
Portland General Electric Energy Smarts for Schools Profile #68

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Executive Summary

While most utilities engaged in demand-side management are providing their customers with direct incentives and other services such as energy audits, analysis, and modeling, Portland General Electric has taken a lead position with its schools program. School programs represent a class of DSM programs that foster long-term value changes while serving to implement short-term retrofit measures in both schools and students' homes. As such school programs will quite likely be the focus of additional utility attention in the coming years.

Energy Smarts for Schools draws from two well-defined disciplines, energy awareness curricula and school facilities retrofits, and then embellishes this synergistic combination with some quite unique and potentially powerful elements. First off, schools are retrofitted with energy-efficient equipment saving school districts money and demonstrating energy efficiency retrofits for the student body and faculty alike. Second, school children from kindergarten to 12th grade are exposed to an innovative and progressive curricula that fosters an appreciation of the value of energy and raises awareness of the critical link between energy use and the environment.

One element of the curriculum is an innovative program called "In Concert with the Environment." Students take home a questionnaire about their household's energy use, purposefully too complex to complete without the assistance of their parents. Then students bring the questionnaire back, enter the data into user-friendly software, and take home a profile of their home's energy use and a list of recommended energy efficiency measures! (PGE also sends the students home with some basic, low-cost measures to start the "self-administered" retrofit process as well!)

PGE has added two other elements to the program. First, the utility will provide funding (in the form of assurances) so that school districts can hire resource managers who are intended to be instrumental in fine-tuning building operations and resource use including electricity, oil and gas, and water. Second, as an outgrowth of the curricula programs, PGE provides small grants for a wide variety of student-initiated educational projects that focus on energy efficiency.

The strength of this profile is not its data, but its concept. While Energy Smarts for Schools began in 1991 and preliminary impact data is beginning to surface, trying to assess the impact of value changes that result from the curricula programs is nebulous at best. This issue will not only affect PGE's ability to recover its DSM costs associated with Energy Smarts for Schools, but will be shared by utilities across North America trying to move beyond short-term incentives and towards a market transformation that must be fundamentally based in value change.

Energy Smarts for Schools

Utility: Portland General Electric

Sector: Institutional (Schools)

Measures: Energy efficiency improvements to facilities; educational materials for classrooms

Mechanism: Four-piece program includes educational effort, retrofit component, grant awards, and enables district wide resource conservation management officials

History: Components began in 1991; fully integrated in 1992

1992-1993 Program Data

Participation: 90 facility retrofits

Five resource conservation managers

Twelve grant awards

50,000 participating students

Conventions

For the entire 1993 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.

Utility Overview

In 1889, Portland General Electric (PGE) accomplished the first long-distance transmission of electricity in the country. The energy traveled 15 miles from a wooden dynamo house in Oregon City to light a downtown Portland street. PGE has grown a great deal since that first transmission, and provided electric service to more than 600,000 retail customers in 1992.

PGE is the electric utility subsidiary of Portland General Corporation and is located in Portland, Oregon in the Northwest portion of the state. PGE's service area covers 3,170 square miles, contains a population of 1.3 million people (45% of the state's population), and includes 60% of the state's economic base. In 1992, PGE had electric operating revenues of \$818,603,000 and employed 3,253 people. Energy sales totaled 18,475 GWh, with 2,739 GWh in wholesale sales. Of the retail sales, the residential sector accounted for 6,226 GWh (39.6%), the commercial sector 5,717 GWh (36.3%), and the industrial sector 3,602 GWh (22.9%). Miscellaneous retail sales totaled 99 GWh (0.7%), while unbilled sales totaled 92 GWh (0.5%). On average, each residential customer used 11,713 kWh.

The population within PGE's service area increased by almost 2% in 1992, a rate twice that of the national average. Moreover, current regional projections forecast a population increase of close to half a million people by the year 2010 in the Portland area. PGE expects a 2% annual sales growth as a result of the growth in its service territory.

The region's growth is typified by the City of Portland, located at the confluence of the Columbia and Willamette rivers. The Port of Portland is the highest ranked port on the West Coast in terms of total tons exported, is ranked second in West Coast auto imports, and third in total tonnage of imports and exports on the West Coast. Oregon's high-technology industry is centered in Portland with more than 75% of the state's electronics jobs located within the city. Major manufacturing concerns in PGE's service territory include paper mills, primary and fabricated metals, food products, ships, trucks, and rail cars. [R#1]

In the face of strong growth, PGE faces capacity constraints caused by the permanent closure of the Trojan nuclear plant on January 4, 1993. Due to Trojan's closure, PGE's reserve margin would be slightly negative at record

PGE 1992 STATISTICS

Number of Customers	610,566
Retail Energy Sales	15,736 GWh
Energy Sales Revenues	\$819 million
Winter Peak Demand	3,161 MW
Generating Capacity	3,561 MW
Reserve Margin	13 %
Average Electric Rates	
Residential	4.52 ¢/kWh
Commercial	4.73 ¢/kWh
Industrial	3.54 ¢/kWh

peak demand. PGE's winter peak demand was 3,161 MW in 1992, and its generating capacity was 3,561 MW with Trojan's output available, creating a reserve margin of 13%. If necessary, the utility will utilize secondary purchases to cover any deficit in 1993.

Until new power resources come on line in late 1995 or early 1996, PGE will replace much of Trojan's output with a mix of power purchases, increased thermal generation at existing plants, and acquisition of alternative resources. PGE's resource acquisition plan focuses on obtaining energy by re-powering existing resources and from a combination of natural gas-fired combined cycle combustion turbines, cogeneration units, energy efficiency, wind power, and geothermal power. PGE's ownership of 950 MW of transmission rights on the Pacific Northwest Intertie (a West Coast "electrical highway") provides the utility flexibility to buy and sell power. Finally, a power-pooling arrangement allows PGE to rely on other Northwest utilities for a part of its reserve capacity.

