R#9]

STAFFING REQUIREMENTS

Assessing the staffing requirements for implementing and administering all of ECSD's DSM programs is a formidable task. The City of Austin's ECSD has an implementation staff of roughly 60 full-time equivalents (FTEs) involved in its energy efficiency and green builder initiatives. This consists of engineers, program managers, data processors, field service, administrative assistance, and customer service. However, this does not include shares of the time spent on the DSM programs by financial, research and evaluation, marketing, accounting, or purchasing staff. ■

MONITORING

The Association of Energy Engineers provides protocols that structure three levels of monitoring which ECSD currently implements. Level 1 consists of a post installation inspection of measures to help confirm savings. After a contractor installs measures, an ECSD representative visits the home or business to confirm that energy-efficient equipment has been installed correctly, is running properly, and meets efficiency standards. Engineering estimates are then used to calculate savings. In the Gas Technologies program, for example, ECSD staff use engineering estimates to calculate an average savings per system installation. Total savings per installation are then tallied and multiplied by the number of installations to determine total savings for each program.[R#6]

Level 2 monitoring includes actual evaluations, market studies, or customer surveys and involves a Department of Energy simulation modeling technique (DOE-2) to assist in determining post-retrofit savings. Before the installation of efficiency measures occurs, ECSD staff pull random participants from their database on a per-program basis. ECSD then uses the DOE-2 model to simulate a typical participant. By using the model's efficiency and consumption parameters, a baseline pattern of energy consumption for an average participant is determined. One year after the installation this analysis is performed again to determine energy savings.[R#6]

Level 3 monitoring involves the actual installation of meters. Currently this level of monitoring is not performed at ECSD except for pilot projects. However, for fiscal year 1994-95 the City has approved funding for pre-and post-metering of participants. Data collected will be kept for several years to determine the persistence of savings. ECSD staff are pleased with this funding and believe that it will give them a chance to quell the concerns of DSM skeptics.[R#6]

EVALUATION

Until recently program evaluation focused on peak demand savings only. Now Austin gets emissions credits for avoided sulfur dioxide emissions from U.S. Environmental Protection Agency (a provision enabled by the Clean Air Act Amendments of 1990) but must track program energy savings to do so, solidifying Austin's commitment to documenting energy savings. In fact, Austin was the first municipal utility in the United States to get emissions credits from EPA. Austin's upcoming IRP incorporates energy savings into the planning equation, tying in well with the City Council's overriding objectives for DSM which include avoiding additional capacity needs; promoting economic development through energy efficiency; providing environmental protection; and ensuring equity among customer classes.

APPLIANCE EFFICIENCY PROGRAM EVALUATION

Only a few of ECSD's programs have had formal impact evaluations. One of these, the Appliance Efficiency program, is ECSD's largest and oldest DSM program. This prescriptive program was designed to reduce the utility's summer peak load and lower customers' electric bills.[R#13]

The impact evaluation found that the Appliance Efficiency program reduced demand by 76.79 MW from 1982 to 1990 causing a reduction in the City-wide system peak of 4.1%. The evaluation found that average residential customers saved 753 kWh and 0.83 kW of demand. Commercial customers saved 2,318 kWh and 1.22 kW. This resulted in participant bill savings of $57 and $123 per year for residential and commercial customers respectively and program costs of $337 and $255 per kilowatt for residential and commercial customers.[R#13]

DIRECT WEATHERIZATION EVALUATION

In June of 1991 ECSD performed an evaluation of the Direct Weatherization program. Prior to this evaluation, proof of the effectiveness of the program in providing a higher level of comfort to low-income utility customers was not available.

This evaluation was important in that it determined average energy savings for homes that had been weatherized through the program. The evaluation found that an electrically-heated home that has been retrofitted through the program saves 1,484 kWh (12%) of total electricity consumption and 0.61 kW (14%) demand annually. Ceiling insulation made up the largest piece of the 12% of consumption savings (4.07%), followed by the installation of a water heater wrap and low flow showerhead (3.71%), caulking and weatherstripping (2.42%), and solar screens (1.82%). Ceiling insulation also made up the largest part of the demand savings (6.43%).[R#15]

Similarly, a gas-heated home that has been retrofitted saves 143 CCF of natural gas annually. The evaluation found that these electrical and gas savings amount to a combined annual reduction in gas and electric bills of $122 per customer.[R#15]

