

---

# Wisconsin Electric Appliance Turn-In Program Profile #24, 1992

---

<b>Executive Summary</b>	<b>2</b>
<b>Utility Overview</b>	<b>3</b>
<i>Wisconsin Electric 1991 Statistics Table</i>	
<b>Utility DSM Overview</b>	<b>4</b>
<i>1992 DSM Programs at Wisconsin Electric Table; Utility DSM Overview Table; Annual DSM Expenditure (chart); Annual Energy Savings (chart); Annual Capacity Savings (chart)</i>	
<b>Program Overview</b>	<b>6</b>
<i>Appliance Summary Table</i>	
<b>Implementation</b>	<b>7</b>
<i>Marketing; Delivery; Staffing Requirements</i>	
<b>Monitoring and Evaluation</b>	<b>8</b>
<i>Monitoring; Evaluation; Data Quality</i>	
<b>Program Savings</b>	<b>10</b>
<i>Savings Overview Table; Annual Energy Savings (chart); Cumulative Energy Savings (chart); Annual Capacity Savings (chart); Cumulative Capacity Savings (chart); Participation Rates; Customer Participation Table; Savings per Participant (chart); Participation (chart); Measure Lifetime; Projected Savings</i>	
<b>Cost of the Program</b>	<b>12</b>
<i>Costs Overview Table; Total Incentive Cost (chart); Cost per Participant (chart); Cost of Saved Energy Table; Cost Effectiveness; Cost per Participant; Free Ridership; Cost Components; Incentive Cost Components (chart)</i>	
<b>Environmental Benefit Statement</b>	<b>14</b>
<i>Avoided Emissions Analysis Table; Utility-Specific Avoided Emissions</i>	
<b>Lessons Learned / Transferability</b>	<b>16</b>
<b>Regulatory Incentives / Shareholder Returns</b>	<b>17</b>
<b>References</b>	<b>19</b>

---

# Executive Summary

Wisconsin Electric's Appliance Turn-In Program (APTI) began in 1987 as part of the utility's comprehensive Smart Money program. APTI was the nation's first large scale residential appliance turn-in program. The goal of the program is to get underutilized but operable second refrigerators, freezers, and room air conditioners out of service and properly dismantled. These appliances are removed by Wisconsin Electric at no charge and in return, the customer receives their choice of a \$25 check or \$50 U.S. savings bond for a room air conditioner, and a \$50 check or \$100 U.S. savings bond for a refrigerator or freezer.

Through 1991, over 240,000 residential appliances have been picked up and properly dismantled through APTI. Refrigerators account for around 60% of the appliances turned in, while room air conditioners account for 30%, and freezers account for 10%. All of the collected appliances are recycled. Metal components are recycled and the refrigerants, which contain chlorofluorocarbons (CFCs), are drained and stored for re-use. Over 30 tons of CFCs have been recovered from old appliances. All appliance capacitors are removed at a processing facility and sent to an EPA-approved facility to be destroyed.

Helping the environment while helping the customer financially is the basic theme of the APTI program's marketing push. Wisconsin Electric has used media advertising for the program, has placed program information in new appliance dealer showrooms, has benefitted from word of mouth, and continues to run bill inserts to educate its customers about the program and its 800 telephone number. The actual delivery of the program is carried out by 8 to 10 cartage contractors who test and then pick up the used appliances, and take them to a dismantling facility located in Milwaukee.

From 1987 to 1991 the Appliance Turn-In Program has resulted in demand savings of 20.8 MW and energy savings of 62.9 GWh. In 1991, the program produced demand savings of 5.2 MW and 8.2 GWh of energy savings. More than \$10 million in incentives have been paid out since the inception of the APTI program.

Wisconsin Electric estimates that the APTI program has avoided burning the electrical demand of the old appliances. In addition, over 452 tons of sulfur dioxide emissions, which are a primary cause of acid rain, were avoided. Wisconsin Electric estimates that if all the appliances gathered by the APTI program were buried in one landfill, the landfill would cover 10 acres and be 15 feet deep!

## Appliance Turn-In

Utility:	Wisconsin Electric
Sector:	Residential
Measures:	Removal and dismantling of old refrigerators, freezers and room air conditioners
Mechanism:	Cash incentives for free appliance removal
History:	Started in 1987, over 240,000 appliances picked up so far.

