
PSI Energy

Smart \$aver® Homes

Profile #67

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Executive Summary

PSI Energy's Smart Saver® program began as a means of promoting electrically-heated homes in Indiana but it has evolved over the years to encompass a far broader mission. The Smart Saver® program, coupled with the more recent Summer Saver® program extension, offer a series of interesting incentives for customers, builders, and vendors for the use of high efficiency heat pumps and central air conditioners.

The goal of the program is to encourage and assist residential home builders, manufactured home dealers, and apartment developers and owners to construct, display, advertise and sell/rent Smart Saver® homes, condominiums, manufactured homes, and apartments. In addition, existing homeowners and apartment owners are encouraged to retrofit their air-conditioning and/or electric-heating systems to Smart Saver® standards.

The program began with the specific intent of addressing the market share decline of electrically-heated homes in PSI's service territory. The proportion of the single-family new construction market selecting electric space heating had declined six years in a row and a similar situation was taking place in the existing home market as well with many existing electric heat customers switching to other fuels, primarily natural gas. If allowed to continue, this trend would lower the system load factor, pressuring PSI to raise rates. Thus PSI's challenge was to design a program that would stabilize if not increase the saturation of electric heating in the residential sector, particularly the single family segment. The program has been very successful in achieving this objective: since the program began, the percentage of new single-family construction selecting electric space heating has grown from 26% in 1989 to 42% in 1992 and 80% of these new electrically-heated homes have met the Smart Saver® efficiency standards. Furthermore, hundreds of older heat pumps in existing homes have been replaced with high-efficiency Smart Saver® heat pumps.

In order to maintain electric-heat customers, PSI developed a series of innovative means of coupling electric heat (and later air conditioning) with energy efficiency. The utility developed a Smart Saver® designation, and both new and retrofitted homes that met the criteria became eligible for reduced electric rates by 30% for electricity usage over a 1,000 kWh threshold in winter months. The requirements for the program are based on the installation of high efficiency heating and cooling systems matched with properly designed duct work and insulation. PSI also provides incentives for builders and heating contractors to help defray incremental costs of the higher-efficiency equipment.

Smart Saver® Homes

Utility: PSI Energy
Sector: Residential
Measures: High efficiency heat pumps and air conditioners, low-E windows, water heater insulation wraps and pipe insulation, low-flow showerheads, faucet aerators, and seal-ups
Mechanism: Qualifying homes receive a reduced winter electric rate as well as a satisfaction guarantee. Incentives are offered to builders, dealers, developers, and owners
History: Started in 1990

1992 System GT® Data

Energy savings: 1.1 GWh
Lifecycle energy savings: 16.7 GWh
Peak capacity savings: 0.4MW
Total Smart Saver® Cost: \$5,314,300

Cumulative System GT® Data (1990 - 1992)

Energy savings: 1.9 GWh
Lifecycle energy savings: 22.2 GWh
Peak capacity savings: 0.5 MW
Total Smart Saver® Cost: \$11,696,200

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

Headquartered in Plainfield, Indiana near Indianapolis, PSI Energy (PSI) is Indiana's largest electric utility and the principal subsidiary of PSI Resources. Other subsidiaries include PSI Investments, PSI Recycling, and PSI Argentina. PSI Investments oversees expansion into non-regulated businesses. PSI Recycling recycles paper and metals from PSI Energy and other sources. Goodwill Industries of Central Indiana provides labor for this business and receives a portion of the profits. PSI Argentina owns an equity interest (as a member of a multinational consortium) in the Costanera generating station serving Buenos Aires. The consortium owns 60% of the 1,260 MW oil- and gas-fired power plant.[R#1]

PSI Energy provides electric service to north central, central, and southern Indiana. The utility's service area covers 22,000 square miles, and includes portions of 69 of the state's 92 counties. PSI also sells electricity to other utilities across the country as its chairman, James Rogers, has been a leading advocate of "free wheeling" of electric power. Interestingly, the utility got its start 80 years ago as an interurban railway.[R#1]

PSI had energy sales of 25,571 GWh in 1992, with 5,943 GWh (23%) sold to residential customers, 5,121 GWh (20%) sold to commercial customers, 8,338 GWh (32%) sold to industrial customers, and other types of customers accounting for 6,349 GWh (25%). Electricity sales for 1992 were down 5% from 1991. This decrease was due primarily to reduced sales for resale. PSI is a summer peaking utility with a 1992 peak demand of 4,533 MW and a summer generating capacity of 5,627 MW, creating a reserve margin of 24%. At the end of 1992, PSI had 4,262 employees.[R#1]

Energy sales revenues totaled \$1.0 billion for the year and the average electric rate for all customer classes was 4.16 ¢/kWh. The average electric usage per residential customer was 11,253 kWh. PSI has a fuel mix of 93.6% coal, 3.6% oil, 0.9% hydro, and 1.9% natural gas.[R#1,4]

PSI's service area had 5,148 heating degree days and 726 cooling degree days in 1992. The normals for the area are 5,681 heating degree days and 988 cooling degree days.[R#1]

At year end 1992, PSI had 613,000 total customers. Throughout the year the utility had an average of 530,920 residential customers, 72,274 commercial customers, and 2,990 industrial customers.[R#1]

