New England Electric System
Design 2000
Profile #92

Executive Summary

New England Electric System's Design 2000 program is focused on increasing the efficiency of projects "where new electrical equipment is being installed as a matter of normal business activity," specifically new construction, renovation, and replacement of failed equipment. These planned energy savings opportunities are what NEES calls "time dependent" opportunities, the focus of the Design 2000 program. Other preplanned retrofits for the commercial and industrial sector are incented under the Energy Initiative program, NEES's largest program in terms of costs and savings. Together these programs provided more than half of all NEES's total DSM energy savings in 1993 and just under half of the capacity savings impacts.

Utilities implementing new construction DSM programs face the fundamental challenge of intervening in the design process at the right time. Suggesting energy efficiency enhancements too late is ineffectual. On the other hand, tracking new construction projects and interfacing with a new building's permitting, financing, and design is extremely challenging and requires an intimate understanding of the design process. To fulfill program objectives, NEES staff have had to market the program to raise customer awareness of its incentives and technical assistance services, to use all possible information sources to track new construction projects, to assign additional dedicated program specialists to regional offices, and to extensively use outside expertise to provide heightened customer technical services through the program.

Design 2000 provides three customer approaches depending on the size and complexity of the projects, and in accord with the time schedule of the construction project at hand. A Prescriptive Measure Approach is generally used for small, relatively standard projects and provides specific rebates for certain technological upgrades including some interesting, yet generic, process improvements. A Custom Measures Approach is used for more complex projects requiring modelling and design assistance.

The Comprehensive Design Approach is used for large projects to reap maximum savings using an integrated approach whereby at least four major end-uses of electricity must be addressed. Design 2000 pays not only 100% of the marginal costs of efficiency upgrades but also pays for building simulation and technical assistance, including an honorarium to the design team to cover their costs in analyzing the state of the art options for efficiency. By doing so, Design 2000 pays essentially all out of pocket expenses associated with the efficiency upgrades and then provides the participant with lower electricity bills, which is an attractive program selling point and feature especially in soft real estate markets. Depending on the size and complexity of the project, commissioning is also provided to ensure that the original design intent is met.

NEW ENGLAND ELECTRIC SYSTEM
Design 2000

Sector:	*Commercial, Industrial, Government*
Measures:	*Energy efficient lighting; premium motors and drives; HVAC upgrades; food service and industrial process efficiency improvements; and custom measures including emerging technologies*
Mechanism:	*NEES incentives cover technical assistance, commissioning services, and incremental and design costs of energy-efficient equipment*
History:	*The program began in May 1989. Now concurrently running in Massachusetts, Rhode Island, and New Hampshire*

1993 PROGRAM DATA

Energy savings:	*28,972 MWh*
Lifecycle energy savings:	*416,276 MWh*
Capacity savings:	*6.04 MW*
Cost:	*$8,233,500*

CUMULATIVE DATA (1989-1993)

Energy savings:	*66,220 MWh*
Lifecycle energy savings:	*923,374 MWh*
Capacity savings:	*14.16 MW*
Cost:	*$21,304,000*

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 New England Electric System is a public utility holding company headquartered in Westborough, Massachusetts. Its subsidiaries include three retail electric companies: Massachusetts Electric Company (Mass Electric or MECO), which serves 930,000 customers in Massachusetts; The Narragansett Electric Company, which serves 323,000 customers in Rhode Island; and Granite State Electric Company, serving 35,000 customers in New Hampshire. Collectively, these companies will be referred to as "NEES" or the "NEES Companies" throughout this profile. Geographically, the NEES Companies' service territory includes about one-third of Massachusetts, most of Rhode Island, and a small fraction of New Hampshire.[R#1]

NEES owns four electric transmission companies: New England Electric Transmission Corporation, New England Hydro-Transmission Corporation, New England Hydro-Transmission Electric Company Inc., and The Nantucket Cable Electric Company Inc. New England Electric Resources, Inc., an international operations and management consulting services company, and New England Power Service Company (NEPSCO) are also owned by the NEES Companies. NEPSCO develops and manages DSM programs for the three retail utilities which are then implemented by the business services staff in each service territory. Other subsidiaries include two wholesale electric generating companies, New England Power Company and Narragansett Energy Resources Company (NERC). NERC operates 20 generating stations. Narragansett Energy Resources owns 20% of the Ocean State Power generating station as well as New England Energy, Inc., an oil and gas exploration and development company.[R#1]

NEES 1993 ELECTRIC STATISTICS

Number of Customers	*1,288,184*
Number of Employees	*4,969*
Energy Sales	*20,832 GWh*
Energy Sales Revenues	*$1.866 billion*
Peak Demand	*4,081 MW*
Generating Capacity	*5,362 MW*
Reserve Margin	*31%*
Average Electric Rates	*8.56 ¢/kWh*
Residential	*9.31 ¢/kWh*
Commercial	*8.10 ¢/kWh*
Industrial	*7.30 ¢/kWh*

After a period of negative load growth in the early 1990s due to the regional recession, in 1993 the NEES Companies' electric sales increased 1.4% to 20,832 GWh and revenues totaled $1.87 billion. The utility had 1.3 million customers and 4,969 employees, down from 5,415 employees in 1992. Peak demand in 1993 was 4,081 MW and the NEES Companies had a generating capacity of 5,362 MW, creating a reserve margin of 31%. The average electric rate for all customer classes was 8.56 ¢/kWh. Residential customers paid an average of 9.31 ¢/kWh in 1993, while commercial customers paid an average of 8.10 ¢/kWh, and industrial customers paid 7.30 ¢/kWh on average. The 1993 energy mix consisted of coal 38%, nuclear 18%, gas 16%, oil 11%, hydro 11%, and renewables 6%.[R#1] ■

Utility DSM Overview

From 1980 to 1987 NEES implemented a number of pilot DSM programs which gave the company extensive experience with conservation and load management. Then in 1987 NEES implemented system-wide programs with the introduction of a set of programs called "Partners in Energy Planning." Since then NEES has been recognized as one of the leading DSM utilities in the United States.

A major driver for NEES's success with DSM was the New England Collaborative Process which was born during the rate case proceedings of 1987. These proceedings led to a partnership with the Conservation Law Foundation (CLF), a non-profit advocacy group located in Boston, to promote electrical energy efficiency opportunities with NEES's customers. By the end of 1989 NEES was working with CLF to implement a dozen new DSM programs targeted at commercial, industrial, and residential customers. This led to a serious commitment to DSM and in terms of total DSM expenditures, the NEES Companies spent $380 million from 1987 through 1993. In 1993, NEES spent $68 million on DSM, equal to 3.6% of its gross revenues resulting in annual energy savings of 149 GWh and summer capacity savings were 47.5 MW.[R#1,10,12]

Currently the NEES Companies offer 13 DSM programs listed in the accompanying table. The Energy Initiative program is the largest DSM program offered by the NEES Companies in terms of both annual expenditures and energy savings and promotes the installation of energy-efficient retrofit measures and efficient energy management practices in existing commercial, industrial, and government facilities. Energy Initiative nicely complements Design 2000, a parallel program aimed at new construction and other time-dependent projects and the subject of this profile.[R#9]

While many U.S. utilities, notably those in California, are reexamining their DSM programs and plans in light of the restructuring of the electric utility industry, NEES remains solidly committed to DSM as an important utility resource and cus-