## 1991 Program Data

Energy savings:	8.2 GWh
Lifecycle energy savings:	90 GWh
Capacity savings:	5.2 MW
Incentive cost:	\$1,484,100

## Cumulative Data (1987 - 1991)

Energy savings:	195.2 GWh
Lifecycle energy savings:	692.6 GWh
Capacity Savings:	20.8 MW
Incentive cost:	\$10,739,000
Participation rate:	25%

## Conventions

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

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

# Utility Overview

---

Wisconsin Electric Power Co. is the principal subsidiary of Wisconsin Energy Corporation, along with Wisconsin Natural Gas Co., and five nonutility subsidiaries. The headquarters for Wisconsin Energy Corporation are located in Milwaukee, Wisconsin. Wisconsin Electric's service area includes portions of southeastern, central, and northern Wisconsin. Service is provided to the Upper Peninsula of Michigan and also includes metropolitan Milwaukee. The service territory serves a population of more than 2 million, and Wisconsin Electric has more than 900,000 customers. Over 5,000 people are employed by Wisconsin Energy. [R#1,4]

Energy sales for Wisconsin Electric in 1991 were 25,016 GWh, creating \$1.2 billion in revenues. Of the energy sold by Wisconsin Electric, 61.5% came from fossil fuels, 27.6% came from nuclear power, 9.3% came from purchased and interchanged energy, and 1.6% was from hydroelectric power. Residential customers bought 6,587 GWh while small commercial and industrial customers purchased 6,153GWh. The large commercial and industrial sector accounted for the largest percentage of sales, buying 9,462 GWh. The rest (2,814 GWh) was sold to wholesale municipal customers. Peak demand for the year was 4,797 MW, while peak generating capacity at the time of peak demand was 4,769 MW. The zero reserve margin was covered by purchased energy. [R#4]

Wisconsin Electric has made several organizational changes in response to competition from new nonutility entrants in the power generation arena. A two-part strategy

## WISCONSIN ELECTRIC 1991 STATISTICS

Number of Customers	901,262
Energy Sales	25,016 GWh
Energy Sales Revenue	\$1.238 billion
Peak Demand	4,797 MW
Generating Capacity	4,769 MW
Reserve Margin	0 %
<b>Average Electric Rates</b>	
Residential	6.77 ¢/kWh
Small Commercial & Industrial	5.91 ¢/kWh
Large Commercial & Industrial	3.94 ¢/kWh

[R#1,4]

has been adopted which focuses on both helping current customers become as energy-efficient as possible and building new power sources. Plans for additional power sources include building "peaking" plants designed to handle peak daytime electricity demand. Wisconsin Electric's 1991 Strategic Plan calls for the company to "continue to develop, expand and support recycling and other by-product utilization, energy conservation and pollution prevention programs." [R#4,15]

# Utility DSM Overview

Wisconsin Electric significantly expanded its involvement with DSM programs in 1987. Most of Wisconsin Electric's DSM programs fall under the Smart Money Energy Programs umbrella. The Smart Money Program is one of the largest conservation programs in the country on a per customer basis, and it has received numerous state and national awards. Between 1987 and 1992, DSM programs at Wisconsin Electric have reduced net demand by over 270 MW, thus forestalling future needs for new powerplant capacity. Since 1987 commercial and industrial customers have completed over 92,000 DSM projects through Smart Money, and residential customers have made more than 725,000 energy efficiency improvements. Total DSM costs in 1991 for Wisconsin Electric were 3.2% of 1991 total revenues. Since first implementing DSM programs in 1987 Wisconsin Electric has never spent less than 3.0% of total annual revenues on its DSM programs. Wisconsin Electric predicts that in the year 2000, DSM programs will have reduced annual demand by 10% from what would have been expected otherwise.[R#1,2]

<b>Utility DSM Overview Table</b>	<b>Annual DSM Expenditure (x1000)</b>	<b>Annual Energy Savings (GWh)</b>	<b>Annual Capacity Savings (MW)</b>
1987	\$36,892	66	21
1988	\$54,384	213	46
1989	\$45,874	174	45
1990	\$46,411	240	60
1991	\$38,573	161	47
<b>Total</b>	<b>\$222,132</b>	<b>854</b>	<b>219</b>