PSI 1992 STATISTICS

Number of Customers	613,000
Energy Sales	25,751 GWh
Energy Sales Revenues	\$1.00 billion
Winter Peak Demand	4,034 MW
Summer Peak Demand	4,533 MW
Generating Capacity	5,627 MW
Reserve Margin	24 %
Average Electric Rates	4.16 ¢/kWh

On December 11, 1992 the merger of PSI Resources, Inc. (including PSI Energy) and the Cincinnati Gas & Electric Co. (CG&E) was unanimously approved by the companies' boards of directors. The merger is expected to be finalized in early 1994. CG&E will add 5,044 MW of generating capacity.[R#1,4]

Manufacturing is the dominant source of income for the state of Indiana, with the steel industry a major component. Other manufacturing products include musical instruments and diamond-tools. Agriculture and transportation (specifically trucking) are also major components of the economy.

The State of Indiana forms part of the east central lowlands that slope downward from the Appalachians to the Mississippi. Approximately 5/6 of its surface was modified by glacial action, leaving a vast quantity of excellent soil material and extensive deposits of sand gravel. The more eroded southern part of the state gives way to the central plain, an extremely fertile agricultural belt with large farms, and finally to the flat and heavily glaciated northern regions. Elevation in the state ranges from a high of 1,285 feet to a low of 313 feet. ■

Utility DSM Overview

On October 16, 1991 the Indiana Utility Regulatory Commission approved a settlement agreement between PSI Energy, the Office of the Utility Consumer Counselor, the Citizens Action Coalition, and certain industrial customers regarding PSI's DSM activities. This approval allowed PSI to begin full-scale DSM activities in 1992. Prior to 1992, PSI had minimal involvement with DSM activities. In 1990 the Smart Saver® program was introduced, and in 1991 a commercial audit program was introduced on a very small scale. PSI's current DSM programs are under the umbrella name "Energy Matters." [R#2,7]

PSI projects that DSM programs will reduce the utility's net revenue requirements (customer savings) by approximately \$225 million (1992 dollars) over the next 20 years. PSI estimates that its DSM programs will eliminate the need for one combustion turbine in 1994, two combustion turbines in 1995, and another one in 1999. [R#2]

PSI ENERGY DSM PROGRAMS

Residential

- Water Heater Efficiency
- Lighting Efficiency
- Electric Heat Efficiency

Smart Saver® Homes

- Low-Income Efficiency

Commercial / Industrial

- Commercial Energy Audit and Incentive
- Commercial Lighting - Direct Installation
- Industrial Efficiency Improvements
- Efficient Motors Plan
- Energy Awareness
- C&I Time-Of-Use Rates
- C&I Peak Reduction

The utility promoted its new DSM programs through billing statement stuffers, advertising, direct mail, and one-on-one meetings. In spite of the fact that 1992 was the first year PSI offered full-scale DSM activities, the combined program savings exceeded PSI goals with 22,661 MWh of energy savings and 36 MW of summer peak demand savings achieved. [R#2,3]

DSM Overview	<i>Annual DSM Expenditure (x1000)</i>	<i>Annual Energy Savings (GWh)</i>	<i>Annual Summer Peak Demand Savings (MW)</i>
1992	\$17,653	22.7	36.0
Total	\$17,653	22.7	36.0

When working with commercial and industrial customers interested in DSM, PSI representatives review the customer's facilities, operations, and previous electrical usage. Based on this comprehensive audit, PSI works with the company to customize an energy savings plan. This often involves tailoring incentives to help make specific equipment and/or programs financially feasible. In 1992, PSI performed 450 commercial audits and 56 industrial audits. [R#2]

The residential Smart Saver® Homes program (the subject of this profile) features homes with high efficiency heating and cooling systems which are constructed or retrofitted to meet standards for energy efficiency. These homeowners qualify for a special residential heating rate. [R#2]

PSI promoted air-source heat pumps throughout the 1980s, but geothermal heat pumps became a point of emphasis in 1987 as PSI's flagship product. When the Smart Saver® program began in 1990 it focused on heat pumps with an SEER of at least 9.5. During the first year of the program, ground-source heat pumps were the dominant technology. [R#4]

In September, 1991 PSI became the first utility in the Midwest and the eighth in the country to join EPA's Green Lights program (see The Results Center Profile #35). [R#2] ■

Program Overview

PSI's Smart Saver® program encourages improved residential energy efficiency. Homes that meet PSI's requirements for energy efficiency receive the Smart Saver® designation, a distinction that rewards homeowners with lower electricity rates. Both new and retrofitted homes are eligible. These requirements are based on the installation of a high efficiency heating and cooling system matched with properly designed duct work and insulation. Qualifying homes are eligible for a reduced electric rate as well as a satisfaction guarantee for the installed heating and cooling system. This program began in 1990 and a large majority of program participants are in the new home sector.[R#5]

In 1993, PSI added the Summer Saver® component to the Smart Saver® program. The Summer Saver® program applies to homes that have any kind of heating system and feature a high efficiency air conditioning system along with other energy-saving standards. This program is targeted at new home customers who do not have electric heat and the owners of the approximately 12,000 central air conditioner units that must be replaced each year.[R#5]