NEES CURRENT DSM PROGRAMS

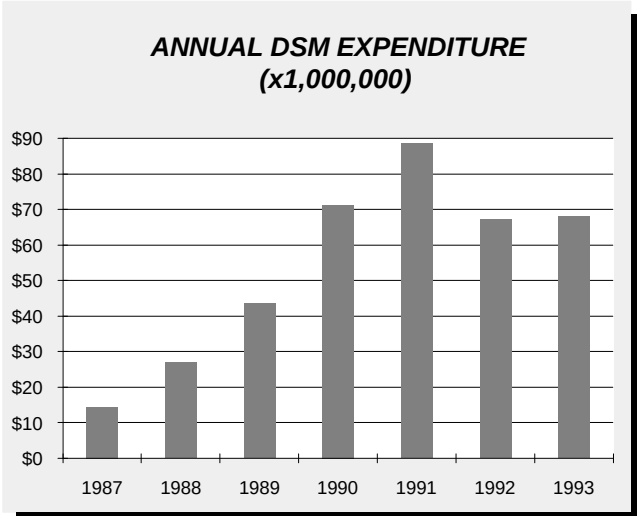
Residential

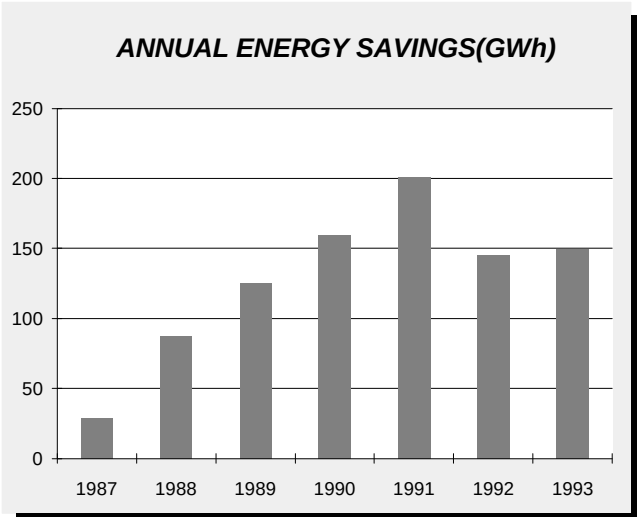
Appliance Recycling
Energy Crafted Home
Energy Fitness
Multifamily Retrofit
Residential Complementary
Residential Electric Space Heating
Residential Lighting
Super Efficient Refrigerator Program

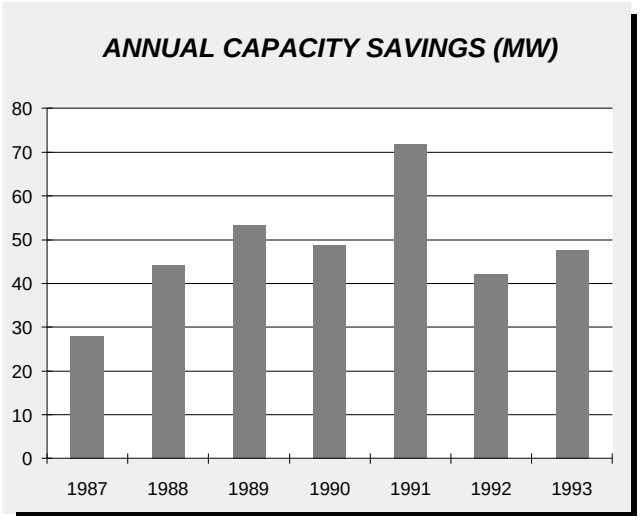
Commercial / Industrial

Energy Initiative
Design 2000
Complementary Business DSM
Performance Engineering & Verification Service
Small Commercial & Industrial

DSM OVERVIEW	DSM EXPENDITURE (x1000)	ENERGY SAVINGS (GWh)	CAPACITY SAVINGS (MW)
1987	$14,416	28.5	27.8
1988	$27,025	87.2	44.0
1989	$43,564	124.9	53.3
1990	$71,243	159.5	48.7
1991	$88,668	200.6	71.9
1992	$67,151	145.1	42.2
1993	$68,096	149.4	47.5
Total	$380,164	895.2	335.4







tomer service strategy. The utility's latest resource plan, NEESPLAN 4, reaffirms energy efficiency investment as a key component of a competitive strategy to minimize customer costs and reduce future environmental risks.

As part of NEESPLAN 4, NEES has set the environmental goals of reducing nitrogen oxides and sulfur dioxide emissions from 1990 levels by 60% by the year 2000, as well as reducing overall greenhouse emissions by 20%. DSM will play an important part in fulfilling these goals as will a new program called EnergyFIT, an umbrella service that is intended to give NEES staff the opportunity to work closely with their customers and to determine their energy needs and how NEES can best fulfill their specific requirements in a more competitive utility environment.

EnergyFIT represents a broad new approach whereby NEES will work closely with its customers to provide a range of services from cogeneration analysis, to environmental compliance strategies, to providing information and guidance on replacing chillers to phase-out CFCs, to project finance assistance. Through these value-added customer services, the NEES Companies are posturing to best serve their customers, maximize sales, bolster their competitive positions, while providing enhanced energy efficiency services to serve their customers and concurrently fulfill their DSM goals.

The NEES Companies plan to avoid the need for 800 MW of generating capacity and to provide cumulative energy savings of 2,000 GWh by the year 2000 through its DSM activities, accounting for approximately one-third of its new resource requirements.[R#1,6,8] ■

Design 2000 (D-2000) was first offered in May 1989 and targets all new construction, renovation, remodeling and failed equipment replacement in commercial, industrial, and government facilities. The program is run concurrently in Massachusetts, Rhode Island, and New Hampshire, although Massachusetts Electric customers make up the bulk of program participation with 75% of Design 2000 participants. Narragansett Electric and Granite State Electric account for 22% and 3% of program participation respectively. The savings and cost data presented in later sections refers only to program activity at Massachusetts Electric though the program design of each service territory is virtually identical.

The program's services are marketed to all the commercial and industrial players and decision makers including developers, property owners, general contractors, architects, purchasers, plant managers, and engineers who manage, develop, and build these projects. Design 2000 provides 1. incentives which cover the additional (incremental) cost of energy-efficient design features and equipment, 2. incentives for design costs, 3. technical assistance, and 4. commissioning services for qualifying projects.[R#13]

Design 2000 projects must be in the design or construction stage at the time a program application is submitted. These time-dependent opportunities require quick response by the utility because the time period to influence design and installation of energy-efficient equipment is short. The ultimate goal of the program is to transform the markets for buildings and equipment so that efficiency becomes an important factor to be considered when energy related services or energy consuming products are being purchased.[R#13]

MARKETING

Design 2000 is currently marketed through a team approach. Account Managers and Account Representatives working in eight District Offices and numerous Satellite Offices promote the program to customers through personal contact. Four districts also have designated Design 2000 Specialists who are assigned full time to facilitate program marketing and delivery. In addition, an Architectural Liaison who is a licensed architect and professional engineer markets the program to his peers from a central location at NEES's headquarters. Two full-time equivalents (FTEs) focus on marketing to the national accounts. One FTE is dedicated to addressing efficiency opportunities available through the failed equipment replacement markets. Trade allies are also a key to the success of the program.[R#2]