The evaluation also found that besides saving money the Direct Weatherization program participants also managed to increase their comfort level closer to the City-wide average. As was expected, these lower-income utility customers kept their homes colder in the winter and hotter in the summer than the "average Austinite" as they were called in the evaluation. The program allowed these customers to improve their comfort and save money simultaneously.[R#15]

According to calibrated engineering models, the average participant living in a gas heated home had an average home winter temperature of 71.9°F, 2.1° colder than the 74° average in Austin. After weatherization, these participants increased their average winter thermostat set-points to 73°, closing the gap in half to only one degree. Similarly, all-electric homes changed their average winter temperature from 71 to 73°F.[R#15]

Weatherization also allowed participants to be more comfortable in the summer while lowering their costs. Average temperatures for weatherized homes decreased by 2.6° in hot summer months while saving energy costs.[R#15]

ELECTRIC EFFICIENCY ECONOMIC IMPACT MODEL

The City of Austin ECSD expanded its electric utility planning process to incorporate additional local area indirect impacts such as environmental and local income changes. In essence, Austin is at the forefront of tabulating the full range of benefits of its energy efficiency and sustainable building practice programs.

For many economies energy generation occurs outside the local area with fuel purchased from outside the local economy as well. Energy efficiency improvements, on the other hand, are implemented by local firms. Installation of equipment, insulation, and air infiltration measures are labor-intensive projects that utilize local labor. Thus, a one-year investment in energy efficiency directly creates immediate jobs in the Austin conservation sector comprised of local businesses, most being small and home-grown businesses. These businesses then buy other goods and services from other Austin businesses, creating classic economic multipliers. Also, the high efficiency equipment paid for by the utility and customers results in lower utility bills, allowing people to then respend this saved money, some of which creates jobs in Austin. The City's investment in energy efficiency thus results in making electricity cheaper over the long-term for its citizens and shifts the investment towards more in-City purchases.[R#16]

ECSD designed an Electric Efficiency Economic Impact Model to quantify this economic impact so that it could be included in the resource acquisition decision process. The State of Michigan is the only other government agency or utility in the nation to have built a modeling approach that quantifies the economic externalities of energy efficiency programs.[R#16]

Following Michigan's lead, ECSD's model was based upon the use of input-output multipliers. The economic multiplier recognizes the cyclical nature of spending and income. When any individual receives a dollar of income it is either spent or saved. If it is spent, it may go to a retailer or grocer who now has one more dollar than before. The retailer, for example, will use that dollar to pay for labor costs and for products to sell. Thus, a multiplier represents the sum of the in-city effects of the original dollar. For this project, Austin-specific multipliers were developed by Southwest Econometrics. ECSD used these multipliers in its Austin specific model to compute the total economic impact of the City's energy efficiency programs in terms of income and employment.[R#16]

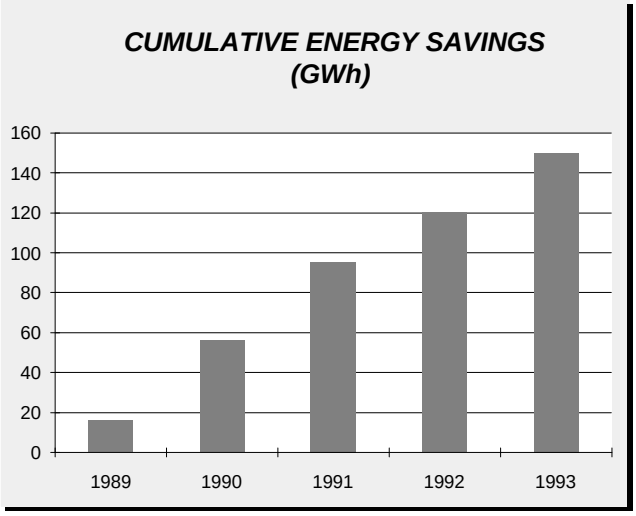
The model used three different assumptions in determining the economic impact of utility's investing in DSM. The model tested showed that the City's energy efficiency investments were good for the Austin economy. Under the most conservative assumptions, the City's investment in energy efficiency programs ($4.1 million in incentives in 1989) generates a net present value of $3.7 million in income over an investment life of 20 years and creates 75 jobs. If no off-setting rate increase is assumed, the City's 1989-90 investment in energy efficiency programs generates a net present value of $8.7 million over the investment life and creates 202 jobs in 1990. Under the more optimistic assumptions of no rate impact and energy efficiency investments not requiring a decrease in expenditures for other goods and services, the City's 1989-90 investment in energy efficiency programs generate a net present value of $15.9 million in income over the investment life and creates 514 jobs in 1990.[R#16] ■