The Smart Saver® program was developed in 1989 and implemented in 1990. Until 1988, PSI had basically been "out of the market" in residential heating for several years. The proportion of the single-family new construction market selecting electric space heating had declined six years in a row. There was a similar situation in the existing home market as well. Many existing electric heat customers were switching to other fuels, primarily natural gas. The total number of single-family, electric-heat customers had leveled off and started to decline for the first time since the 1960s. More existing customers were converting electric heating systems to other fuels than were being added to the system with electrically heated new homes.[R#6]

System GT® (PSI's trademark name for its geothermal systems program used to promote the product,) was the only product that was making headway. However, because of higher installation costs, System GT® was not an option for the majority of the market. The challenge to PSI was to design a program in 1989 that would stabilize the saturation of electric heating in the residential sector, particularly the single family segment.[R#6]

Extensive research was conducted to determine customer needs and desires related to space conditioning. New home buyers and existing homeowners expressed to PSI three criteria as primary motivators in selecting heating systems: low operating costs, comfort, and energy efficiency. Installation cost was the next most important factor cited. Other factors included system safety, dependability, cleanliness, fuel availability, maintenance costs, and warranty. The Smart Saver® program was designed to address the first four motivating factors mentioned above.[R#6]

When the Smart Saver® program began, PSI had the dual goal of improving market share for residential home heating and slowing the growth of system peak. As the program progressed, the utility realized that the growth in residential cooling load needed addressing. Thus Summer Saver® was started in an attempt to leverage the success of Smart Saver® and reach a broader customer base.[R#4]

In April 1990, the Indiana Utility Regulatory Commission (IURC) approved PSI's high-efficiency electric heating rate as part of the Smart Saver® program, which offered customers a 30% rate reduction on electricity used for heating during the winter months. The program offered a comfort guarantee on Smart Saver® heat pumps. It also required high efficiency equipment and higher insulation levels in critical areas. These program components were designed to address customer desires for efficiency, comfort, and lower operating costs. PSI also made available to trade allies such as builders and heating contractors, various incentives to help defray incremental costs of the higher-efficiency equipment.

Since the program began, the percentage of new single-family construction selecting electric space heating has grown from 26% in 1989 to 42% in 1992. Almost 80% of these new electrically-heated homes have met the Smart Saver® efficiency standards. Hundreds of older heat pumps in existing homes have been replaced with high-efficiency Smart Saver® heat pumps.[R#6]

A contract subdivision program also provided a way to penetrate concentrated numbers of homes in the new single-family market. This program locks in incentive levels (usually premium priced) with builders or developers in return for building a threshold percentage of the homes in a development to Smart Saver® standards.[R#4,6] ■

Implementation

MARKETING

PSI actively markets its Smart Saver® home program with a sales force of more than 45 employees. Some leads are generated from new service requests, trade ally relationships, and customer calls. Other leads are generated through zoning, planning, homebuilders, and heating and cooling dealers' meetings.

The goal of the program is to encourage and assist residential home builders, manufactured home dealers, and apartment developers and owners to construct, display, advertise and sell/rent Smart Saver® homes, condominiums, manufactured homes, and apartments. In addition, existing homeowners and apartment owners are encouraged to retrofit their air-conditioning and/or electric-heating systems to Smart Saver® standards. [R#6]

PSI believes that the most efficient way to reach customers ready to buy heating equipment is through trade allies. In turn, the trade allies usually pass on to customers the PSI incentives through reductions in equipment prices. [R#6] PSI also promotes the program through bill inserts and some limited media advertising.

DELIVERY

HOMEOWNER INCENTIVES

Smart Saver® homes receive a special electric rate from October through May for monthly kWh consumption exceeding 1,000 kWh. [R#4,5]

If a PSI customer installs a heat pump system which meets Smart Saver® specifications and is not satisfied with the system after one year, PSI will replace the system with a system that uses any fuel the customer selects. [R#5]

Participating customers also receive a home energy upgrade provided by PSI. These upgrades are provided to all Smart Saver® and Summer Saver® participants. This upgrade includes: water heater insulation wrap and pipe insulation for homes with electric water heaters; low-flow

showerheads for homes with electric water heaters; heat traps for electric water heaters in new construction only; an infiltration test with caulking and sealing of major infiltration points; outlet and switch plate gaskets; and discounted compact fluorescent light bulbs. All of these services are provided for free, except for customers in existing homes who must pay \$4 per compact fluorescent bulb. [R#4,5]

Summer Saver® participants do not receive the reduced residential heating rate, but they do receive all other Smart Saver® benefits, including lower energy bills for heating and cooling.

BUILDER/DEVELOPER AND DEALER INCENTIVES

Builders/Developers and Dealers are eligible for a wide range of incentives through the Smart Saver® and Summer Saver® programs. These incentives include:

- \$200 for the installation of a high efficiency air conditioner or heat pump with a SEER (Seasonal Energy Efficiency Rating) of at least 11.0 as rated by the Air Conditioning and Refrigeration Institute (ARI).
- \$275 for the installation of a high efficiency air conditioner or heat pump with a SEER of at least 12.0 as rated by ARI.
- \$350 for the installation of a high efficiency air conditioner, heat pump, or geothermal heating and cooling system with a SEER of at least 13.0 as rated by ARI.
- \$100 for the installation of a desuperheater in conjunction with an air-to-air heat pump or geothermal heating and cooling system. A desuperheater captures excess heat produced by the heat pump or air conditioner and delivers it as a heat source to the water heater, supplying a large portion of the hot water needs during the summer and winter months.
- \$100 for the installation of low-E windows and exterior doors with a minimum insulation value of R-5.7. Note

that this incentive applies only to builders/developers.