Marketing tools for the Design 2000 program include print advertising, direct mail, promotions at energy expositions and technical seminars. Additionally, program managers and engineers promote the program through presentations to major architectural and engineering firms, developers, customers, civic groups, and community organizations. The NEES Companies also use support material such as case studies, cooperative advertising, and a newsletter targeted at architects, engineers, and developers.[R#2]

During the middle 1980s there was a commercial construction boom, especially in NEES' service territory surrounding Boston. Then in large part due to the New England recession, there was a significant downturn in the commercial real estate market in the late 1980s and early 1990s. This downturn was especially pronounced given the fast pace of development in the 1980s, and until recently there has been excess commercial space and thus high vacancy rates in the region, and a decline in spec-built commercial developments. Manufacturers in Massachusetts and Rhode Island were especially hard hit by the recession and many either moved to lower-cost regions or cut back production. The defense industry and mid-size computer manufacturers were also particularly hard hit. Each of these factors partially negated the importance of the Design 2000 program in the early 1990s.[R#4]

Through this recessionary period, marketing the Design 2000 program was especially challenging. Now as economic conditions have steadily improved, the program has again gained in importance and Design 2000 staff have continued to strengthen relations with the design community and facility managers in the commercial and industrial markets. The NEES Companies have developed and implemented an aggressive "lead tracking system" to identify, quantify, and monitor Design 2000 opportunities at the earliest possible stage in the development process. Staff monitors the Central Register (a state publication of public contracting opportunities in Massachusetts), the Dodge Report, the Sales Prospector, and the New England Real Estate community to identify any new construction starts and major renovation activity with the intent to offer Design 2000 services as part of the development process.

In addition, Account Representatives and Managers call on customers and track Requests For Service Installations (RSIs) and monitor building activity in their sales territory.[R#4]

DELIVERY

Qualifying projects may follow one of three tracks through the program. These include the Prescriptive Measure Approach whereby customers select from a menu of specified conservation measures for which fixed, predetermined rebates are available. The Custom Measure Approach provides a means for customers to propose energy savings projects involving measures such as industry-specific processes, complex lighting, or emerging technologies that are not offered through the prescriptive path. The Comprehensive Design Approach (CDA) is reserved for new construction or renovation projects greater than 50,000 square feet and provides customers with the opportunity to capture the maximum energy savings potential of their buildings by examining it as an integrated system. This approach is unique in that a minimum of four electrical end-uses must be examined. The energy use of the proposed building (base case and energy-efficient case) is simulated using computer modeling. In addition, intensive technical assistance may be provided by industry specialists on retainer to the NEES Companies. The three retail companies reimburse the customer's design professionals for the incremental time spent analyzing various design and equipment options.

Matching program participants with the track that best meets their needs, given project timeliness and budget constraints, recognizes that builders/designers/owners have varying levels of commitment to energy-efficient projects. For instance, the prescriptive path is most appropriate where a customer is only interested in a few selected energy conservation measures, where the building is small or simple, or where the building is so far advanced in design or construction that any extensive examination of ECMs would cause an intolerable delay in the construction process. Design 2000's Failed Motors and Unitary HVAC programs fall within this approach and offer set rebates for energy-efficient motors and HVAC equipment that have burned out and which need to be replaced instantly.

All projects, regardless of the track have certain requirements that include: a pre-installation verification, a technical review, forwarding of itemized invoices, and a post-installation verification. The pre-installation verification by an account manager or representative establishes the existing conditions of the facility or design project using blueprints. The technical review verifies that the proposed measures are appropriate and supported by sound engineering practices, cost effective, and expected to produce the stated demand and/or energy savings. Itemized invoices are forwarded by the customer to the account manager or representative. The post-installation verification is a site inspection of the facility by the account manager, representative (other than the one that conducted the pre-installation verification) or outside contractor that verifies that the measures are installed as originally designed and operational. In addition, where appropriate, commissioning is provided to assure that the system and the equipment installed meet the original design goals of the project.[R#13]

The Prescriptive Measure Approach differs from the other approaches in that the rebates are predetermined and are calculated using an industry standard as the baseline. Rebates equal 100% of the incremental cost of the energy-efficient equipment. Participants submit applications (called "Worksheets") for each end use. In 1994, end uses for which there was a prescriptive rebate available included lighting, HVAC, motors, VSDs, process measures (insulating blanket for injection molding machines, efficient compressors, and insulating plating or degreaser tank), and food service measures (cooking/process measures, hoods for kitchen exhaust, waste heat evaporator for reach-in cooler or freezer).[R#13]

The Custom Measures Approach is unique in that it offers customers the opportunity to identify site specific efficiency improvements in their facilities. This approach requires the customer or customer's engineer to use a computer-based benefit/cost spreadsheet provided by one of the three Retail Companies. The spreadsheet uses data provided by the customer's engineer to evaluate whether the proposed custom measure satisfies the utility's benefit/cost requirements. The analysis includes data such as equipment hours of use, equipment load profile analysis, operating strategy, equipment costs for the base and proposed (energy-efficient) cases, estimated kWh savings, and all assumptions. If the measure satisfies the benefit/cost threshold then the customer is offered an incentive that equals 75% of the incremental cost between the base case and energy-efficient case. Technical review and certification by a professional engineer is required.[R#13] ☞

The Comprehensive Design Approach (CDA) is an integrated design process that offers customers the opportunity to maximize electrical energy efficiency in their commercial or industrial development or major remodel. CDA projects require that the facility be greater than 50,000 square feet, the project be in the conceptual or schematic design stage of planning, and ECMs must involve a minimum of four different electrical uses of which HVAC and lighting must be two.[R#13]

The CDA process involves a brainstorming session with the owner, project design team, and utility representative from which a list of technically feasible, cost-effective, electric ECMs are developed. NEES provides an honorarium to the design team for the time and effort associated with this meeting. A technical consultant hired by the NEES Companies representative develops a base case of the proposed building in conjunction with the owner's design team. Using this base case, the list of ECMs is evaluated using a computer-based benefit/cost spreadsheet. Each ECM must first pass the benefit/cost test individually and then the ECMs that passed are bundled together and evaluated. An incentive equaling 100% of the incremental cost for the ECMs is offered to the owner. The retail company pays the owner's design team a design incentive based on the approved incremental design fees. These incremental design fees reflect the additional time needed to incorporate the CDA results into the construction documents. [R#13]

While NEES does not require pre-certified or selected contractors for the program (since incentives are provided for equipment only and not labor) it does maintain and distribute a list of several hundred local vendors who have enrolled in the program and have received progam-specific training. When requested by customers, staff generally suggest 3-5 appropriate contractors for the job. Customers can also use NEES's Performance Engineering (PE) Service, a supporting program that is intended to provide advanced engineering services for customers interested in assistance in identifying efficiency opportunities and advanced verification of savings. The PE Service is provided for both Energy Initiative and Design 2000 projects and maintains a roster of approved contractors.

Another feature of the program is a prepayment option whereby customers that fulfill certain requirements can receive 30% of the cost of the approved measures in advance of construction. The customer must complete construction documents and construction must be in progress. In 1993, for example, NEES paid out nearly ten advances using the "Standard Agreement," a service that not only provides customer benefit but which also allows NEES to process customers in a specific year prior to completed construction.