Currently, PGE is exploring renewable energy source options. The utility is a partner in a 50 MW wind project in eastern Washington and is looking at other wind sites in the Northwest. The utility is also considering potential geothermal sites in Oregon and northern California. PGE hopes to acquire at least 100 MW of renewable energy over the next decade, focusing primarily on geothermal and wind energy. [R#1] ■

Utility DSM Overview

Because of its capacity situation and a changing corporate culture, PGE plans to aggressively increase its DSM efforts over the coming years. In 1992, PGE spent \$12.07 million dollars, equivalent to 1.5% of energy sales revenues, on its DSM programs and saved 106 GWh. In comparison to 1992 levels, PGE plans to double its savings from energy efficiency in 1993 and triple those savings in 1994.[R#1]

PGE DSM PROGRAMS

- A) Residential
 - Residential New Construction
 - Efficient Water Heaters
 - Housewarming - Weatherization
 - Low Income Weatherization
 - Shower Head

- B) Commercial/Industrial
 - Energy Smarts for Schools**
 - Energy Resource Center
 - PGE Facilities Retrofit
 - Nonresidential Energy Efficiency
 - Process
 - Motors
 - Adjustable Speed Drives
 - Customer Solutions
 - Comrat
 - Energy Services Funding Option

- C) Other
 - Streetlighting Program

DSM Overview	<i>Annual Energy Savings (GWh)</i>
1978	1.7
1979	21.0
1980	39.4
1981	36.8
1982	9.6
1983	5.3
1984	1.7
1985	2.6
1986	2.6
1987	3.5
1988	5.3
1989	6.1
1990	7.0
1991	43.8
1992	106.0
Total	292.4

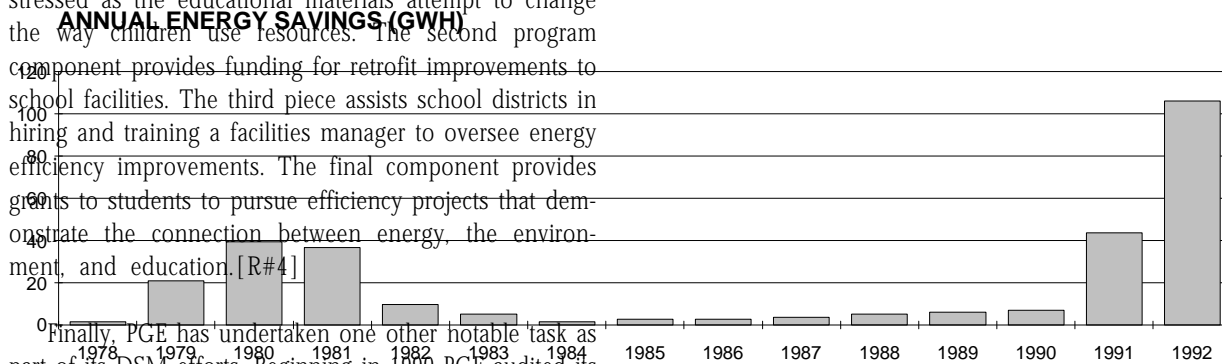
PGE has been involved with DSM activities on a limited scale since 1978 but its programs were ramped up significantly in 1991. From 1978 through 1989, PGE reported total annual energy savings of 135.8 GWh, achieving virtually all of these savings through residential weatherization programs, such as home audits and inspections, low-income weatherization and water heater wrapping. While the number of DSM programs offered by PGE increased greatly in 1990, only 7 GWh of energy savings were achieved. In 1991, PGE offered almost three times as many DSM programs as the previous year resulting in

substantially increased savings. Annual energy savings as a result of DSM reached 43.8 GWh in 1991 and 106 GWh in 1992.[R#2]

PGE currently offers a wide range of energy conservation programs covering the residential, commercial, and industrial sectors. Under the umbrella of the Super Good Cents program (see The Results Center Profile #7), PGE has several residential new construction programs. The utility also continues to provide a weatherization program to low income individuals and families.[R#2]

In addition to the more "standard" DSM programs, PGE has developed some unique energy conservation offerings such as the Energy Resource Center (see The Results Center Profile #55) and the Energy Smarts for Schools (Energy Smarts) program, the subject of this profile. The Energy Smarts program is a four-piece program that addresses improving energy efficiency in schools at a variety of levels. The first component of the program is designed to teach kids in the Oregon school system the importance of energy efficiency by providing classroom materials and projects for grades K through 12. The linkage between energy efficiency and the environment is stressed as the educational materials attempt to change the way children use resources. The second program component provides funding for retrofit improvements to school facilities. The third piece assists school districts in hiring and training a facilities manager to oversee energy efficiency improvements. The final component provides grants to students to pursue efficiency projects that demonstrate the connection between energy, the environment, and education.[R#4]

Finally, PGE has undertaken one other notable task as part of its DSM efforts. Beginning in 1990 PGE audited its own facilities. These audits have been completed and PGE is retrofitting its buildings on the basis of the results of the audits. The utility intends to have completed its retrofits by mid-1993, providing an example to its customers of the importance of efficiency upgrades.[R#3] ■



Program Overview

The Energy Smarts for School program (Energy Smarts) is a multi-faceted program designed to educate Oregon schoolchildren about the value of energy efficiency while providing the opportunity and resources to improve the efficiency of the children's schools and homes. Energy Smarts integrates four distinct components: Energy Efficiency in Oregon Schools (EEOS), the Small Grants program, the Resource Conservation Manager (RCM) project, and Energy Smarts Education (Education). These components each had a different genesis but came together under the Energy Smarts umbrella in 1992. Each component of the Energy Smarts program is a collaborative effort involving PGE and a variety of other private and public-sector entities. PGE believes that this collaboration has been instrumental in the success of the program to date.[R#4,5] The four pieces of the program are presented below.