Residential customers only receive direct incentives at the request of a trade ally.[R#4]

ELIGIBILITY REQUIREMENTS

- To qualify for Smart Saver® status, new or retrofitted homes must have a high efficiency electric heating and cooling system with a SEER of at least 11.0 as listed by ARI.

- New homes must be constructed to meet the state building code requirements for thermal insulation levels in the Indiana Energy Conservation Code. Ceiling insulation must be a minimum of R-38.

- Any home completed after January 1, 1990 must have an air supply system that meets the standards of the Air Conditioning Contractors of America (ACCA) Manual D.

- The duct system must meet air flow requirements for all living areas as determined by each room's heat loss/heat gain calculation requirements.

- Heating and cooling duct work must be installed within the heated envelope of the home. Ductwork outside the heated envelope must be insulated to a minimum of R-19.

- The heating and cooling system must be installed by a Refrigeration Service Engineer Society (RSES) certified technician.

- The home may have a home energy seal-up performed by PSI Energy or its agent. Homes with an electric water heater may also have a water heater wrap-up performed by PSI.

- It is recommended that installed glazing be low-E and exterior doors have a minimum insulation value of R-5.7.

- Summer Saver® homes may have any heating system but must have a high efficiency air conditioner with a SEER of at least 11.0 as listed by ARI. Otherwise, requirements for Summer Saver® homes are the same as Smart Saver® homes. Summer Saver® homes do not qualify for the special residential electric heating rate; that incentive applies only to Smart Saver® homes.[R#5]

To ensure that homes meet Smart Saver® standards, PSI or a PSI contractor will:

- Perform a heat loss/gain utilizing PSI HVAC cost or any other ASHRAE standard-based computer program on each home attempting to reach Smart Saver® standards.

- Ensure that all Smart Saver® homes have a duct design approved by the HVAC contractor or other PSI designated party.

- Perform an inspection on all Smart Saver® homes (pre dry wall and/or post construction).

With new construction, Smart Saver® homes add no additional time to the building process. The inspection and seal-up occur toward the end of the building cycle. Existing homes can qualify for Smart Saver® status once the unit is installed and has been inspected (usually within two weeks).[R#4]

TYPICAL SMART SAVER® AND SUMMER SAVER® PARTICIPANT SAVINGS

In 1992, a "standard" all electric home in PSI's service territory used 26,316 kWh and had an electric bill of \$1,337.87. Conversely, a home retrofitted to Smart Saver® standards (SEER 11) used an average of 21,317 kWh and had an electric bill of \$1,047.64. In the same year, new homes built to Smart Saver® standards used on average 20,021 kWh with an electric bill of \$1,007.33.

A "standard" PSI gas heated home used an average of 11,988 kWh with an electric bill of \$739.82 in 1992. Homes retrofitted to Summer Saver® standards (SEER 11) ➡

Implementation (continued)

consumed an average of 11,080 kWh and had an electric bill of \$700.08. New Homes constructed to Summer Saver® standards used an average of 10,766 kWh with an electric bill of \$687.71. [R#6]

MEASURES INSTALLED

Installed measures include high efficiency air conditioners and heat pumps (ground source heat pumps, air to air systems, add-on heat pumps), low-E windows, water heater insulation wraps and pipe insulation, low-flow showerheads and low-flow faucet aerators, heat traps, and outlet and switch plate gaskets. PSI offers an infiltration test with caulking, sealing, and doorsweeps provided. Program participants can also purchase compact fluorescent bulbs at reduced rates. [R#4,5]

STAFFING REQUIREMENTS

Currently there are 33 residential sales representatives, 12 sales assistants, 4 administrators, and 5 regional managers implementing the Smart Saver® program. Kirk

Hobbs is the General Manager for residential sales and he directs program implementation. Rich Philip is the Senior Market Manager and he devotes 3/4 of his time to designing and monitoring the program. Walt Stutz is Senior Market Manager, responsible for developing communications pieces and some program planning and development. [R#4,6]

There are approximately 500 builders and 400 heating and cooling dealers involved with the program as well. [R#4] ■

Monitoring and Evaluation

MONITORING

PSI monitors participation through its customer billing system since customers participating in the Smart Saver[®] program receive a special rate, which is noted on their bill. Similarly, participants in the Summer Saver[®] program are tracked by PSI's billing program.[R#6]

Program savings are based on engineering estimates combined with end-use load research. Three years ago PSI completed an end-use load study based on 90 sites which examined HVAC systems, water heating, etc. Currently the utility is performing a similar end-use study in order to update its savings estimate calculations.[R#6]

Each home is inspected by the contractor who does the seal-up service. Model numbers, insulation levels, etc. are checked at this time. The wrap-up and seal-up work is inspected on a random basis by another contractor.[R#4]