## **1992 DSM PROGRAMS AT WISCONSIN ELECTRIC**

### **RESIDENTIAL SMART MONEY PROGRAMS**

Rebate

#### **Appliance Turn-in**

Load Management

Direct Sale of Compact Fluorescent Lamps

### **COMMERCIAL/INDUSTRIAL SMART MONEY PROGRAMS**

Retrofit/Replacement Rebate and Loan

New Construction Rebate and Loan

Instant Rebates

Flexible Financing Option

Energy Service Company Assistance

Load Management

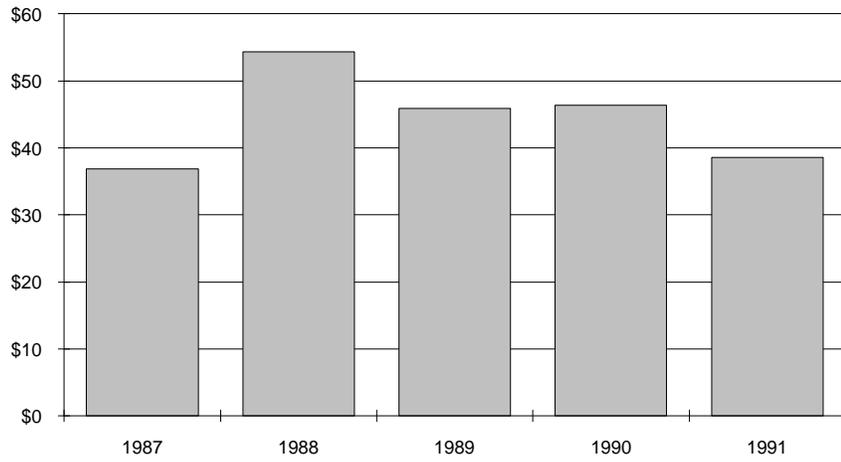
### **OTHER DSM PROGRAMS**

Energy Partners--Central Air Load Control & Water Heater Direct Load Control

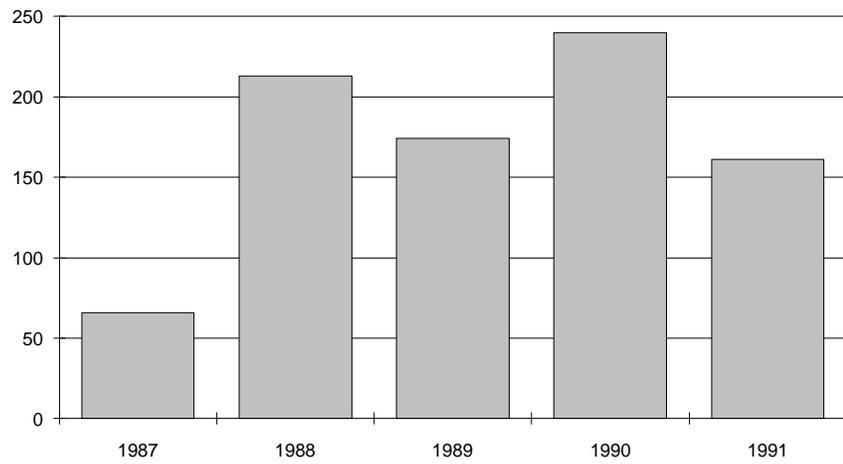
DSM Programs under the Smart Money Energy Program had impressive achievements in 1991. More than 81,000 residential and commercial customers participated in close to 147,000 projects. Approximately 49,000 lighting measures were installed with net benefits of over \$19 million. In addition, Wisconsin Electric's Appliance Turn-In program gathered more than 40,000 appliances. 1991 Smart Money programs accounted for 160,000 tons of avoided carbon dioxide emissions, and Wisconsin Electric coal purchases were reduced by 76,000 tons.[R#2]

The DSM expenditures shown in the DSM Overview Table reflect energy efficiency programs and load management programs. However, capacity savings due to certain load management programs (which are, in essence, rate options) are not included in figures shown in the table. Between 1987 and 1991, these load management programs (including Interruptible Rates, Curtailable Rates, and the Water Heater Direct Load Control Program), have generated total capacity savings of approximately 70 MW.[R#2]