Energy Efficiency in Oregon Schools (EEOS) was designed to improve the energy efficiency of educational facilities by providing funding for school retrofits. EEOS is a collaborative effort of PGE, Northwest Natural Gas (NNG), the Oregon Department of Energy (DOEn), the Oregon Department of Education (DOEd), with support from Pacific Power, to help schools respond to tighter budgets without compromising their quality of education. All three of the utilities involved provide financing options for efficient equipment, as does the DOEn.[R#4]

Financing for retrofit improvements in schools has been available from PGE since 1991, however, the utility's

resources have been limited since the program's inception. PGE did provide incentives to nearly 20 school districts under the EEOS umbrella during 1992.[R#4]

The Small Grants program is administered under an umbrella partnership called the Oregon Collaborative for Energy Education and the Environment (OCEEE), consisting of PGE, NNG, Pacific Power, Bonneville Power Administration/Lower Columbia Area, DOEn, DOEd, Oregon State University Energy Extension Program, and the Northwest Power Planning Council/Oregon. This program provides funding to schools, districts, teachers, classrooms, students, and student organizations that develop and implement educational projects to foster an improved awareness of energy use and its effects on the environment. Grants are awarded twice a year and are typically less than \$1,000.[R#4]

The Resource Conservation Manager (RCM) project is a collaborative involving PGE, NNG, and Bonneville Power Administration. The RCM project is intended to assist school districts in hiring and training an energy efficiency manager for the district's facilities. The RCM is intended to coordinate the design and implementation of an efficiency program for each school facility, to track and report the savings gained, and to act as resource for teachers and students. The project's sponsors guarantee that the cost of the RCM's salary will be covered by the savings gained from the reduction in energy bills and have insured the school district against loss by pledging to pay any shortfall in salary. The RCM project is still in the pilot

phase with five managers selected. The Ashland, Hillsboro, Salem, and North Clackamas school districts each have selected a manager, and several districts comprising the Columbia County area have banded together to hire one RCM for the region. RCM training for the pilot districts was done in August of 1993 by the sponsors and the RCMs began work in September.

The Energy Smarts Education (Education) component provides curriculum material for use in Oregon's schools to educate children on the value of energy efficiency with particular emphasis on the links between efficiency and environmental benefits. The Education program was developed by PGE in tandem with NNG, DOEn, and DOEd. The education material is organized into different modules for grades K-3, 4-7, 8-9, and high school children. Each module is named to further emphasize the link between energy and the environment. Examples include a K-3 module called "Think Earth" that is designed to teach children to conserve resources, minimize waste, and reduce pollution. The 4-7 grade module is called "EcoSmarts" and emphasizes energy efficiency through activities to reduce home energy use and increase recycling. Perhaps the most ambitious component is the 8-9 grade material, called "In Concert with the Environment," that was developed by EcoGroup of Tempe, Arizona. "In Concert" encourages students to perform an audit of their homes and enter the results into an energy analysis computer program. The utility then uses this analysis program in conjunction with historical bill data to provide an efficiency improvement recommendation report for the

home. The student can then use this report to show to his or her parents what can be done and how much money can be saved. Finally, high school pupils are encouraged to participate in a funding program for efficiency projects through a curriculum booster called "EcoGrants." [R#4]

In addition to the collaboration entailed, the Energy Smarts program has two other attractive features: 1) its educational efforts on the link between energy and the environment to change students' behavior, and 2) the integration of actual efficiency measures with the educational materials. The link between environmental benefits and energy efficiency can be a powerful tool for developing an "efficiency ethic" and thereby improving energy efficiency over a long-term period. This link is especially important given a population that is "greening" rapidly. The synthesis of this educational component with the installation of efficiency measures provides immediate savings that may serve to validate behavioral changes for the students. These ideas are further explored in the "Lessons Learned" section of this profile. ■

Implementation

MARKETING AND DELIVERY

All facets of the Energy Smarts program have been touted extensively by the sponsoring organizations. The program has received considerable attention in the local, state and regional media and has also been praised on a national level.[R#6,7,8] A logo for the program has been developed and is now attached to all program materials, increasing program visibility and allowing for immediate recognition. However, each component of the program is coordinated and implemented differently according to the specific needs of each activity.

The EEOS program is promoted by the sponsors to school districts. Oregon schools are receptive to energy efficiency improvements due to a State law limiting property taxes and therefore restricting school budgets that was passed in 1991. The State Superintendent of Public Instruction is also a former member of the Northwest Power Planning Council and has been instrumental in targeting schools for energy efficiency. The sponsors were expecting participation on a facility-by-facility basis, however budget constraints and the potential financial benefits of the program have led entire school districts to consider district-wide "efficiency plans." [R#9]

Once a facility has been identified, a joint gas and electric audit is performed by the EEOS sponsors at no cost to the school to identify efficiency opportunities. Low interest loans, rebates, and a shared-savings mechanism are available from some of the participating utilities for the school to finance improvements and the DOE also provides a low-interest loan option. Under the shared-savings provision, PGE and NNG provide up-front financing for the installation of efficient equipment and in turn receive a 75% share of the potential savings. Each month for ten years (or until the full cost of the investment is recovered), the resulting energy savings are itemized on a the customer's bill, and the school reaps the benefits of efficiency for the life of the measures (typically longer than the payback period). By providing joint auditing and incentives each utility is able to leverage its resources while still securing valuable savings.[R#9]

The Small Grants program is promoted by the members of the Oregon Collaborative for Energy Education and the Environment (OCEEE) through several electronic networks, teachers publications, and via direct mail by the

sponsors. A grant application is distributed throughout the state's school system to teachers, students, and student organizations. The application is an easy to understand, six-page document that is returned for evaluation by OCEEE. The criteria used to evaluate proposals include impact, value, community involvement, innovation, ease of replication, and evaluation. Grants are awarded in two funding cycles in spring and fall. A total of \$25,000 (unlevelized) is available for 1993 with average grants expected to be under \$1,000 each.[R#11]

The first set of grants was awarded in May of 1993 with twelve grants totalling nearly \$11,000 (unlevelized) distributed to a variety of schools, districts, and classrooms. Some examples of projects that received funding include the planning and building of a model energy-efficient house by high school students and a project exploring the relationship between energy and nature by planting a garden at an elementary school.[R#10] Proposals for the next funding cycle will be solicited in October and OCEEE expects to award grants again in November. [R#5]

The Resource Conservation Manager (RCM) project is in its pilot phase. The sponsoring utilities have contracted with a project coordinator and a technical coordinator to negotiate with several school districts about the project. As a result, five RCM's have been selected, their training was completed in August, and field work began in September.