Additionally, the NEES Companies offer commissioning services for all CDA projects. Commissioning is a process that both verifies that energy saving measures are installed and operating as intended and is the beginning of a complete operation and maintenance plan for the customer. Ultimately, commissioning ensures that projected electrical energy savings persist over time.[R#13]

MEASURES INSTALLED

A wide range of energy conservation measures have been installed through the Design 2000 program. Measures eligible for incentives through the Design 2000 program include energy-efficient lighting, premium efficiency motors and drives, HVAC upgrades, food service and industrial process efficiency improvements, and custom measures such as industry-specific processes, complex lighting, and emerging technologies.

STAFFING REQUIREMENTS

The NEES Companies have approximately 100 Business Services Account Managers and Representatives whose responsibilities include promoting all of NEES's DSM programs as well as other NEES services. In order to support the Design 2000 markets, the NEES Companies have assigned Design 2000 Specialists to focus solely on Design 2000 services. The New England Power Service Company (NEPSCO) has a program manager and assistant program manager devoted full-time to Design 2000. Additional staff devoted to Design 2000 include one architect/engineer to promote the program within the design community, a marketing analyst devoted to overseeing commissioning services, and one FTE focusing on the replacement markets. In addition, there are technical staff at both the central and district level to support Business Services Account Managers and Representatives in offering program services to customers.[R#13] ■

MONITORING

Fundamentally, Design 2000 is implemented on a regional basis using NEES's eight District Offices in NEES's three Retail Companies' service territories. There, customer Account Managers and Account Representatives not only market the program but also track the program on a daily basis.

"Telemagic," a lead tracking software is one tool used to market the program. This marketing tool allows NEES staff to input data, track leads, make timely follow-up calls, etc. Once customers begin to participate in the program they are tracked using NEES's centralized DSM tracking system, whereby each district office is electronically linked to headquarters. Each day staff input data regarding new applications, projects under contract, and the like into NEES's highly sophisticated tracking system. The system then allows headquarters and District staff the ability to pull the aggregate program data on a real-time basis. (A key finding in a May 1993 process evaluation of Design 2000 was that NEES's centralized program tracking system was cumbersome and thus important indicators, such as program participation, were difficult to retrieve. After the evaluation, NEES upgraded its program tracking system and uses a system called "Ingres" that is working very well.)[R#2,4]

Headquarters staff then prepare two forms of tracking reports: weekly reports and stakeholders reports. The weekly reports track weekly activity as well as year-to-date program progress including new applications, projects under contract, projects in progress, complete, etc. These reports are provided to DSM support staff and field representatives to identify which customers are participating in the program, how much money has been paid out and is committed, and what kind of savings impacts are being achieved. Weekly reports generated at year end form the basis for comprehensive DSM reports which are furnished to the regulatory commissions in Massachusetts, Rhode Island, and New Hampshire.

Stakeholders reports track program activity compared with program goals that are established for the field staff in the district offices. Using a customized Lotus software package, headquarters staff provide stakeholders reports to each district office twice a month with a focus on energy and capacity savings impacts and dollars spent in relation to the budget.

EVALUATION

Determining the actual impacts that result from the Design 2000 program is complicated because preexisting data for participating customers is not available. Nevertheless, NEES has taken significant steps to assure program savings with reasonable levels of confidence through detailed evaluations. For instance, the impact evaluation strategies used to evaluate the Massachusetts Electric program in 1992 included engineering analysis, computer simulations, and calculated unit values; baseline studies to determine the level from which savings were taken; monitoring and metering studies to determine performance of motors and variable speed drives; a scheduling survey which determined hours of use and summer and winter diversity factors from interviews with participants; and a study to determine persistence of economizers on rooftop air conditioners, energy management systems, and reflective window film.[R#2]

A process evaluation of the 1992 Massachusetts Electric Design 2000 program was completed in May 1993. This evaluation assessed the program through analysis of the program database and interviews with key program staff (both office and field staff), technical contractors, and customers. Customer telephone surveys included 150 participants and 50 non-participants. On-site assessments and interviews with participating customers were conducted at 30 facilities.[R#2]

For participating customers, 67% considered themselves "very satisfied" with the program, and an additional 22% considered themselves "satisfied." In addition, 85% of participants were "very satisfied" or "satisfied" with the assistance received from Design 2000 staff and 72% were "very satisfied" or "satisfied" with the length of time it took to process the application form. The evaluation also concluded that while the services delivered to customers were highly satisfactory, the program would benefit from more delivery resources. Program participants and field staff agreed that customers would get more program value from added technical assistance and quicker processing of applications.[R#2]

The evaluation recommended that the program goals be expanded beyond the annual expenditure of authorized funds and the achievement of associated energy and demand ☞

reductions to focus on increasing participation in the time-dependent markets such as new construction. Multi-year goals or targets should also be established which support a longer-term direction and ramp-up. In response to this recommendation, an aggressive and detailed marketing plan was developed and implemented and a new market penetration goal was introduced.

The evaluation also recommended that NEES increase the use of outside technical consultants. These consultants can help to identify projects at an early stage and provide technical assistance in a more timely manner. In response to this recommendation, the NEES Companies hired an architect to work full time on marketing the program to major architectural firms in the utility's service territory in addition to adding consultants with specific expertise in various electrical end uses.

Given the expanded responsibilities of the field representatives, additional technical and marketing training for the field staff also became a priority. The NEES Companies responded by ramping up their training efforts in 1993. The evaluation also found that the Quality Assurance/Quality Control program for Design 2000 post-installation inspections should be improved. In response, the NEES Companies promoted the use of engineering consultants where appropriate.

A limited process evaluation focusing on free ridership was conducted of the 1993 Design 2000 program and completed in March 1994. This evaluation consisted of telephone surveys of 355 participating customers and 157 design professionals who participated in the program in 1993. The results of the survey were used to calculate a single best estimate of free ridership by measure category for the program's 1993 participants.[R#9]

Separate impact evaluations were performed for each of the six major end-use categories covered by the 1993 program. Savings were derated for free ridership rates as determined by the Design 2000 process evaluation. Lighting impacts were based on impact parameters developed from metered data that was then applied to all installed lighting measures. Time of use lighting loggers and current transformer loggers were used to collect data for approximately two weeks at 52 sites.[R#9]

Impacts for motors were based on on-site run time and power monitoring of a sample of motors installed through both the Design 2000 and Energy Initiative programs. Surveys were performed on the operating characteristics of 621 motors, run-time monitoring of 100 motors for a two-week period, and power monitoring of 95 motors for a day. HVAC and building shell impacts were based on site-specific engineering analysis. Operational information on packaged air conditioning, chillers, water source heat pumps, energy management systems, seven day programmable thermostats, and shading coefficient was obtained through site visits and telephone interviews and again used to calculate gross energy and capacity savings.

Savings for variable speed drives (VSDs) were based on metering and site-specific engineering analysis. Operational information for 57% of the VSD horsepower installed through both Design 2000 and Energy Initiative in 1993 was gathered through phone surveys of 54 sites. Impacts for 19% of the VSD horsepower were measured through the PE Service (a separate MECO DSM engineering service) or individual site-specific monitoring. Impacts for the remaining 24% of the VSD horsepower installed were based on extrapolating the monitoring and engineering analysis results on an application-specific per-horsepower basis. Impacts for the food and process measures were based on engineering estimates developed by the Demand Management Institute of Newton, Massachusetts. Impacts for custom measures varied according to the type of measure.[R#9] ■

CASE STUDY: BASF

BASF, a German corporation with subsidiaries worldwide, was constructing a new facility in the Worcester, Massachusetts Biotechnology Park to accommodate 400 employees for the company's bioresearch subsidiary. Under the Design 2000 program, BASF worked with Massachusetts Electric to incorporate an array of state-of-the-art energy-efficient features into the new building.