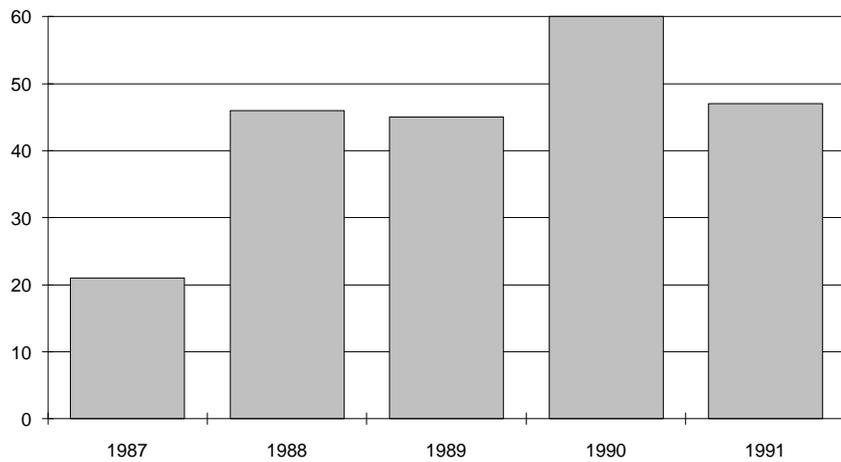
**ANNUAL DSM  
EXPENDITURE  
(\$1,000,000)**



**ANNUAL ENERGY  
SAVINGS (GWH)**



**ANNUAL CAPACITY  
SAVINGS (MW)**



# Program Overview

---

The Appliance Turn-In Program (APTI) began in 1987 as part of Wisconsin Electric's Smart Money Energy Program. The Appliance Turn-In program was the nation's first large scale residential appliance turn-in program. The concept behind the APTI program was to remove old, inefficient, operable refrigerators, freezers, and room air conditioners from customers' homes in order to conserve energy. Wisconsin Electric's forecasting group estimated that in 1987, 30% of residential customers owned a second refrigerator.

Wisconsin Electric requires that program participants be residential customers, located in Wisconsin Electric's service area, and the turn-in unit must be an electric, functioning appliance. Commercial, electric/gas combination units, and dorm-size refrigerators (under six cubic feet) are not eligible. The qualifying appliance is removed by Wisconsin Electric at no charge to the customer. In return, the customer receives their choice of a \$25 check or \$50 U.S. savings bond for a room air conditioner or a \$50 check or \$100 U.S. savings bond for a refrigerator or freezer. Households are limited to a turn-in of two of each type of appliance. The purchase of a new appliance is not required for participation in the APTI program. Wisconsin Electric will remove appliances that do not work, but the customer does not receive a rebate. If, on the other hand, the appliance works but cannot be removed, Wisconsin Electric will disable the appliance, and the customer will still receive a rebate.

Through 1991, over 240,000 residential appliances have been picked up through APTI. Refrigerators account for around 60% of the appliances turned in, while room air conditioners account for 30%, and freezers account for 10%. All of the collected appliances are recycled. Metal components are recycled and the refrigerants, which contain chlorofluorocarbons (CFCs), are drained and stored for re-use. Appliance capacitors are removed and sent to an EPA approved facility to be destroyed. Over 30 tons of CFCs have been recovered from old appliances. The CFCs embedded in the foam of refrigerators are not currently removed because the process is not economically feasible, but Wisconsin Electric is watching technological developments in the hope of someday being able to remove all CFCs.