The RCM program has been modeled after a three-year program in place in Eugene, Oregon School District 4J, where the district has saved nearly half a million dollars during that time through substantial reductions in the use of electricity, fossil fuels, and water, as well as improved recycling. However, the RCM program has added an additional incentive for participating school districts by insuring the district against any financial risk. The sponsors have agreed to pay any shortfall between the salary of the RCM and the savings gained from improved efficiency. Further, the district is free to spend any excess money as a result of expected savings as it sees fit.[R#12]

To implement the program the school district signs an agreement with the sponsoring utilities. The utilities agree to assume the financial risk as detailed above and provide technical support for the RCM. In turn, the district agrees

to provide space and staff support for the RCM and to implement the RCM's recommendations in the form of an energy policy and a tracking system. All of the participants have agreed to a two-year initial pilot program.[R#12]

The Energy Smarts Education (Education) program was developed by PGE and quickly expanded to include the other partners identified in the Program Overview section of this profile. The Education program was initially piloted in late 1991 in several schools in and around the Portland area which were selected for geographical diversity and the strength of existing relationships to PGE. Another round of pilots was conducted in the spring of 1992 incorporating the results of a preliminary evaluation of the fall pilots to provide more information to teachers prior to the program, and to present the material in science class. Response has been strong enough to convince the collaborative partners to continue and expand the program.[R#13]

The Education program provides teachers with curriculum material specifically designed to be easily integrated into their existing plans. For the "Think Earth" (grades K-3) and "EcoSmarts" (4-7) modules, this material includes a teacher guide, classroom materials (i.e., poster for the walls), and student materials, such as workbooks. The "In Concert with the Environment" module targeted at 8-9 graders is somewhat more sophisticated. A guest teacher visits the classroom with an introductory video, returns with workbooks and a lap-top computer for data entry of the energy features of the students' homes, and finally brings a report detailing the efficiency measures available to each student's home. The "EcoGrant" module for high school students contains information on preparing and receiving a grant to develop classroom projects encouraging environmental awareness and energy efficiency.[R#14]

MEASURES INSTALLED

Typical measures installed under the EEOS component are lighting applications including T8 electronic ballasts, compact fluorescent lamps, delamping, halogen lamps, and exit signs. Additionally, other measures such as controls and time clocks, motion detectors, variable speed drives, low-E glazing for windows, and insulation have been installed.

A number of measures have been installed by parents of students participating in the Education program. Each participating student is given a low-flow shower head and two faucet aerators. Seventy percent of the shower heads were installed with 69% of the kitchen faucet aerators and 67% of the bathroom faucet aerators also installed. Other measures reported to be implemented include furnace filters, compact fluorescent lights, insulation and weather stripping, additional showerheads, and water heater or pipe wraps.[R#13] PGE is counting on the education program to spur interest in improving energy efficiency among residential customers whether they take advantage of the utility's DSM programs or choose to install measures on their own.[R#19]

STAFFING REQUIREMENTS

None of the participants in the Energy Smarts for Schools program has devoted a full-time employee to the program. Rather, the sponsoring organizations provide as much staffing and in-kind support to the various components of the program as necessary with requirements varying considerably according to the status of projects underway.[R#5]

The only contractors currently employed on the Energy Smarts program are involved in the RCM component. BRACO Energy Services, a management and energy service company, has provided one full-time employee to manage the project. Another contractor, Conservation Control Corporation, has provided one part-time employee to provide technical background for the training of RCMs and to support the retrofit of facilities under the RCM project. It should be noted that each of the five RCMs is a full-time employee. ■

Monitoring and Evaluation

MONITORING

Monitoring for a program such as Energy Smarts for Schools includes similar but significantly different provisions than typically used for DSM programs that focus on the installation of efficient technologies. With a substantial part of the Energy Smarts program focused on education and behavioral change, tracking the process to monitor for the reception of materials and to ensure its quality is of prime importance. Estimating the energy benefits of the program's components, based on both the education and the installation of efficient measures, is also important. PGE is attempting to monitor the entire program at the component level.

Retrofit projects under the EEOS umbrella are subject to monitoring (and evaluation) as part of the utility's existing commercial and institutional buildings program.[R#9]

The RCM project has been designed with monitoring provisions. Each school district will implement a building energy tracking system to monitor its installations that receive upgrades. Monthly reports will be prepared for the sponsoring utilities by the RCM to keep them informed of progress.[R#12]

The Small Grants program uses evaluation as a criteria for awarding funding. Proposals are required to describe how success will be measured, who will monitor and evaluate the project, and any provisions allowing for mid-course correction of the project.

Monitoring is perhaps most nebulous in the Education component of the program as there are inherent difficulties in tracking and confirming the change in behavior attributable to an education program. Nevertheless, the structure of the educational modules provides some monitoring capability. For example, each completed assignment is analogous to an installed measure as presumably each assignment provides additional information necessary to ultimately effect behavior. In a more concrete sense, the utility has records of each participating student in the Education program that were used for the preliminary process and impact evaluation of the pilot phase of this program.

EVALUATION

Evaluating the energy benefits of the Energy Smarts program has been complex. Quantifying the energy benefits of the educational component of the program has not yet been done, although evaluators from PGE and BPA are currently working on a plan to capture this information. Because contracts for the first grants have only recently been put in place, and the RCM project has not yet been implemented, there has been no evaluation of these components. The EEOS retrofit program is the only candidate for a traditional impact evaluation, however, PGE has not performed such an evaluation, instead choosing to bundle EEOS projects with other C&I retrofits.