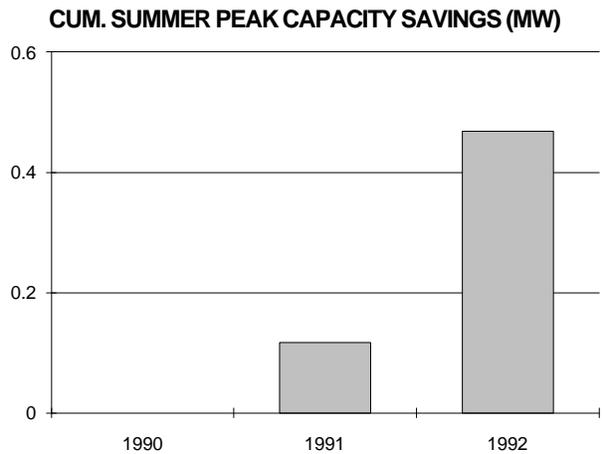
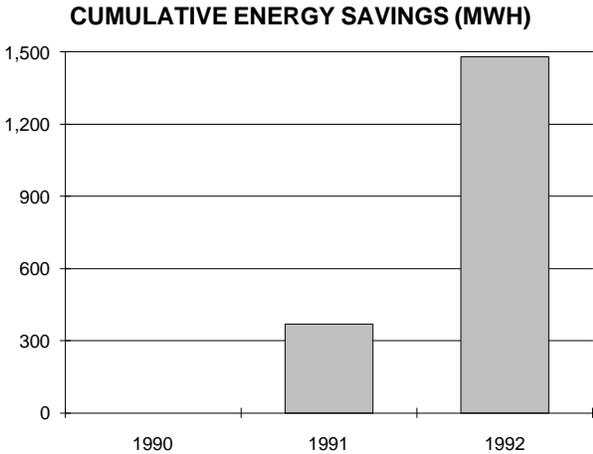
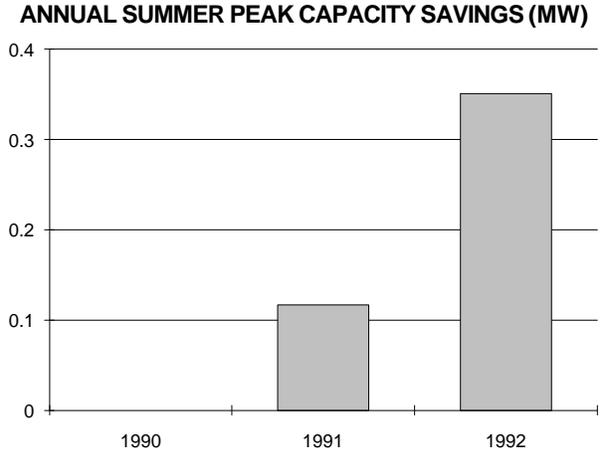
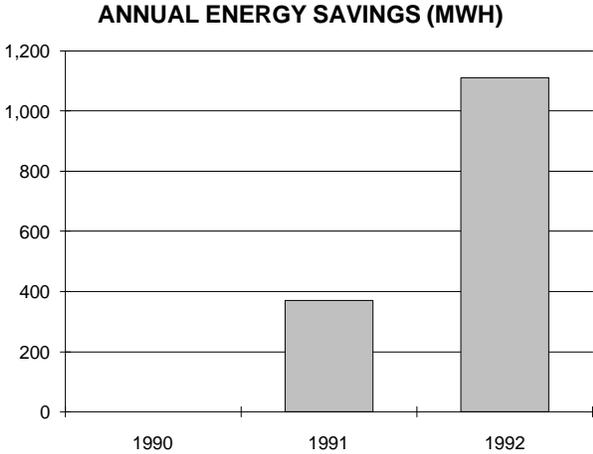
EVALUATION

PSI has not completed any formal process or impact evaluations covering the Smart Saver[®] program. The utility is currently planning both a process and impact evaluation and hopes to have these completed in 1994.[R#4,6] ■

Program Savings

Sytem GT® Savings Overview	<i>Annual Energy Savings (MWh)</i>	<i>Cumulative Energy Savings (MWh)</i>	<i>Lifecycle Energy Savings (MWh)</i>	<i>Annual Summer Peak Capacity Savings (MW)</i>	<i>Cumulative Summer Peak Capacity Savings (MW)</i>
1990	N/A	N/A	N/A	N/A	N/A
1991	370	370	5,550	0.117	0.117
1992	1,110	1,480	16,650	0.351	0.468
Total	1,480	1,850	22,200	0.468	

Data Alert: The savings figures presented in this section refer only to the System GT® portion of the program. (System GT® covers only new, single family ground source heat pumps, the only portion of the program for which PSI has been able to recover its costs.) Savings figures are based on engineering estimates coupled with end-use load research and have not been derated for free riders or other factors. [R#6]



Although the Smart Saver[®] program began in 1990, PSI only began to track savings in 1991 for ground source heat pumps (the System GT[®] portion of the program) which saved 370 MWh and 0.1 MW. Lifecycle energy savings for System GT[®] in 1991 total 5,550 MWh. In 1992, the System GT[®] component achieved annual savings of 1,110 MWh and 0.35 MW. Thus System GT[®] installations have saved a cumulative total of 1,850 MWh and 0.47 MW.[R#6]

The utility has calculated savings per installed measure for other aspects of the program. For instance, each retrofit air conditioning unit achieves annual savings of 740 kWh, retrofit heat pumps account for 4,381 kWh in savings, geothermal heat pumps save 12,799 kWh, new home heat pumps account for 4,999 kWh in savings, and new home efficient air conditioners save 840 kWh.[R#6]