Steven Murray, BASF's project manager, found working with Design 2000 staff exciting from both engineering and financial viewpoints: "We've had the satisfaction of constructing a facility that includes the most innovative energy-efficient features available today. But we also anticipate substantial annual savings form these technologies in the years to come."

The BASF project included energy-efficient fluorescent lighting with electronic ballasts and specular reflectors, coupled with occupancy sensors. HVAC measures installed included two-speed cooling tower fan motors and thermal storage. Other general measures included high efficiency motors and variable speed drives. Improvements to the building shell were made including a roof made of highly insulated material. The upgraded facility also included a state-of-the-art energy management system.

Massachusetts Electric invested $1.2 million in the building and anticipates a reduction in peak demand of 1,446 kW and annual consumption savings of 2,102 MWh. In turn, BASF will save just under a quarter of a million dollars each year. The inclusion of energy-efficient features in the facility will also result in environmental savings of 8,408 tons of coal or 3,754 barrels of oil annually.

DATA ALERT: All savings and participation figures reflect program activity only in the Massachusetts Electric service territory, the only Retail Company with multiple years of post installation evaluation data. Savings have been derated for free ridership rates assigned to each end-use measure category.[R#9]

PROGRAM SAVINGS

The Design 2000 program achieved annual energy savings of 28,972 MWh and annual capacity savings of 6.0 MW in 1993. Both energy and capacity savings were up from their 1992 levels of 27,410 MWh and 5.6 MW. Design 2000 was the second largest Mass Electric DSM program in 1993 in terms of energy and capacity savings, narrowly trailing the Energy Initiative program. Combined, these two programs account for 55% of Mass Electric's annual DSM energy savings and 43% of annual DSM capacity savings.[R#2,9,14]

The Design 2000 program is unique because unlike many retrofit programs, addressing market driven ECM opportunities presents a wide distribution of end-use improvements. For example, with many multi-measure programs, lighting measures often account for up to 80% of total energy savings, whereas Design 2000 energy savings are distributed among a variety of end-uses. In 1993, lighting measures accounted for 37.6% of savings, VSDs accounted for 25.2%, custom improvements totaled 19.4%, HVAC and shell measures equaled 15.3% of savings, motors totaled 1.6% of savings, and food and process improvements equaled 1.0% of savings.[R#9]

PARTICIPATION RATES

Participants for a given year are defined as customers who complete Design 2000 projects within that given year. The program started with three participants in 1989 and 52 participants in 1990. The program had 143 participants in 1991, 336 participants in 1992, and 375 participants in 1993. Annual energy savings per participant totaled 94,333 kWh in 1989, 68,827 kWh in 1990, 41,790 kWh in 1991, jumped to 81,577 in 1992, and then dropped somewhat to 77,259 kWh in 1993, reflecting the diversity of size in projects addressed by the program to date.[R#9,14]

FREE RIDERSHIP

Free ridership was assessed through a survey of program participants and design professionals as part of the Design 2000 process evaluation completed in March 1994. Because savings were calculated on a measure category by measure category basis, NEES was able to derate each measure's savings by that measure's level of free ridership. In general, free ridership rates for 1993 installations range from 10% to 40%, with the average free ridership for all individual measure types being 16%. Free ridership levels for the measure categories are as follows: motors 11%, HVAC and building shell measures 38% (with the exception of thermal storage, 5%), VSDs 11%, food and process measures 18%, lighting measures range from 17% to 64%, and custom measures range primarily from 10% to 13%.[R#9]

MEASURE LIFETIME

The average measure lifetime used by Massachusetts Electric has varied from year to year depending on the equipment installed. In 1990 and 1991 the average measure life was 19.3 and 17.6 years respectively. In 1992, the average measure life dropped to 11.9 years before increasing again to 14.4 years in 1993.[R#2,9,14]

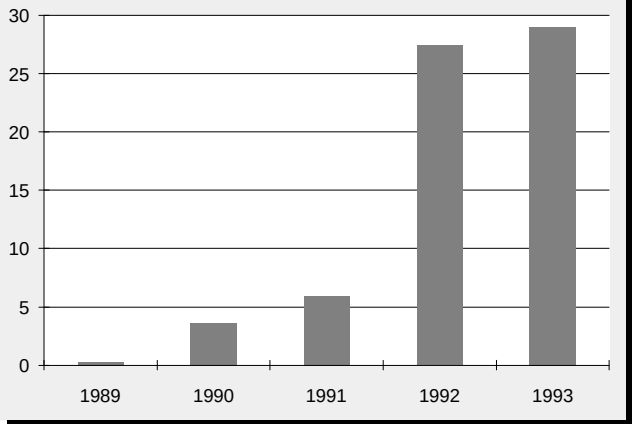
PROJECTED SAVINGS

The ultimate goal of the Design 2000 program is to transform markets such that energy efficiency becomes the routine business practice for all commercial and industrial new construction. NEES actively supports this transformation through incentives, technical assistance, and through legislative procedures such as strengthening building codes. NEES hopes to eventually influence energy efficiency in at least 60% of new building construction and major renovation. ■

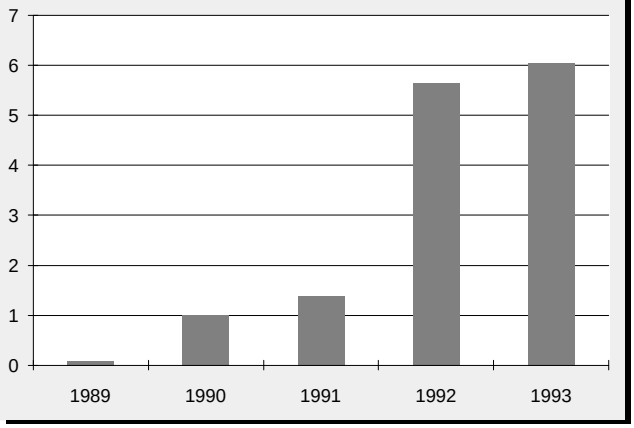
PARTICIPATION	NUMBER OF PARTICIPANTS	SAVINGS PER PARTICIPANT (kWh)
1989	3	94,333
1990	52	68,827
1991	143	41,790
1992	336	81,577
1993	375	77,259
Total	909	

SAVINGS OVERVIEW	ENERGY SAVINGS (MWh)	CUMULATIVE ENERGY SAVINGS (MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	CAPACITY SAVINGS (MW)	CUMULATIVE CAPACITY SAVINGS (MW)
1989	283	283	7,099	0.900	0.900
1990	3,579	3,862	68,932	1.010	1.100
1991	5,976	9,838	105,143	1.380	2.480
1992	27,410	37,248	325,924	5.641	8.121
1993	28,972	66,220	416,276	6.035	14.156
Total	66,220	117,451	923,374	14.156	