However, a preliminary process evaluation of the Education component was performed in 1992 to evaluate the pilot projects initiated in the fall of 1991. A survey was performed by the Gilmore Research Group [R#13] to evaluate the effectiveness of the program from both the students' and parents' perspective and to determine whether the material was effective at changing their energy use. The survey focused on the "In Concert" module of the education material and consisted of 1,200 telephone interviews, 600 with participating students and 600 with their parents. (Fully 540 of these were matched sets of students and parents.) A large majority of the students completed the work involved and felt they had learned from the materials. A similar number of the parents remembered the program and were involved in the helping their children with the home audit. The potential energy benefits of the program were also encouraging, as better than one in three parents purchased energy savings devices (typically furnace filters) and a majority of students and parents reported behavioral changes to improve energy efficiency.[R#13]

A similar study of the "In Concert" module was performed to determine teacher acceptance of the educational materials. The majority of teachers felt the program was valuable from an education perspective, particularly at presenting information on specific energy issues (i.e. electricity vs. gas usage). Most teachers felt that basic environmental issues such as recycling were already covered in class. The materials used in class were generally well received, as were the special presenters of the material. This evaluation led to two significant modifications for the Spring 1992 pilots: providing better information to the teachers before presenting the material and using science classes as the forum for the material.[R#9,13] ■

Data Alert: PGE has not quantified the energy benefits of the Energy Smarts for Schools program. The utility has only estimated energy savings resulting from the EEOS retrofit component and for limited measures installed by students participating in the Education component. Data for other program components does not exist or cannot be quantified by PGE at this time.

As noted in the previous section of this profile, evaluating the savings from the Energy Smarts for Schools program has proven to be difficult for PGE. The utility has yet to generate an estimate of the savings reaped by the Education component of the program due to the inherent difficulties of quantifying behavioral effects, although savings estimates for take-home measures included in the Education component have been estimated. As the Small Grants component only recently awarded the first set of grants there are not yet any savings figures from this aspect of the program. Similarly, the RCM project has just completed its pilot training phase with implementation beginning in September 1993. For this project, the sponsoring utilities are confident that savings will accrue at a level significantly above the cost of the RCM.

Based on the preliminary impact evaluation discussed in the Monitoring and Evaluation survey, the utility has estimated that the installation of 2,500 low-flow shower heads and faucet aerators by the families of students participating in the Education component have resulted in annual energy savings of 440 kWh per installation. However, a substantial portion of these savings accrue to Northwest Natural Gas because many customers have gas water heating. PGE believes that 50% of the energy savings are electric.[R#5] Therefore, The Results Center has calculated annual energy savings of 550,000 kWh for PGE and 18,764.9 therms for NNG.

Hard data from the installation of efficiency measures through the EEOS retrofit program has only been estimated by the utility. PGE estimates that the 90 schools participating during 1992-1993 resulted in energy savings of approximately 9 GWh.[R#5]


PARTICIPATION RATES

Participation is defined differently for each aspect of the Energy Smarts in Schools program and each component is detailed below.

Each completed retrofit of a facility is considered one participant in the EEOS retrofit program. There have been 90 facilities retrofitted as a part of this program during 1992-1993 with many of these projects currently underway.

For the Small Grants project, 12 grants were awarded during the first cycle of funding out of a pool of 34 applicants. Similar participation levels are expected for the Fall 1993 awards given current available funding.

Five pilots have been selected for the RCM project. There are currently nearly 300 schools districts in Oregon. However, the state is now in the process of significantly consolidating these districts for financial reasons and it is unclear what the final number will be. Additionally, many districts may choose to share a RCM particularly if the current sharing agreement between the Columbia River districts proves to be effective. If successful, the RCM program will be expanded in two years at the conclusion of the pilot phase.

Finally, the Education component has the potential to reach every school-aged child in Oregon. Approximately 50,000 children participated during 1992 and the program is targeted to expand to reach 65,000 students during 1993. 

Program Savings (continued)

FREE RIDERSHIP

Given the unique nature of the Energy Smarts program, free ridership has not been an issue. Although Oregon's schools are faced with budget constraints that could be alleviated by reduced energy costs, they are also hampered by capital constraints effectively preventing them from pursuing the installation of efficiency measures without financial assistance from other parties. In fact, this shortage of up-front financing, while certainly a factor in many energy efficiency decisions, is particularly acute for institutional customers such as churches, homeless shelters, government facilities, and schools. A detailed discussion of this and other barriers to improving efficiency for institutional customers will be presented in the forthcoming profile by The Results Center of the Fort Lewis retrofit by Tacoma Public Utilities.

The utility has considered free ridership in the context of linking the education component to increased participation in its residential DSM programs. Given that its customers will be better informed of the value of energy efficiency, it might be expected that more customers would participate in residential DSM programs only to collect the incentives. Conversely, the utility believes that many customers will install measures as a result of the education program without participating in the residential programs, thus acting as free drivers. To date, PGE believes that these effects cancel each other, although it is pursuing analysis of this issue. [R#19]

MEASURE LIFETIME

Data Alert: Measure lifetime also varies considerably for the different aspects of the Energy Smarts program, however, the utility has not done any calculation of useful measure lifetime for any component of this program. In the absence of any calculations by PGE, The Results Center presents figures used by other utilities in similar programs but strongly urges readers to consider these figures as approximations only.

The shower heads and faucet aerators installed as part of the Education program are likely to have a lifetime similar to that as calculated by Pacific Gas & Electric (see Profile #14) of 10 years.

A lifetime of 15 years is the standard in use by other utilities for commercial building improvements performed in a variety of DSM programs. [R#17] Therefore, The Results Center expects measures installed under the EEOS and RCM projects to roughly approximate this figure.

Finally, the potential lifetime of the educational benefits of this program is exactly that, a lifetime.