Participation	Participants	Program Goal
1990 New Homes	395	450
1990 Retrofit	274	600
1991 New Homes	1,354	579
1991 Retrofit	919	974
1992 New Homes	2,075	1,424
1992 Retrofit	942	871
Total	5,959	4,898

PARTICIPATION RATES

PSI defines program participants as either new or retrofitted homes which meet Smart Saver[®] program requirements. From 1990 through 1992, a total of 3,824 new homes and 2,135 retrofitted homes participated in the program, for a grand total of 5,959 program participants. The program has exceeded PSI's participation goal (from 1990 through 1992) of 4,898 homes by 22%. The program has a maximum technical participation potential of 400,000 single family homes.[R#4,6]

During 1992, 2,075 new homes joined the program and 942 retrofitted homes qualified as Smart Saver[®] homes. Thus the total annual program participation of

Energy Savings per Installed Measure	Savings (kWh)	Payback Period (Yrs)
Retrofit Air Conditioning	740	2.7
Retrofit Heat Pump	4,381	1.1
Geothermal Heat Pump	12,799	7
New Home Heat Pump	4,999	1.6
New Home Air Conditioner	840	4.8

3,017 homes exceeded the program goal for the year of 2,295 homes. Note that each year approximately 200 System GT[®] installations have taken place.[R#6]

In 1992, 42% of newly constructed single-family homes selected electric space heating. Almost 90% of these new homes met the Smart Saver[®] efficiency standards. However, the program only reaches 6% to 7% of the existing home HVAC system replacement market.[R#6] For the Summer Saver[®] component there have been 455 new home participants and 814 retrofits through August 1993.[R#4]

FREE RIDERSHIP

There are several different types of installed measures and implementation requirements with the Smart Saver[®] program. As a result it is difficult to assess free ridership for the program as a whole. Instead, PSI is planning on evaluating free ridership on a measure by measure basis.[R#6]

MEASURE LIFETIME

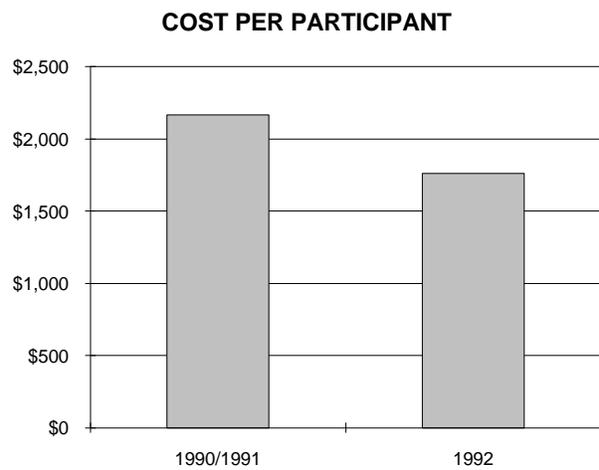
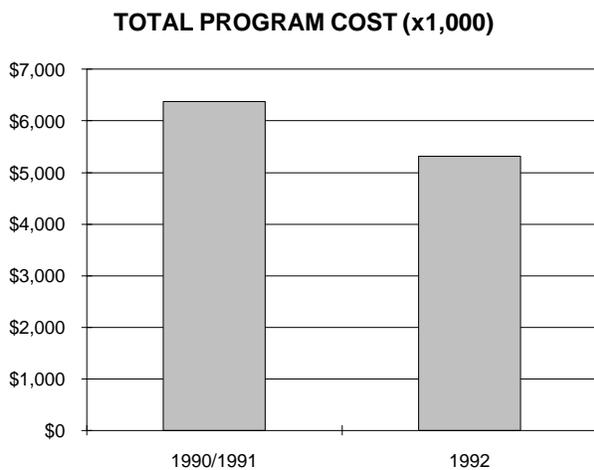
PSI assigns an average measure lifetime of 15 years to heat pump and air conditioning systems and all other measures installed through the program. The utility plans on assigning measure lifetimes to individual measures in the future.[R#4,6]

PROJECTED SAVINGS

The utility estimates the Smart Saver[®] program will achieve total annual savings of 80.9 GWh and 43.4 MW from 1993 through 2000, based on forecasted participation. These projected savings figures refer to all components of the Smart Saver[®] program.[R#4,6] ■

Cost of the Program

Total Program Costs	Incentives (x1000)	Contractors (x1000)	Advertising (x1000)	Other (x1000)	Total Program Cost (x1000)	Cost per Participant
1990/1991	\$1,939.3	\$0.0	\$1,001.9	\$3,440.6	\$6,381.9	\$2,169.24
1992	\$1,788.7	\$225.2	\$295.1	\$3,005.3	\$5,314.3	\$1,761.46
Total	\$3,728.0	\$225.2	\$1,297.0	\$6,446.0	\$11,696.2	



System GT® Cost of Saved Energy (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%
1991	19.73	21.18	22.69	24.25	25.85	27.51	29.21
1992	4.47	4.80	5.14	5.50	5.86	6.24	6.62
Average	8.28	8.90	9.53	10.18	10.86	11.55	12.27

Data Alert: The costs presented in this section refer to total program costs. Starting in 1993, PSI has included the Smart Saver[®] discounted electric rates as part of program costs. For 1990 through 1992, discounted rates were not included with program costs. In addition, costs for 1990 and 1991 have not been levelized as they have not been separated by year.[R#6]

PSI spent \$5,314,300 on the Smart Saver[®] program in 1992 and a grand total of \$11,696,200 has been spent on the program since it began in 1990.