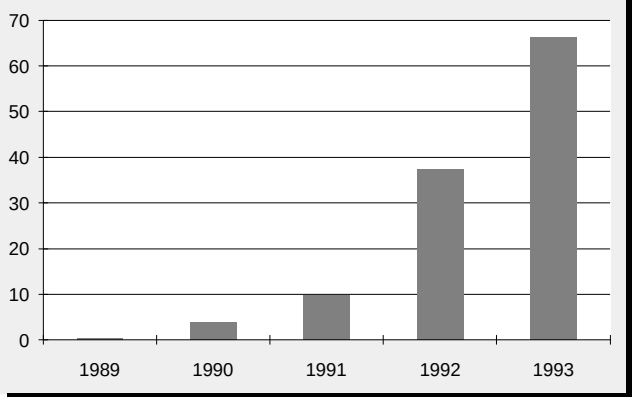
ANNUAL ENERGY SAVINGS (GWh)



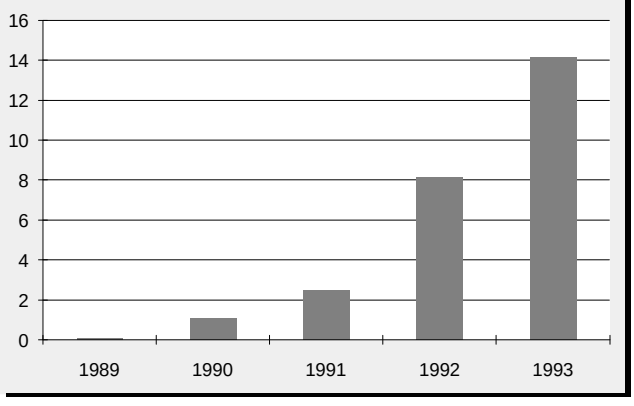
ANNUAL CAPACITY SAVINGS (MW)



CUMULATIVE ENERGY SAVINGS (GWh)



CUMULATIVE CAPACITY SAVINGS (MW)



Cost of the Program

DATA ALERT: All program cost figures contained in this section refer only to Massachusetts Electric.

In 1993, the Design 2000 program had total expenses of $8.2 million. Program expenses were $2.4 million in 1990, $3.2 million in 1991, and jumped to $7.5 million in 1992. Design 2000 was Massachusetts Electric's second most expensive DSM offering in 1993 coming in behind the Energy Initiative program which incurred expenses of $10 million.[R#2,9]

Of the total cost of the program between 1991 and 1993, fully 84% or just under $16 million has been spent on what NEES calls "program expenses" including customers' incentives, contractor costs for design assistance, and other forms of program overhead. Payroll has accounted for another 13% of the total, and advertising the balance of 3%.

COST EFFECTIVENESS

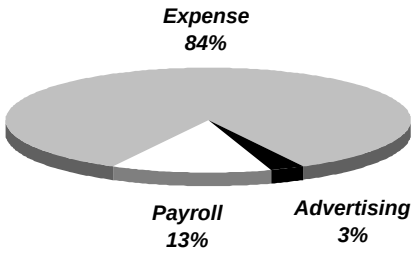
Mass Electric calculated a benefit/cost ratio of 3.41 for the program in 1993 based on the value of the program's utility and customer savings, including a value for environmental benefits using the Massachusetts Department of Public Utilities' externality values, and program spending. When evaluation costs and shareholder incentives are included, the benefit/cost ratio drops to 3.17.[R#9,12]

The Results Center has calculated the cost of saved energy for the program based on annual energy savings, annual costs, and the average measure life for each year of the program. In 1990, at a 5% discount rate, the program had a cost of saved energy of 5.43 ¢/kWh. The cost of saved energy dropped to 4.68 ¢/kWh in 1991, dropped again to 3.10 ¢/kWh in 1992, and then decreased slightly to 2.80 ¢/kWh in 1993.

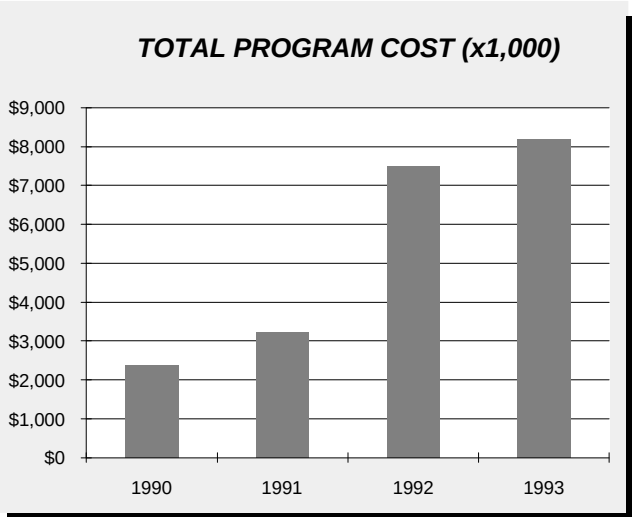
COST PER PARTICIPANT

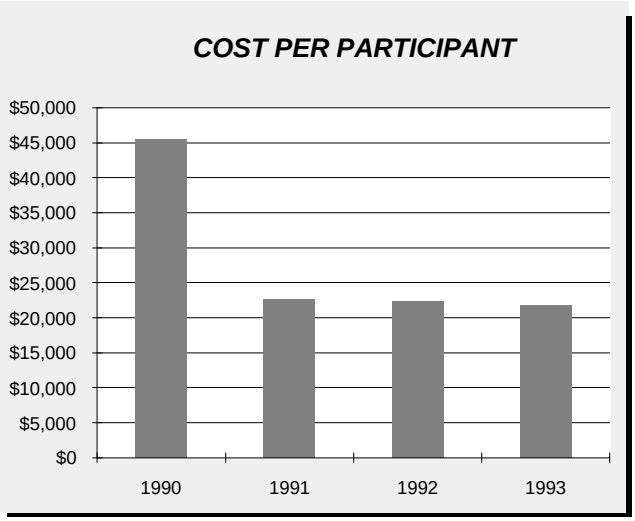
The average cost per participant has remained quite consistent over the past three years, equaling $21,956 in 1993, $22,266 in 1992, and $22,541 in 1991. In 1990, however, the cost per participant was $45,500 largely because there were only 52 rather large program participants in that year versus 375 in 1993. ■

COST COMPONENTS



COSTS OVERVIEW	PAYROLL (x1000)	EXPENSE (x1000)	ADVERTISING (x1000)	TOTAL COST (x1000)	COST PER PARTICIPANT
1989	NA	NA	NA	NA	NA
1990	NA	NA	NA	$2,366.0	$45,500.00
1991	$464.1	$2,610.9	$148.5	$3,223.5	$22,541.91
1992	$947.6	$6,382.4	$151.5	$7,481.5	$22,266.47
1993	$1,046.5	$6,993.4	$193.6	$8,233.5	$21,955.90
Total	$2,458.1	$15,986.7	$493.6	$21,304.5	





COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
1990	4.57	4.99	5.43	5.88	6.35	6.84	7.35
1991	3.99	4.33	4.68	5.05	5.42	5.82	6.22
1992	2.76	2.93	3.10	3.27	3.46	3.64	3.83
1993	2.45	2.62	2.80	2.99	3.18	3.37	3.58