PROJECTED SAVINGS

PGE has made no projection of the savings that will accrue from the Energy Smarts program. However, the utility is facing severe capacity constraints for the next 2 to 3 years and is relying on its conservation efforts in concert with some interim supply increases to meet those needs. ■

Cost of the Program

To date, PGE has not been fully tracking the costs of the Energy Smarts program. Many of the costs, particularly those associated with the Educational effort, are considered in-kind. Administrative costs are split evenly between the Commercial DSM group and the Public Affairs Department of the utility. However, some data is available for each aspect of the program.

The EEOS retrofit program has provided \$101,731 (unlevelized) in rebates to participating schools to date.

The Small Grants project has a funding pool of \$25,000 (unlevelized) for 1992 from which to make awards. However, other costs associated with the project, such as administrative costs and marketing expenses are not included in this figure.[R#5]

The RCM project has approximately \$100,000 (unlevelized) for administrative and technical support. Although PGE would be obligated to pay any cost deficiency between the RCM's salary and the money saved from efficiency improvements, the utility is confident that savings will more than cover expenses.[R#5]

COST EFFECTIVENESS

PGE has not yet run any cost-effectiveness tests for the Energy Smarts program. However, such an evaluation is planned in conjunction with the RCM project.

COST PER PARTICIPANT

The cost per participant cannot be aggregated for the entire program, given the disparity in measuring participation and the uncertainty of the program's costs.

COST COMPONENTS

Due to the decentralized nature of the program, PGE has not aggregated the costs of the Energy Smarts for Schools program. All available cost data for the various components has been included in this profile. ■

CASE STUDY: PORTLAND PUBLIC SCHOOLS

Portland Public Schools (PPS) comprises 61 sites and 5,685,000 square feet within PGE's service territory (and another 70 sites and roughly 4 million square feet outside PGE's territory). PPS buys 28,721,675 kWh per year from PGE, making it the 36th largest PGE customer as of April 1993. Energy, of which 51% is electric, represents 1.5% of the district's operating costs.[R#21]

Because of a constrained budget PPS has been working with members of the EEOS collaborative to improve its energy efficiency. Thirteen facilities have undergone energy audits and are thus eligible for incentives under the EEOS umbrella (as described in the Program Implementation section). In fact, PPS intends to invest over \$20 million district-wide in energy efficiency over the next

seven years through financing secured from an EEOS member, the Oregon Department of Energy.[R#21] The attached chart illustrates the estimated annual kWh savings, the estimated total cost of securing those savings, and projected savings and costs per square foot. It also includes the projected energy savings for all PPS schools within PGE's service territory, amounting to roughly 25% of current consumption.[R#20]

The Results Center calculated the simple payback of the estimated energy savings from these 13 schools to be 15.95 years assuming no increase in PGE's current commercial rate of 4.73 ¢/kWh. However, incentives from the EEOS program should significantly reduce the cost to PPS and the payback period.

Portland Public Schools Case Study	<i>Estimated kWh Savings</i>	<i>Estimated Cost</i>	<i>Projected Savings (kWh/sqft)</i>	<i>Projected Cost (\$/sqft)</i>
Abernethy	62,150	\$66,050	1.36	\$1.44
Alameda	14,364	\$9,544	0.29	\$0.19
Atkinson	49,634	\$37,360	0.85	\$0.64
Bridger	81,585	\$39,469	1.89	\$0.91
Creston	49,944	\$29,584	0.74	\$0.44
Franklin	344,100	\$240,029	1.63	\$1.14
Hayhurst	66,143	\$28,937	1.18	\$0.51
Hosford	48,658	\$33,099	0.64	\$0.44
Laurelhurst	49,899	\$31,800	1.05	\$0.67
Marysville	19,282	\$23,288	0.36	\$0.44
MLC/Couch	123,900	\$171,500	1.99	\$2.76
Ockley Green	77,359	\$47,037	1.09	\$0.67
Woodstock	66,427	\$36,972	0.96	\$0.53
Sample Total	1,053,445	\$794,669	1.16	\$0.87
* Extrapolated Total	6,526,643	\$4,894,982		

* Based on square footage of PPS schools in PGE territory (except Abernethy, Hayhurst and Woodstock) which have completed retrofits.

Cost of Saved Energy (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%
Abernethy	7.88	8.46	9.07	9.69	10.33	10.99	11.67
Alameda	12.61	13.54	14.50	15.50	16.52	17.58	18.67
Atkinson	11.13	11.95	12.80	13.68	14.59	15.52	16.48
Bridger	17.32	18.59	19.91	21.28	22.70	24.15	25.64
Creston	14.14	15.18	16.26	17.38	18.54	19.72	20.94
Franklin	12.01	12.89	13.81	14.76	15.74	16.75	17.78
Hayhurst	19.15	20.56	22.02	23.53	25.10	26.70	28.36
Hosford	12.31	13.22	14.16	15.14	16.14	17.17	18.24
Laurelhurst	13.14	14.11	15.12	16.16	17.23	18.33	19.47
Marysville	6.94	7.45	7.98	8.53	9.09	9.67	10.27
MLC/Couch	6.05	6.50	6.96	7.44	7.93	8.44	8.96
Ockley Green	13.78	14.79	15.84	16.93	18.06	19.21	20.40
Woodstock	15.05	16.16	17.31	18.50	19.73	20.99	22.29
Sample Total	11.10	11.92	12.77	13.65	14.55	15.49	16.45
Extrapolated Total	11.17	11.99	12.85	13.73	14.64	15.58	16.54

The Results Center has calculated the cost of saved energy at a five percent real discount rate for these 13 facilities to be 12.77¢/kWh, assuming a 15-year measure lifetime (the current industry standard for commercial buildings) and without levelizing the initial estimated costs. This high cost can be attributed to a number of factors. Primary among these is the use of the technical potential of the facility as the baseline for energy savings, that includes all measures resulting in energy savings, not merely those measures with a limited payback or those

under the utility's avoided cost. In short, this cost represents the cost to do a comprehensive retrofit of the facilities, rather than merely skimming the cream. The second major reason for such a high cost is the use of the total cost of the energy improvements, rather than the cost to PGE. Neither the utility nor the school district will incur the full cost of improvements (and thus the full cost of saved energy). Rather, these costs will be split between participants, with each having a lower cost of saved energy. ■

Lessons Learned / Transferability

LESSONS LEARNED

The Energy Smarts for Schools program is of value for its innovative design above and beyond any measurable energy benefits the program provides. There are three central lessons to be learned from this program. These are fundamental and underlying themes of the program, rather than design or implementation tips. They are: 1) the value of collaboration, especially among disparate entities with potentially conflicting agendas; 2) the development of a strong link between energy efficiency and environmental benefits; and 3) the integration of an educational program with the installation of efficiency measures.