The utility estimates that the Smart Saver[®] program will cost \$7,858,970 in 1993. The utility projects program costs to total \$30,197,402 for 1994 through 1997, with annual costs fluctuating between \$7.3 and \$7.9 million.[R#6]

COST EFFECTIVENESS

PSI estimates that customer payback periods range from 1.1 years for retrofit heat pumps, to 1.6 years for new home heat pumps, to 2.7 years for retrofit air conditioners, to 4.8 years for new home air conditioners, and 7 years for geothermal heat pumps.[R#6]

For 1992, The Results Center has calculated a cost of saved energy for the System GT[®] component of the program only (using savings and costs values for this component only) of 5.14 ¢/kWh at a 5% discount rate. Using this methodology the average cost of saved energy for 1991 and 1992 is 9.53 ¢/kWh. Note that PSI focuses program goals on the number of participating homes and not energy savings.

COST PER PARTICIPANT

In terms of customer incurred costs, PSI estimates that in new homes the equipment incentives of \$200 for SEER 11 equipment often cover the incremental equipment and insulation costs compared to standard equipment. The incentives of \$275 and \$350 for SEER 12 and 13 equipment cover a much smaller percentage of incremental costs, but the incremental benefits do not warrant higher

incentives. In existing homes, the \$200 SEER 11 incentive usually covers half of the incremental cost if additional duct work insulation is necessary. If no ductwork insulation is required, the incentive covers the incremental costs a majority of the time.[R#6]

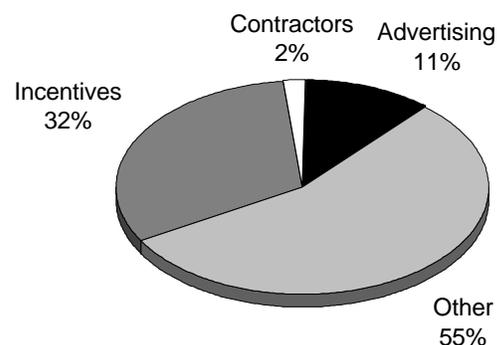
When considering total program costs, the average cost per participant (using total participants) incurred by PSI over the lifetime of the program is \$1,962. For 1990/1991 the average cost per participant was \$2,169, but dropped to \$1,761 in 1992.

COST COMPONENTS

PSI has spent a total of \$11,696,200 on the Smart Saver[®] program. Of this amount, incentives account for \$3,728,000, contractor costs total \$225,200, advertising expenditures were \$1,297,000, and miscellaneous expenses totaled \$6,446,000. Note that miscellaneous expenses include equipment and labor costs.[R#6]

In 1991, PSI spent \$871,293 on the new, single family, geothermal heat pump portion of the program. Costs for this component of the program dropped to \$592,495 in 1992.[R#6]

For 1993, the utility estimates that incentive costs will total \$1,899,450, seal-ups will cost \$849,225, fixed costs will be \$3,356,715, and reduced customer rates as a result of program participation will cost \$1,553,580 for the year.[R#6] ■



Environmental Benefit Statement

AVOIDED EMISSIONS: Based on 1,850,000 kWh saved 1990 - 1992

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
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Coal Uncontrolled Emissions

A	9,400	2.50%	3,989,000	95,000	19,000	2,000
B	10,000	1.20%	4,253,000	37,000	12,000	9,000

Controlled Emissions

A	9,400	2.50%	3,989,000	9,000	19,000	0
B	10,000	1.20%	4,253,000	4,000	12,000	1,000
C	10,000		4,253,000	24,000	12,000	1,000

Atmospheric Fluidized Bed Combustion

A	10,000	1.10%	4,253,000	11,000	6,000	3,000
B	9,400	2.50%	3,989,000	9,000	8,000	1,000

Integrated Gasification Combined Cycle

A	10,000	0.45%	4,253,000	8,000	1,000	3,000
B	9,010		3,826,000	3,000	1,000	0

Gas Steam

A	10,400		2,320,000	0	5,000	0
B	9,224		2,015,000	0	13,000	1,000

Combined Cycle

1. Existing	9,000		2,015,000	0	8,000	0
2. NSPS*	9,000		2,015,000	0	4,000	0
3. BACT*	9,000		2,015,000	0	1,000	0

Oil Steam--#6 Oil

A	9,840	2.00%	3,358,000	51,000	6,000	6,000
B	10,400	2.20%	3,561,000	50,000	8,000	4,000
C	10,400	1.00%	3,561,000	7,000	6,000	2,000
D	10,400	0.50%	3,561,000	21,000	8,000	1,000

Combustion Turbine

#2 Diesel	13,600	0.30%	4,457,000	9,000	14,000	1,000
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Refuse Derived Fuel

Conventional	15,000	0.20%	5,291,000	14,000	18,000	4,000
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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 accompanying page is to allow any user of this profile to apply PSI Energy's level of avoided emissions saved through its System GT[®] component of the Smart Saver[®] Homes 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 / Transferability