Environmental Benefit Statement

AVOIDED EMISSIONS: Based on 117,451,000 kWh saved 1989 - 1993						
Marginal Power Plant	**Heat Rate BTU/kWh**	**% Sulfur in Fuel**	**CO2 (lbs)**	**SO2 (lbs)**	**NOx (lbs)**	**TSP* (lbs)**
Coal	**Uncontrolled Emissions**					
A	9,400	2.50%	253,224,000	6,008,000	1,214,000	121,000
B	10,000	1.20%	270,020,000	2,326,000	784,000	581,000
	Controlled Emissions					
A	9,400	2.50%	253,224,000	601,000	1,214,000	10,000
B	10,000	1.20%	270,020,000	233,000	784,000	39,000
C	10,000		270,020,000	1,550,000	775,000	39,000
	Atmospheric Fluidized Bed Combustion					
A	10,000	1.10%	270,020,000	711,000	388,000	194,000
B	9,400	2.50%	253,224,000	601,000	486,000	36,000
	Integrated Gasification Combined Cycle					
A	10,000	0.45%	270,020,000	478,000	78,000	194,000
B	9,010		242,889,000	173,000	58,000	12,000
Gas	**Steam**					
A	10,400		147,284,000	0	336,000	0
B	9,224		127,904,000	0	801,000	38,000
	Combined Cycle					
1. Existing	9,000		127,904,000	0	491,000	0
2. NSPS*	9,000		127,904,000	0	233,000	0
3. BACT*	9,000		127,904,000	0	32,000	0
Oil	**Steam--#6 Oil**					
A	9,840	2.00%	213,174,000	3,230,000	381,000	362,000
B	10,400	2.20%	226,093,000	3,204,000	479,000	233,000
C	10,400	1.00%	226,093,000	457,000	385,000	121,000
D	10,400	0.50%	226,093,000	1,344,000	479,000	74,000
	Combustion Turbine					
#2 Diesel	13,600	0.30%	282,939,000	563,000	875,000	48,000
Refuse Derived Fuel						
Conventional	15,000	0.20%	335,910,000	866,000	1,140,000	253,000

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 NEES's level of avoided emissions saved through its Design 2000 program to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

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

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

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

*** Acronyms used in the table**

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

LESSONS LEARNED

Influencing commercial and industrial new construction and renovation practices requires careful attention to timing: Addressing the energy efficiency of time-dependent retrofit activities makes sense but is extremely challenging. To do so effectively, and to implement systematic energy efficiency improvements over baseline conditions, requires an intimate knowledge of the design process and precise timing. Recommendations made too early may become forgotten in the final design of a project. Recommendations that are made too late represent costly and usually unacceptable change orders and construction delays. Clearly, influencing new construction – what NEES has aptly called "time dependent" activities – is desirable but difficult.

Institutional market barriers still plague program participation: The NEES Companies face a myriad of challenges in achieving high participation levels in Design 2000 due to a variety of obstacles common to the commercial new construction and renovation markets. The success of the program is dependent upon the cooperation of many players including building developers, architecture and engineering firms, equipment vendors, and service contractors. While the NEES Companies provided incentives that aim to assure that cost is not a barrier to participation, there are many non-price barriers that still must be overcome. These barriers include standard design practices which promote oversized equipment, and trade allies lacking in technical expertise necessary to design, sell, or install energy-efficient technologies.[R#7]

Addressing the fragmentation of the design process is a key to program success: Because there are many different parties involved in the new construction design and building process, a major challenge to marketing the program has been the fact that these parties often work in isolation or only interact with one or two other parties throughout the entire process. This fragmentation prevents any single party from pushing for energy efficiency throughout the entire design and build process.[R#7]

Incenting designers early in the process is important: At each advancing stage of the design process the difficulty and expense associated with design changes increases as the opportunity to save capital costs diminishes. Therefore decisions made at the beginning of the design process set the stage for the remainder of the process. However, architectural and engineering fees do not support consideration of a variety of design options. Typically fees are based on a percentage of direct or indirect project capital costs, which leads to a cookie-cutter design approach. Higher capital costs associated with oversized equipment lead to higher fees, while time and effort put towards looking at different design options cut into profits. Thus there is an inherent disincentive to consider energy-efficient design.[R#7]

For architects, energy efficiency is less important than occupant comfort and satisfaction: Architects want to satisfy clients and this often depends upon speed of design, cost, aesthetics, and comfort. The mechanical design is usually performed by mechanical engineers or design-build firms. Because the cooling loads required by building design elements are often unknown, sizing of equipment is done to ensure it is large enough to cover any added equipment that might be installed later. Therefore oversizing equipment can become an inherent problem in the building design process. Through the Comprehensive Design Approach, the NEES Companies provide estimates to designers that evaluate and predict appropriately sized mechanical systems.[R#7]

In commercial new construction, speed is of the essence: Construction contractors and subcontractors are often on a tight budget and schedule and as a result interest in innovative construction is minimal. In addition, building commissioning and the training of operators rarely takes place. Poor operation of equipment often minimizes the value of efficiency measures that survive design, construction, and commissioning. Commercial building operators are generally more interested in making equipment work and minimizing complaints as opposed to worrying about energy efficiency.[R#7]

Paying 100% of marginal costs clearly gets customers' attention: While NEES cannot claim complete success with Design 2000, since approximately two-thirds of all new commercial and industrial space (measured on a square footage basis) does not benefit from the program, overall Design 2000 has been a success. Its implementers believe the program is highly attractive to customers who don't need much convincing to accept rebates that cover 100% of the incremental cost of the efficiency upgrades and engineering costs required to achieve maximum savings. Staff note that these attractive financial incentives coupled with the benefits of participation are important drivers for the program.

External market conditions — and recessions — can play havoc with commercial new construction programs: On the other hand, Design 2000 has been challenged by external market conditions. In the late 1980s a bonanza of commercial construction resulted in a soft real estate market with lots of vacant space. As such, the program was generally

underutilized as the entire New England economy was plagued by recession. Now that the economy has revived, so has the program's impact and importance.

As the program has matured, so has the sophistication of Design 2000 projects: Furthermore, the program has evolved over time and with this evolution has become a greater focus on more comprehensive projects. NEES has responded by working more closely with industrial customers, for example, bringing in outside consultants on the utility's "nickel" to analyze and recommend process improvements. These projects have cost more to implement but represent an exciting evolution for a program of this kind.

Working with trade allies and government agencies is a key means of supporting the program's goals: The NEES Companies hope to transform the new construction market and reduce the resources required to achieve its DSM objectives, achieving energy efficiency with minimal direct intervention. In order to do this the NEES Companies must build close, sustainable relationships with trade allies so that eventually trade allies can supplement and replace many functions typically performed by utility staff. The utility also hopes to work with government officials to upgrade building codes and equipment standards to reflect new design practices and equipment improvements encouraged by the program, which in turn lower the utility's costs further.[R#3,7]

Building value-added services into DSM programs gets customers' attention: The NEES Companies learned that in order for the Design 2000 program to be successful it is necessary to identify and address customer needs that span beyond DSM. In other words, DSM programs will be more successful if the customer is happy with all services provided by the utility. For instance, the NEES Companies believe it is essential to provide commissioning services with a new construction program. The utility has found that instead of viewing commissioning as extra work, customers often perceive commissioning as an added value to the program.[R#3]

Measuring the effect of new construction and renovation programs is still challenging: Several issues still plague measuring the effect of commercial new construction and renovation programs. Large construction projects tend not to fit into neat annualized time frames and thus program participation is hard to define. Furthermore, projects vary dramatically in terms of size. Thus a more accurate measure of participation might be to assess the square footage run through a program such as Design 2000 as a percentage of all commercial new construction within a utility service territory in a given time frame. This square footage measurement, however, is similarly elusive and NEES staff believe that if this performance measure is used, reporting on it may be less accurate than desired.