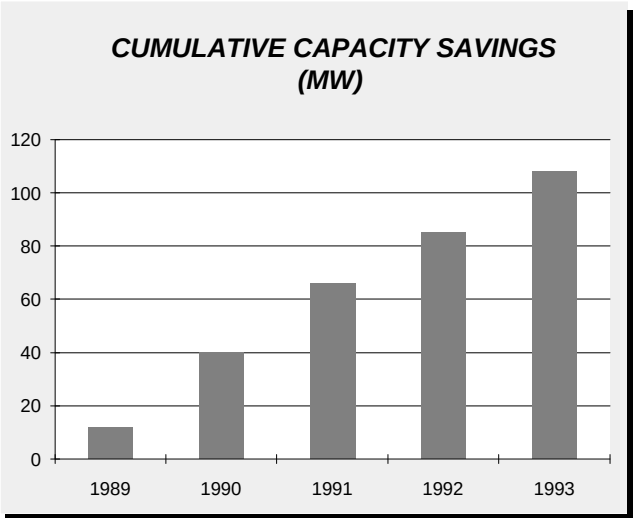
Program Savings

Data Alert: All energy and capacity savings are based upon Austin's fiscal year that runs from October 1 to September 30. For instance, the data presented for 1993 represents program savings from October 1992 to September 1993. Energy savings for 1993 are projections while capacity savings are based on actual results.

In 1993 energy savings resulting from all ECSD's DSM programs totaled 29.3 GWh and 23.05 MW demand. Annual savings from 1992 to 1993 increased 16% from 25.2 GWh to 29.3 GWh, significantly less energy saved than ECSD's highest annual savings of 39.7 GWh achieved in 1990. The record level of savings in 1990 resulted from ECSD's highest total annual participation for all its programs combined, lead by the inception of the Multifamily program in which over 28,400 units were weatherized in its first year. To date total annual energy savings of 149.1 GWh usage and 108.1 MW of total annual capacity have resulted. Based upon an average measure life of 15 years, ECSD's DSM programs will result in lifecycle savings of 2,236.5 GWh.[R#18]

The individual program that resulted in the greatest energy savings for 1993 was the Commercial Energy Management Partnership which had 6,687 MWh of energy savings, while the Whole House/Loan program resulted in the greatest capacity savings in 1993 with 6.52 MW. To date, the program with the largest amount of energy savings is the Multifamily program with 40,322 MWh and 26.44 MW of capacity savings. The Commercial Energy Management Partnership has also had significant success, resulting in 37,947 MWh and 19.52 MW of capacity savings.[R#18] ☞