LESSONS LEARNED

The most basic lesson learned from the program is that the theory of supply and demand works in terms of transforming the marketplace. PSI has found that the high incremental costs of energy-efficient equipment are greatly reduced once the demand for such equipment increases. When the utility has raised the efficiency requirements for the program, there has typically been a large differential between the cost of the energy-efficient equipment and standard equipment. As customers participate in the Smart Saver[®] program and purchase the energy-efficient equipment, the equipment price quickly drops. [R#6]

Since the beginning of the Smart Saver[®] program, PSI has provided participants with a comfort guarantee. Until the summer of 1993, PSI had received virtually no complaints from participants regarding the comfort of their homes. During the summer of '93, however, there were more calls than in previous years. PSI attributes this increase in complaints to the fact that the weather was exceptionally mild in Indiana from 1990 through 1992, while the summer of 1993 was unusually hot and humid. Nonetheless, the utility has only had to exercise no more than 8 comfort guarantees. [R#4,6]

PSI has found measuring the air flow in customers' homes to be extremely challenging. The equipment used by the utility to measure air flow has a degree of accuracy of plus or minus 25%. More specifically, the utility found that the measuring equipment was least accurate in smaller rooms. PSI has not invested in more accurate equipment due to incremental costs reaching thousands of dollars. Similarly, PSI has found that some customers whose homes test out very well in terms of air flow complain of discomfort, while other customers whose homes test poorly are very satisfied. [R#6]

A major challenge that has always faced the program is the low priority that new homebuyers place on HVAC equipment. Buyers tend to assume that any new system will be better than their existing system. [R#6]

TRANSFERABILITY

PSI's Smart Saver[®] program is relatively unique in that it emphasizes not only ground source heat pumps but other efficiency measures as well. Ground source heat pumps are not as yet a very widespread technology, especially in the residential sector. (See The Results Center Profile #59) ■

Regulatory Incentives 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. (Note that the dollar values in this section have not been levelized.)

INDIANA OVERVIEW

In April of 1990 the Indiana Utility Regulatory Commission opened a formal docket to address DSM issues as they relate to PSI Energy. In response to the Commission's order, PSI Energy collaboratively developed a package of 16 DSM programs, a proposal for the recovery of lost revenues, and a proposed shared-savings mechanism which was submitted to the Commission in a Settlement Agreement in May 1991. In October 1991, the Commission accepted and approved the settlement. [R#9]

In August of 1990, the Indiana Utility Regulatory Commission issued a notice of proposed rulemaking for integrated resource planning (IRP) guidelines. Three utilities in the state, including PSI Energy, were ordered to submit IRPs as a result of rate cases or certificate of need proceedings. (The certificate of need process in Indiana has also been used to require utilities to compare proposed capacity with other options.) All three utilities did subsequently file IRPs. [R#9]

TREATMENT OF DSM EXPENDITURES

In the April 1990 order the Commission indicated that it would allow PSI Energy to recover reasonable and prudent DSM expenditures. PSI Energy was to use a deferred account established in the April 1990 order until the utility's next general rate case which is scheduled for late 1993. Carrying charges are applied to the deferred balance. At the time of the settlement, PSI was spending on the order of \$2 million per year on DSM and all costs above this have been put in the deferred account. Now the utility projects its annual DSM expenditures to be on the order of \$30 million per year, and if approved by the Commission this amount will be collected each year from rates and used to pay for PSI's DSM efforts pending annual reviews for prudent expenditures. [R#6,9]

TREATMENT OF LOST REVENUES AND SHAREHOLDER PROFITABILITY

In May of 1991, PSI Energy submitted a collaboratively developed shared-savings incentive mechanism and proposal for recovery of lost revenues. A hearing was held in August of 1991 and in October of the same year, the Commission accepted and approved the PSI stipulation agreement in its entirety without change or additional conditions.

The collaborative included PSI Energy, the Office of the Utility Consumer Counselor, Citizens Action Coalition of Indiana, Industrial Energy Consumers, Designated Industrial Consumers of Energy, and General Motors Corporation. In response to an April 1990 order, PSI collaboratively developed 16 DSM programs and a proposed shared savings mechanism. ☞

Regulatory Incentives (continued)

Under the terms of the agreement PSI Energy would be allowed to earn 10% of the net value of savings resulting from the DSM programs. Net savings would be calculated as avoided costs minus program costs and lost revenues and would take into consideration actual customer participation levels. (Note that the settlement agreement approved by the Commission did not include curtailable, interruptible, and time-of-use rates in the calculation of the incentive.)

In addition to 10% of net savings, PSI Energy could earn up to another 10% of savings based on 1995 peak demand savings. For example, if PSI demonstrates annual peak demand savings of 65-68 MW, the utility will earn a 1% additional shared savings incentive. Similarly, if the utility achieves 85 MW or more of annual peak demand savings, it will earn a 10% additional shared-savings incentive. [R#9]

SPECIFIC TREATMENT OF SMART \$AVER® HOMES AND SUMMER \$AVER® HOMES

To date the Commission has approved only one component of the programs for cost recovery and shareholder incentives. This segment, as discussed in the Savings and Cost section, is the new single family, ground source heat pump component of the program. All other components of the program are essentially considered marketing expenses by the Commission and are only eligible for partial cost recovery. [R#9] ■

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