TRANSFERABILITY

Commercial and industrial new construction and renovation programs continue to challenge even the most able utility DSM departments due to the many barriers including identification of projects and convincing customers to agree to participate before construction plans have already been drawn up. In addition, such programs often require a great deal of effort on the part of participants. Other successful programs documented by The Results Center include Pacific Gas & Electric's Commercial New Construction (Profile #33), Bonneville Power Administration's Energy Smart Design (Profile #37), PacifiCorp's Large Commercial Energy FinAnswer (Profile #46), United Illuminating's Energy Blueprint (Profile #50), and Northeast Utilities Energy Conscious Construction (Profile #6).

A key question surrounding commercial new construction programs is the level of incentive to offer for increasing the efficiency of these projects. While NEES currently pays 100% of the incremental costs of efficiency in the Design 2000 program, PacifiCorp and Southern California Edison (through its Envest program) have been leading utilities in the use of energy service charges whereby customers are loaned the incremental costs of efficiency improvements and then repay these costs over time using an energy service charge on their bills. As long as the value of the efficiency enhancements exceed the monthly charges, despite the improvements the customer has a positive cash flow while the utility achieves its goal of avoiding lost opportunities. Clearly the jury is still out on the relative effectiveness of the two approaches.

In fact, loans versus rebates is a broad DSM design issue that is not only related to new construction programs but to all forms of DSM upgrades. While current concerns about the electric utility industry restructuring and increased utility competition call for greater emphasis on loans, and less to direct incentives, many advocates of efficiency question whether loans can achieve the same levels of customer participation in DSM programs and penetration of efficiency measures in individual facilities. NEES remains committed to direct incentives but has also been offering financing services to their C/I customers. Specifically, NEES offers the services of experienced financial consultants that will recommend various financing mechanisms and if needed find the direct lender that satisfies the customer financing needs. NEES is exploring additional strategies for financing customer copayments and DSM projects as well. ■

Regulatory Treatment

The purpose of this section is to discuss the regulatory treatment of the costs of New England Electric System's Design 2000 program. To do so, a brief overview of the regulatory treatment of all NEES's DSM programs is presented to illustrate the overall regulatory context within which this utility operates its DSM programs. Following this abbreviated overview, the specific regulatory treatment of Design 2000 is presented. More comprehensive discussions of the regulatory context in Massachusetts, Rhode Island, and New Hampshire can be found in Profiles #1, 23, 31, & 36.

While the principal beneficiaries of NEES's Design 2000 program are certainly those customers served with energy efficiency improvements and all customers that benefit in the long run from DSM as a least cost resource strategy, one of the striking aspects of NEES's rise in prominence in the DSM arena has been the utility's commitment to developing incentives so that NEES shareholders earn a favorable return on their DSM investments. NEES has been a pioneer with DSM incentives and has worked out equitable incentive packages with three utility commissions.

The NEES Companies recover their direct DSM costs on a current basis through a conservation charge subject to regular reconciliation. Unlike California, however, NEES has not requested recovery of lost revenues. On the other hand, its shareholders benefit from DSM investments through shareholder incentives that allow shareholders to share the benefits of DSM program investments with their customers.[R#15]

In 1989, in an innovative and precedent-setting collaborative NEES jointly filed its 1990 DSM program plans for approval with the regulatory commissions of Massachusetts, Rhode Island, and New Hampshire with the Conservation Law Foundation of New England (CLF). Each of the three retail utility companies put forth a method by which it could earn a DSM-related incentive that was acceptable and in fact desirable to CLF. The objectives of the incentive approach were to guarantee that customers are not negatively impacted by incentives paid to shareholders, to share the resulting benefits of DSM (avoided costs savings) in a fair manner with the majority going to the customers, and to ensure that the company would be paid only for performance. The decisions that were made by each of the three state commissions made the NEES Companies among the first in the country to be allowed incentives for DSM program performance.

In Rhode Island and New Hampshire, the commissions approved a shared-savings approach which based each company's incentive on the value created by the C&LM programs. For example if the programs cost $25 million but resulted in a benefit of $100 million, then NEES's shareholders would be able to receive a portion of the net of $75 million. This share was determined in an interesting way. In both jurisdictions the utility companies were able to earn a Maximizing Incentive equal to 5% of the value created (adjusted for customer direct costs and evaluation costs). In addition, the retail companies could earn an Efficiency Incentive equal to 10% of the net value (the difference between the value created and the costs of the DSM program including the maximizing incentive). The remaining savings would flow to customers. In Rhode Island, however, the Commission adopted a minimum performance threshold, resulting in Narragansett Electric earning an incentive on savings above a base value specified by the Commission.

The Department of Public Utilities (DPU) in Massachusetts adopted a different approach. Rather than basing Massachusetts Electric's incentive on a shared-savings mechanism, the DPU established a per kW and kWh bounty for each kW and kWh saved above minimum performance thresholds. For example, if the utility does not attain 50% of the projected en-

ergy savings, no incentive kWh is paid. While not a shared-savings arrangement per se, essentially shareholders do receive a bonus that reflects a share of the total benefit provided to the utility and its customers by successfully implementing DSM programs. Note that in Massachusetts, unlike Rhode Island and New Hampshire, the bounties represent net benefits to shareholders after taxes.

For the 1991 program year, the Massachusetts and Rhode Island incentive mechanisms remained virtually unchanged. However, the New Hampshire Public Utilities Commission added a minimum performance threshold. In 1992, all three retail utility companies entered into settlements and received approval from their respective commissions for their 1992 programs. There were some changes from the 1991 programs. For example, Granite State was required to establish and meet certain thresholds for its residential, commercial, and industrial customer classes. In addition, the Maximizing Incentive for C/I programs was dropped from 5% to 3.5% of value created.

Massachusetts Electric's 1992 C&LM incentive structure was also changed significantly. For 1992, a two-part mechanism was put in place that rewards the utility based on the size and the efficiency of the savings achieved. The Maximizing Incentive was calculated in essentially the same manner as Massachusetts Electric's prior incentive was determined with the exception that it will only represent half of the expected bonus. In addition, the threshold was no longer fixed, but rather adjusted according to the level of actual spending. The second component, or Efficiency Incentive, was based on the efficiency of the overall program. Massachusetts Electric earned the other half of its target bonus if the target benefit/cost ratio was achieved. The actual Efficiency Incentive earned increased if the target benefit/cost ratio was improved, and decreased if the target ratio was not met. In addition, a penalty was imposed if the actual customer value created by the overall program was less than the total expenditures. If this occurred, Mass Electric's cost recovery would be limited to the customer value created.

In 1993, for example, the DSM programs implemented by Massachusetts Electric cost $47 million and resulted in benefits worth $135 million (all terms in this paragraph are unlevelized). (MECO's Design 2000 cost a total of $9 million in 1993 while creating a total value of $30 million, resulting in a net benefit of $21 million.) Thus the total net customer benefit was $83,847,000. After calculating both maximizing and efficiency incentives MECO earned just under $2 million as an incentive, or approximately 45% of the preapproved 1993 bonus possible. Note that since the utility recovered 100% of its DSM costs through the conservation charge cost recovery mechanism, the $2 million incentive represents a shareholder incentive for the DSM expenditure.[R#9] ■

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Special thanks to Bob Potter and Michael McAteer for their guidance and support throughout the development of this profile.