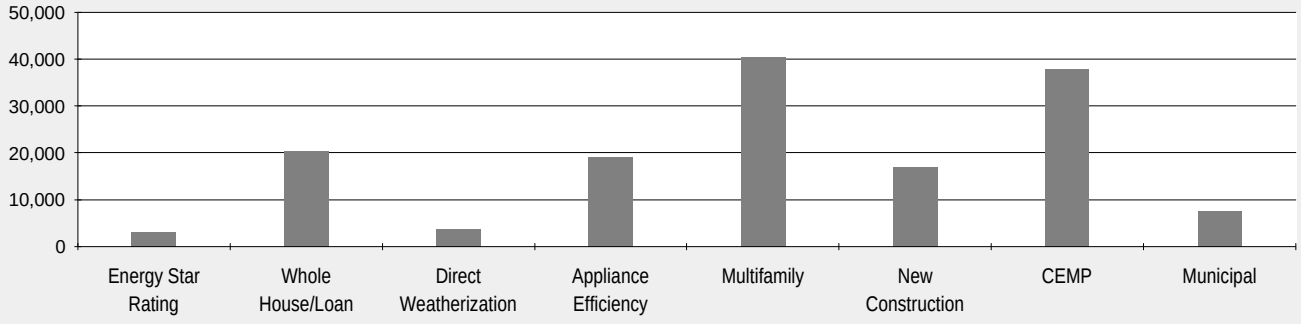




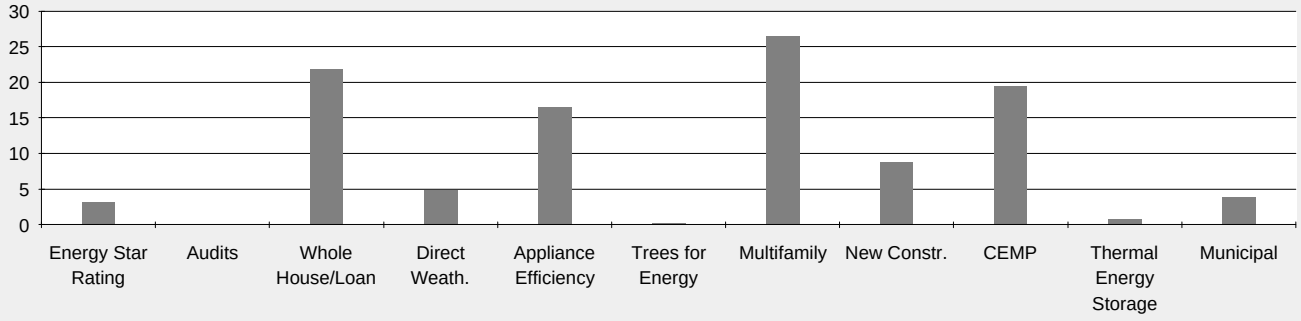
AUSTIN SAVINGS OVERVIEW	ANNUAL ENERGY SAVINGS (GWh)	CUMULATIVE ENERGY SAVINGS (GWh)	LIFECYCLE ENERGY SAVINGS (GWh)	ANNUAL CAPACITY SAVINGS (MW)	CUMULATIVE CAPACITY SAVINGS (MW)
1989	16.2	16.2	243.0	12.00	12.00
1990	39.7	55.9	595.5	27.29	39.29
1991	38.7	94.6	580.5	26.63	65.92
1992	25.2	119.8	378.0	19.12	85.04
1993	29.3	149.1	439.5	23.05	108.09
Total	149.1	435.6	2,236.5	108.1	310.3

SAVINGS OVERVIEW	1993 SAVINGS MWh	1993 SAVINGS MW	1989-1993 SAVINGS MWh	1989-1993 SAVINGS MW
Energy Star Rating	859	0.92	2,969	3.18
Whole House/Loan	6,088	6.52	20,378	21.82
Direct Weatherization	756	0.98	3,838	4.89
Appliance Efficiency	6,169	4.88	19,129	16.50
Multifamily	4,026	2.64	40,322	26.44
New Construction	3,091	1.59	17,050	8.77
CEMP	6,687	3.44	37,947	19.52
Thermal Energy Storage	-2	0.18	-8	0.87
Municipal	1,614	0.83	7,484	3.85
Total	29,290	21.98	149,109	105.84

1989-1993 TOTAL ANNUAL ENERGY SAVINGS PER PROGRAM (MWh)



1989-1993 TOTAL ANNUAL CAPACITY SAVINGS BY PROGRAM (MW)



PARTICIPATION	1993 PARTICIPANTS	TOTAL PARTICIPANTS TO DATE	1993 SAVINGS PER PARTICIPANT (kWh)
Energy Star Rating	750	5,144	1,146
Audits	0	42,386	0
Whole House/Loan	1,714	12,742	3,552
Direct Weatherization	593	4,057	1,276
Appliance Efficiency	5,266	102,455	1,171
Multifamily	6,569	72,908	613
New Construction	27	79	114,480
CEMP	155	1,577	43,144
Thermal Energy Storage	2	5	-810
Municipal	3	19	537,840
Total	15,079	241,372	1,942

Note that the Custom Rebate, Small Business Rebate, and Green Builder programs have no reported savings because they are relatively new.