Collaboration has been critical to the success of the Energy Smarts program to date. Alone, Portland General Electric could not have undertaken all of the program's components to the degree each has been pursued due to a lack of financial and staffing resources. By building alliances with other utilities, state agencies, regional authorities, and school districts, PGE has been able to leverage its educational resources while increasing the scope and depth of its activities. These collaborative efforts have benefited each of the participants, allowing them to achieve goals while building better relationships amongst each other and with their customers. Of particular note is the collaboration between PGE and NNG, given their competition for market share. Each utility has compromised to the degree that the home audit performed by students is fuel-blind.[R#19]

Linking energy efficiency to environment benefits can be a powerful tool for developing an energy efficiency "ethic" and thereby improving energy efficiency over the long term. This link appears to be particularly important given the growth of a "green" population in the United States. (In fact, participants in one recent survey rated a clean environment more important than a satisfactory sex life!) The size of the "green" population has been estimated as high as 78% of all consumers.[R#18] Much of this growth may be attributed to the efforts of environmental organizations to educate the general population on the value of the environment and the benefits of environmentally conscious actions such as recycling. It is worthwhile to note that the development of an environmental ethic has been especially strong among school-aged individuals.[R#15] Energy efficiency has much to gain from a strong link to environmental benefits.

Integrating education with the installation of efficiency measures couples the behavioral benefits gained from education to immediate savings resulting from installed efficient technology. This synthesis may provide the immediate results necessary to validate the behavioral changes for students. Perhaps the best illustration of this synthesis is the grant program that allows students to pursue their own efficiency projects and integrate these two facets for themselves.

One final point of note has to do with timing and regulation, specific to Oregon. The Energy Smarts for

Schools program was initiated during a major school reform and budget crisis. Although the program has potentially positive effects both in the classroom and on the budget, it did not receive immediate attention as a possible solution due to the state of flux the educational system was experiencing. Additionally, PGE is only now beginning to work with the Oregon Public Utilities Commission (PUC) on potential treatment of the Energy Smarts program as a DSM program. Earlier efforts to secure PUC backing could only have helped the program. The utility recognizes the need to track program costs and benefits if it is to treat Energy Smarts as a DSM program.[R#5]

An ultimate measure of success for the program will be the willing participation of all schools in Oregon without involvement by the utility sponsors. Obviously, the Oregon Department of Education has a critical role to play if an energy efficiency education is to be institutionalized in Oregon.

TRANSFERABILITY

The Energy Smarts program is highly transferable to other jurisdictions. In fact, each of the components has been implemented to varying degrees by other utilities, providing proof-of-concept for these program elements. This program is unique among those profiled by The Results Center in that it could be implemented without change by a gas utility. In a sense, it already has, as Northwest Natural Gas has been a key partner in the Energy

Smarts for Schools program.

The Energy Smarts program is also unique because it involves so many different organizations and addresses energy efficiency at so many distinct levels through its program elements. Arguably, the ability to form the strong working partnerships necessary to implement a widespread program would be the most difficult aspect of this program to emulate. Without these partnerships a single utility would likely face resource constraints limiting the feasibility of delivering a program similar to Energy Smarts.

For comparative purposes, several utilities address education and educational facilities improvements in demand-side management programs. School facility retrofits are funded within utility commercial and industrial programs or through programs specifically for institutional customers. Edison Electric Institute, the trade association for electric investor-owned utilities, has an Educational Services Committee that focuses on both consumer education and classroom education. As noted earlier, the Eugene, Oregon school system pioneered the resource conservation manager concept. Finally, the "In Concert with the Environment" program is currently being used at 19 utilities in 14 states. "In Concert" was developed by the EcoGroup of Tempe, Arizona as a tool for educating people on the linkage between energy efficiency and environmental benefits and will be featured in a forthcoming profile prepared by The Results Center. ■

Regulatory Incentive and Shareholder Returns

Traditional utility ratemaking, where each and every kilowatt-hour sold provides profit, is a major barrier to utilities' implementation of energy efficiency programs. Several state regulatory commissions and their investor-owned utilities have been pioneers in reforming ratemaking to: a) remove the disincentives in utility investment in DSM programs, and b) to provide direct and pronounced incentives so that every marginal dollar spent on DSM provides a more attractive return than the same dollar spent on supply-side resources.

The purpose of this section is to briefly present exciting and innovative incentive ratemaking mechanisms where they're applied. This we trust, will not only provide some understanding to the reader of the context within which the DSM program profiled herein is implemented, but the series of these sections we hope will provide useful snapshots of incentive mechanisms being used and tested across the United States.