PARTICIPATION RATES

Participation in ECSD's DSM programs is defined as the number of rebates, audits, installations, homes, loans, businesses, or municipal buildings that have participated in one or more program. Since the inception of DSM at Austin, all programs combined have involved 241,372 participants in a service area of 291,785 customers. While there certainly has been some overlap in participants, this roughly represents an impressive overall participation rate of 80%.[R#18]

The program with the highest participation for 1993 was the Multifamily program with 6,569 units which implemented some form of weatherization measures. This program's participation has steadily declined an average of 23% per year from 28,408 in 1990. The program with the largest participation to date has been the Appliance Efficiency program with 102,455 participants since 1982. The Thermal Energy Storage program has the lowest participation to date with five. Note that this program does not result in energy savings, only capacity savings. In fact it bears a small energy use penalty.

The Results Center has calculated that the Municipal program has resulted in the greatest savings per installation, with annual savings of 537,840 kWh in 1993, followed by the Com-

mercial New Construction program with per participant savings of 114,480 kWh savings per facility constructed. Commercial Energy Management has also resulted in a high savings per participant at 43,114 kWh. On the other hand, the most popular program in terms of nominal participation, the Multifamily program, has resulted in the lowest savings per participant at 613 kWh for each unit retrofitted.[R#18]

FREE RIDERSHIP

Savings have not been adjusted for free riders. ECSD's upcoming IRP, scheduled to already be finished but currently delayed, will account for free ridership.

MEASURE LIFETIME

The Results Center has assigned an average weighted measure life of 15 years for all the programs combined. This convention was used to consider every measure implemented within each program.

PROJECTED SAVINGS

ECSD projects that 1994 and 1995 energy savings will be 58,190 MWh and 60,868 MWh, respectively. This is a 100% increase from the 1993 calculated energy savings of 29,290 MWh. This increase is derived from three main sources: a projected increase of 13,000 MWh savings (a 200% increase) in the Commercial Energy Management program, a 6,000 MWh savings increase (400%) in the Appliance Efficiency program, and an additional 7,800 MWh savings in government programs.[R#18]

Capacity savings are projected to increase from 23.05 MW in 1993 to 34.09 MW in 1994 and 40.37 MW in 1995. This represents a 55% increase in the first year and an additional 18% increase in the second year.[R#18]

Most commercial demand savings come from small commercial buildings, defined as buildings that demand between 200-500 kW, with 60% to 70% of these savings from lighting measures. Of the 23 MW saved in 1993 through all ECSD programs approximately 7 MW, or less than 33%, of savings came from the commercial sector. By 1995, it is expected that commercial savings will exceed residential savings for the first time. In fiscal year 1995 the ECSD's goal is to save 23 MW in the commercial sector.[R#18] ■

Cost of the Program

From 1989 to 1993 ECSD spent a total of $41,169,000 on demand-side management. Expenditures have remained relatively stable over these years, ranging between $7.7 and $8.8 million, with 1990 being the year with the largest expenditure of $8,770,000.

As presented in the Costs Overview by Program table, the program with the highest costs for 1993 was Whole House/Loan program at $1,718,000. The Appliance Efficiency rebate program, the second most costly program, had a 1993 expenditure of $1,329,000. The two least costly programs were the Energy Star Rating program and the Thermal Energy Storage program at $152,000 and $70,000, respectively. The Energy Star Rating program costs are low because no incentive is offered, while the Thermal Energy Storage's low costs are attributed to very low participation.[R#19]

In 1993, on a cost per kW capacity saved basis by program, the Thermal Energy Storage program had the highest cost at $389/kW saved. The New Construction program cost the least at $131/kW of capacity saved. During 1992 the ECSD's commercial programs cost an average of $200/kW capacity saved, while the residential programs averaged $413/kW saved.[R#18]

COST EFFECTIVENESS

The Results Center calculations of the annual utility cost of saved energy at various discount rates for 1993 are shown in the accompanying table. The year with the largest expenditure, 1990, was also the year with the largest amount of energy savings and thus yielded nearly the lowest cost of saved energy for all programs combined at 2.13 ¢/kWh at a 5% discount rate. (The cost of saved energy in 1991 was 1.93 ¢/kWh at 5% real.) The highest cost of saved energy, 4.77 ¢/kWh, was in 1989. All years combined resulted in a cost of saved energy of 2.66 ¢/kWh for a 5% discount rate.

Austin screens programs using three tests, the Utility Cost Test, the Participant Cost Test, and the Societal Cost Test minus certain externalities. The results of these tests will be presented in Austin's upcoming IRP.