OREGON OVERVIEW

The Oregon Public Utilities Commission has taken active steps to promote integrated resource planning (IRP) in Oregon and to remove the disincentives for the state's investor-owned utilities to invest in energy efficiency. The Commission formally adopted IRP in April of 1989. Then a few months later, in December of 1989, the Commission authorized special accounting practices for DSM, with all eligible conservation program expenditures subject to deferral and amortization over the useful life of the assets from the date placed in service. Some conservation costs, such as advertising costs and the costs of legislatively-mandated programs such as low income programs, are expensed.[R#22]

In 1992, the Commission directed the state's utilities to submit proposals for DSM program cost recovery, lost revenue recovery, and shareholder incentives. The intent of this docket was to break the link between sales and profits, to decouple sales and profits thus enabling the utilities to invest in energy efficiency. In February 1993, the Commission approved PGE's proposal. (More accurately, in 1991 the Commission had authorized PGE's original cost recovery mechanism for its SAVE program as a three-year test. Thus by the time that the Commis-

sion opened its formal investigation of cost recovery and shareholder incentives, PGE's mechanism was already up and running. In February of 1993 it was formally approved with the addition of the "ratebase true-up" provision.) PGE and PacifiCorp took different approaches. The PacifiCorp's Energy FinAnswer umbrella program uses a novel energy service charge approach that is discussed at length in Profile #46.[R#22,23]

PGE'S TREATMENT OF DSM COSTS

In Oregon, rate cases are not regularly scheduled but occur whenever either the Commission or a utility requests one. For illustration, the last general rate case was in 1985, and was settled in 1986. Note that there is a proposal before the Commission that calls for regularly scheduled rate cases, say every three years, that might facilitate the decoupling process.

At the time of each rate case PGE submits its DSM plans. These include not only savings targets and cost projections, but indicate the level of lost revenues that will occur based on these plans. Rates for the future test years are then modified to cover the costs of ratebasing the DSM program costs and their associated lost revenues plus the incentives expected, based on the projected costs and savings. Portland General Electric allocates DSM program costs, lost revenues, and shareholder incentives to all customers via a uniform cents-per-kWh charge called the Energy Efficiency Adjustment.[R#22,23,24]

PGE'S LOST REVENUES

Lost revenues resulting from DSM activities are collected by Portland General Electric through a Lost Revenue Adjustment (LRA) component of the Energy Efficiency Adjustment. The LRA is applied to each kilowatt-hour sold to the rate classes in which the lost revenues originated. Lost revenues are calculated as the product of the reduction of kWh retail sales and the weighted average of the retail base rates for the respective program category less the sum of short-run avoided marginal cost and the wholesales sales margin.[R#22]

RATEBASE TRUE-UP MECHANISM

In February of 1993 the Commission approved a proposal made by Portland General Electric for an Energy Efficiency Investment True-Up Mechanism. The provi-

sion enables the utility to defer revenue requirements, for both DSM program costs and lost revenues, that exceed the level established in the utility's most recent general rate case. The mechanism was approved for all investments made on or after January 1, 1993. As such if the utility's programs exceed their targets as specified in the general rate case, and thus program costs and lost revenues are greater than anticipated, a "true-up" will occur, and the recovery of these costs are recovered in an automatic adjustment clause once a year.[R#22,23,24]

PGE'S SHAREHOLDER INCENTIVES

PGE originally proposed a shareholder incentive mechanism along with its rate filing in the spring of 1990. The proposal led to several months of discussion between the Commission, the Oregon Department of Energy, and Portland General Electric. Finally the incentive mechanism was separated from the rest of the provisions of the rate case to treat it separately. What the parties to the proceeding determined is that PGE can earn incentives of approved programs that fall under a "SAVE" umbrella. These programs are characterized as having clearly demonstrable savings. Thus PGE could earn an incentive on these investments.[R#22,24]

In January 1991 the Oregon PUC approved a shareholder incentive mechanism for PGE that allowed the utility to earn a share of the net benefits from DSM programs. The incentive was set for an initial term of three years at which time it will be reviewed and modified if necessary.[R#22]

PGE's incentive mechanism is a shared savings incentive that is recovered through the Energy Efficiency Adjustment tariff, or rate surcharge. The Shared Savings Incentive (SSI) is the total of incentive payments for all qualifying energy efficiency measures and is calculated for each of four program categories: residential space heat, residential non-space heat, commercial, and industrial.[R#22]

The SSI for each program category is determined by multiplying an incentive rate for the program category by the difference between annual kWh savings and the benchmark set by the Commission for that particular program category. Incentive rates are a function of program cost, total resource cost, and the utility's long run incremental costs. A penalty may result if the utility fails to meet a program category benchmark or if the utility's pro-

gram category costs or levelized total costs exceed Long Run Incremental Costs.[R#22]

One of the key issues in determining that PGE incentive was that PGE requested 50% of the incentive payment up-front. The Commission rejected this, opting instead to allow benefits to flow to the utility as benefits accrue to the ratepayers, and allowed PGE to recover incentive payments over a 15-year time frame with a 25% up-front payment paid after the first year of the DSM programs' implementation and following evaluation.[R#22]

REGULATORY TREATMENT OF THE ENERGY SMARTS FOR SCHOOLS PROGRAM

The Energy Smarts Schools programs as described in this profile, has four distinct component which have been handled differently in the regulatory context. For instance, the school retrofits component is considered part of PGE's commercial retrofit program. Thus its expenses are capitalized (ratebased), lost revenues are collected, and its costs do qualify for PGE's SAVE incentives described above. The Resource Conservation Manager component's costs also qualify for SAVE's treatments and incentives.[R#23]

On the other hand, neither the curricula component nor the small grants program qualify as energy efficiency programs per se. Instead, PGE sees these programs as potential "lead generators," or means whereby awareness of and interest in energy efficiency is raised, potentially leading to subsequent retrofits through other related energy efficiency programs. Part of the reason that PGE chose not to try and put the curricula and small grants program under the SAVE umbrella is that the Oregon Public Utilities Commission has very strict standards for cost recovery including before and after measurement. Thus the Commission would require PGE to do extensive monitoring and evaluation in order to recover costs, lost revenues, and to receive shareholder incentives associated with the curricula and small grants program, an approach that PGE staff thought would not make sense even if a methodology for verifying savings could be established. Kathy Phillips-Israel of PGE noted that, "We decided we couldn't verify savings realistically, at a realistic cost!"[R#23] ■

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Special thanks to Lynda Tatum for her assistance and guidance throughout the development of this profile.