COST PER PARTICIPANT

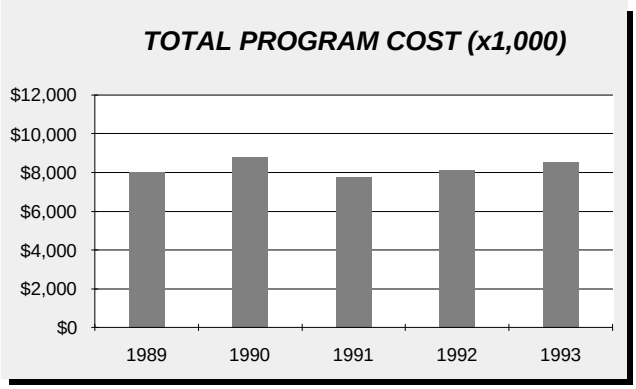
The cost per participant is based upon operating costs and incentives, as well as indirect expenses and code compliance. (Code compliance refers to funds paid by ECSD to Austin's Building Safety Department for inspections of retrofits to make sure they meet the City's building code requirements.) Increments of both the indirect expenses and code compliance expenses were extrapolated out and assigned back to each program proportional to the amount of savings resulting from each program.

COSTS OVERVIEW	OPERATING COSTS (x1,000)	INCENTIVE COSTS (x1,000)	TOTAL EXPENDITURE (x1,000)
1989	$3,896	$4,132	$8,028
1990	$3,448	$5,322	$8,770
1991	$3,692	$4,057	$7,749
1992	$4,160	$3,961	$8,121
1993	$3,927	$4,574	$8,502
Total	$19,123	$22,045	$41,169

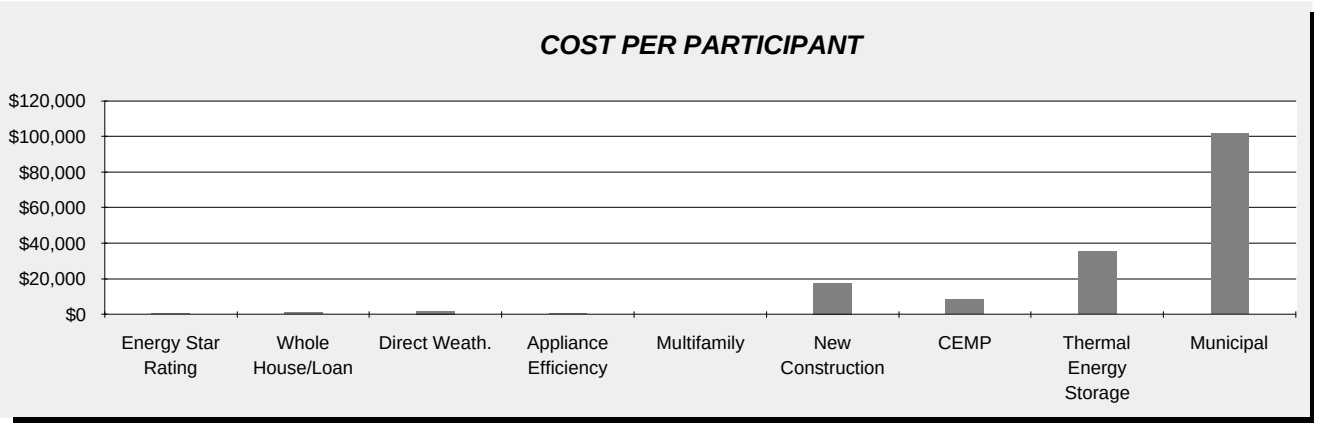
The Results Center calculated the utility cost per participant for each program based on total annual expenditures and the total number of participants in the program to date. The Municipal program has had the highest cost per participant, $101,632, followed by the Thermal Energy Storage program with $35,149 per participant. The Commercial New Construction program, with a utility cost per participant of $17,711, has been the third most expensive. The programs with the lowest cost per participant are the Multifamily and Energy Star Rating programs at $164 and $311 per participant respectively.[R#19]

COST COMPONENTS

Expenditures are broken down into operating and incentive costs. In 1993 total operating expenditures were $3,927,000 and incentives were $4,575,000, totaling $8,502,000. Operating costs accounted for 46% of all costs. This includes code compliance and indirect costs comprised of evaluation, planning, marketing, and administrative assistance costs.[R#6] ■



1993 COSTS OVERVIEW BY PROGRAM	OPERATING COSTS (x1,000)	INCENTIVE COSTS (x1,000)	TOTAL EXPENDITURE (x1000)	COST PER PARTICIPANT
Energy Star Rating	$152	$0	$152	$311
Whole House/Loan	$227	$1,491	$1,718	$1,332
Direct Weath.	$301	$701	$1,002	$1,808
Appliance Efficiency	$96	$1,233	$1,329	$360
Multifamily	$84	$618	$702	$164
New Construction	$32	$177	$209	$17,711
CEMP	$372	$314	$686	$8,245
Thermal Energy Storage	$29	$41	$70	$35,150
Municipal	$170	$0	$170	$101,632
Code Compliance	$181	$0	$181	
Indirect Expenses	$2,281	$0	$2,281	
Total	$3,927	$4,575	$8,502	



COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
1989	4.15	4.46	4.77	5.10	5.44	5.79	6.15
1990	1.85	1.99	2.13	2.27	2.43	2.58	2.74
1991	1.68	1.80	1.93	2.06	2.20	2.34	2.48
1992	2.70	2.90	3.10	3.32	3.54	3.77	4.00
1993	2.43	2.61	2.80	2.99	3.19	3.39	3.60
Total	2.31	2.48	2.66	2.84	3.03	3.23	3.43

Environmental Benefit Statement

AVOIDED EMISSIONS BASED ON: 435,600,00 kWh saved 1989 - 1992						
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%	939,154,000	22,281,000	4,504,000	450,000
B	10,000	1.20%	1,001,444,0	8,625,000	2,909,000	2,156,000
	Controlled Emissions					
A	9,400	2.50%	939,154,000	2,228,000	4,504,000	36,000
B	10,000	1.20%	1,001,444,0	862,000	2,909,000	144,000
C	10,000		1,001,444,0	5,750,000	2,875,000	144,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	1,001,444,0	2,635,000	1,437,000	719,000
B	9,400	2.50%	939,154,000	2,228,000	1,802,000	135,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	1,001,444,0	1,773,000	287,000	719,000
B	9,010		900,821,000	642,000	216,000	43,000
Gas	***Steam***					
A	10,400		546,242,000	0	1,246,000	0
B	9,224		474,368,000	0	2,971,000	140,000
	Combined Cycle					
1. Existing	9,000		474,368,000	0	1,821,000	0
2. NSPS*	9,000		474,368,000	0	862,000	0
3. BACT*	9,000		474,368,000	0	120,000	0
Oil	***Steam--#6 Oil***					
A	9,840	2.00%	790,614,000	11,979,000	1,414,000	1,342,000
B	10,400	2.20%	838,530,000	11,883,000	1,778,000	862,000
C	10,400	1.00%	838,530,000	1,696,000	1,428,000	450,000
D	10,400	0.50%	838,530,000	4,983,000	1,778,000	274,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	1,049,360,0	2,089,000	3,244,000	177,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	1,245,816,0	3,210,000	4,226,000	939,000

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 Austin's level of avoided emissions saved through its comprehensive municipal DSM initiatives 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.

THE EXTERNALITY COST MODEL

To measure the environmental impact of energy efficiency programs ECSD developed the Environmental Externality Cost Model. This model, a complex FORTRAN program, consists of two parts: air quality and cost assessment which Austin intends to market to other cities and utilities alike.

The air quality model is the Industrial Source Complex Dispersion Model developed by the EPA for nationwide use, with significant enhancement by ECSD staff. Outputs include the quantity of emitted pollutants such as sulfur dioxide (SO2), nitrous oxides (NOx), total suspended particulates (TSP), carbon monoxide (CO), and carbon dioxide (CO2) in tons per year. It determines pollutant concentration in mg/m^3 and estimates the damage resulting from these in terms of mortality, morbidity, crop losses, visibility effects, and material damage. These results are then converted to cents/kWh values. Environmental impacts can be determined by local, long-range (owing to acid deposition), and global effects (CO2). Based on the City's current investment, the model has estimated annual reductions of 27,000 tons per year in carbon dioxide, 20 tons per year in sulfur dioxide, 54 tons per year for nitrous oxides, and 13 tons per year in carbon monoxide.[R#20] ■

*** Acronyms used in the table**

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

LESSONS LEARNED

Local political support helps drive DSM: There is no question that publicly owned utilities need political support within their own jurisdictions. In Austin, IRP and DSM was enabled by local political support. Gaining this support, however, has taken different forms.[R#1]

Austin forged its own path with IRP and DSM success in the absence of significant state emphasis and requirements, undercutting the hypothesis that state emphasis in these areas is a prerequisite for successful activity. Regulation can indeed get programs going, but in Austin's case it was not a major driver.

DSM drives market transformations that ratchet building codes: In Austin the link between ECSD and the City's objectives has been explicit: ECSD has direct responsibility for developing building codes. Thus DSM programs stimulate markets for efficient goods and degrees of market transformation occur, allowing the City to ratchet code levels in harmony with its DSM efforts. For example, rebates were used to ratchet up air conditioner efficiency ratings which in turn created a transformation of the market. Once market transformation was completed, the code was then also made more stringent.

Cost effectiveness is a key DSM parameter: Utilities concerned about DSM costs must be assured that programs are cost effective. Currently there are five primary cost effectiveness tests that are essential to integrated resource plans and which assess the costs and benefits of DSM programs from a number of perspectives. These include the participant's perspective, the non-participant's perspective (Rate Impact Measure test), the utility's perspective, the Total Resource Cost test (which considers both utility and customer costs), and society's perspective which factors environmental costs into the equation as well.

Austin screens programs using three tests: the Utility Cost Test, the Participant Cost Test, and the Societal Cost Test minus certain externalities. The results of these tests will be presented in Austin's upcoming IRP and will serve as a benchmark for future program directions.

Relationships must be built before you need them: Austin found that it is especially important to marshall broad community support for its programs. For instance, the success of the Energy Star program and the Green Builder program has been rooted in the utility's ability to get builders, architects, and building owners on board. At the same time it is crucial to keep local decision-makers on board. This combined approach creates both market pull for conservation and regulatory push.

Economic benefits of DSM are important: Unlike investor-owned utilities that must focus on making a profit for their shareholders, city governments have another set of priorities. One overarching priority is the economic viability of the community. Efficiency can promote economic development as presented by Austin's Electric Efficiency Economic Impact Model. In fact, a city's economic development can be more important than its utility's load growth.

Societal benefits are salient: Publicly owned utilities such as Austin have the opportunity to embody and conduct their affairs under a framework of a societal economic and environmental perspective and customer-service orientation. This perspective allows for greater weight to be applied to social concerns such as local economic development and environmental impacts. It shifts publicly owned utilities' foci from shareholder responsibility to customer/owner accountability.

For its residential programs (specifically the Green Builder program), Austin's ECSD is promoting a sustainable approach that includes energy, building materials, water, and solid waste. A sustainable building group meets once a month with 60-70 people at each meeting. ECSD hopes to apply this approach to its commercial and industrial buildings with a goal of including sustainability issues in all DSM programs. In fact, the State of Texas has created a Sustainable Energy Development Council and sustainability is viewed as a future driver for energy efficiency programs in Austin as it provides an avenue to educate both consumers and providers (i.e. builders, contractors) to effectively move the market.

Austin's focus on water savings and harvesting greywater underscores its broader social orientation. Austin also promotes vehicle conversions to natural gas, a program to ease air quality problems in Austin.

TRANSFERABILITY

The City of Austin has implemented an impressive roster of DSM programs for the benefit of Austin's citizens. These programs embody a wide range of program designs, from conventional incentives, to loans, and to the Green Builder program which factors a host of other resource-related issues into DSM.

Not all of Austin's programs will be easily assimilated into other communities. On the other hand, given the range of programs presented, it is likely that at least some of Austin's programs will be applicable in almost all settings.

The extent to which many programs can be transferred is a function of political will, which in turn is a function of a community's awareness of the potentials and benefits of energy efficiency, and the strength and vision of politicians to transform this awareness into societal benefit.

Perhaps the key lesson learned in Austin is fundamentally hopeful: It is possible to turn adversity into advantage. Austin rebounded from a poor nuclear investment and created one of the most comprehensive and far-reaching efficiency initiatives in the country. For this the utility has been rewarded nationally and internationally (at the Earth Summit in Rio de Janeiro) and has gained respect and support locally, a critical factor in any utility's success with the capture of energy efficiency. ■

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