Wisconsin Electric estimates that the APTI program has led to the avoided burning of over 33,000 tons of coal by removing the electrical demand of the old appliances. In addition, over 452 tons of sulfur dioxide emissions, a primary cause of acid rain, were avoided. Wisconsin Electric estimates that if all the appliances gathered by the APTI program were buried in one landfill, the landfill would cover 10 acres and be 15 feet deep! [R#8]

Appliance Summary	Refrigerators		Freezers		Air Conditioners		Total
	Number Turned In	% of Total	Number Turned In	% of Total	Number Turned In	% of Total	
1987	37,741	58%	7,809	12%	19,521	30%	65,071
1988	14,882	55%	2,581	10%	9,496	35%	26,959
1989	31,860	60%	6,479	12%	14,353	27%	52,692
1990	32,784	57%	7,772	14%	16,783	29%	57,339
1991	17,702	44%	0	0%	22,135	56%	39,837
Total	134,969	56%	24,641	10%	82,288	34%	241,898

# Implementation

---

## MARKETING

In 1987 Wisconsin Electric began a mass media advertising campaign for APTI which included TV, radio, and newspaper ads. In addition, bill inserts were used to promote APTI. Wisconsin Electric continues to use a mass media approach to marketing, gearing their ads toward the demographics of second refrigerator owners. Bill inserts have consistently increased in marketing importance, both as a source of information about the program and as a means of influencing program participation. Word-of-mouth also is an important source of program information.

Wisconsin Electric has also experimented with placing stickers which describe the turn-in program on new appliances at appliance dealers. The stickers are designed to increase awareness when a customer is replacing their existing unit with a new one. [R#7,8] Smart Money also has a rebate guide that lists the Appliance Turn-In Program as one of the many options for rebates offered by the utility. [R#5]

**“With just one phone call, Jane got \$50, saved \$75 and helped save the earth.**

**Jane got her old refrigerator hauled out of her basement for free. By unplugging her inefficient old unit, she saved energy and about \$75. Jane helped save the environment. Jane got \$50 cash for her old, operating refrigerator. Jane had lots of time left in her day to relax.**

**All you have to do is lift the receiver! All units collected by Wisconsin Electric will be recycled. The refrigerant will be recycled; the capacitors safely disposed of; and the metal sorted, shredded and reused.” [R#6]**

The new appliance rebate and the Appliance Turn-In service are separate products. Customers must request the turn-in service separately. To participate in the Appliance Turn-In Program, customers must call the “Smart Money Energy Line” in Milwaukee. Customers outside of the Milwaukee area can use an 800 number to request to participate in the program. No order form is necessary.

## DELIVERY

The actual appliance turn-in process is very systematic and begins when a customer calls in to request the removal of an appliance. During the phone conversation, the customer’s name is cross referenced on the Customer Information System, at which point a customer eligibility check is run. The customer tells Wisconsin Electric whether they want a check or a savings bond. Wisconsin Electric then sends a confirmation letter, telling the customer which cartage company will be picking up their appliance. A work order is sent to the cartage contractor. The cartage contractor schedules a removal date at which time the contractor verifies that the appliance is operational. The appliance is removed from the customer’s house and taken to a dismantling center, where the capacitors and refrigerant are removed.

All appliances are taken to a single dismantling facility in Milwaukee. Fifty percent of Wisconsin Electric’s customers live in the Milwaukee area, making the location of the dismantling facility ideal. Appliances gathered outside of Milwaukee are collected and trucked into the city for dismantling. After dismantling, appliances are then transported to a metal recycling company. Finally, work orders are sent from the cartage contractors to Wisconsin Electric so that payment can be made to customers and contractors. Checks or savings bonds are mailed to customers within four to six weeks from the date that the appliances are picked up. [R#3]

## STAFFING REQUIREMENTS

Staffing for APTI has steadily decreased since 1987 as the program has been refined. Wisconsin Electric considers the program to be stable in its design and function. Staffing also has been affected by the changing number of appliances turned in each year. Wisconsin Electric is constantly addressing its staffing needs for the program in an attempt to use the smallest staff necessary. Currently Wisconsin Electric employs eight to ten cartage contractors, and one white goods disposal company. In addition, the utility has hired a contractor to provide temporary service for phone and operations activities. A marketing services specialist operates the program, with assistance from the new product, public affairs, market research, and evaluation areas.

# Monitoring and Evaluation

---

## MONITORING

The monitoring of the APTI program differs from that required for typical rebate programs. The aim of monitoring for the APTI program is to ensure that: (1) only units from WE's service area are turned in; (2) turned in appliances are operational; and (3) turned in appliances cannot be returned to service. Additionally, Wisconsin Electric carefully monitors the names and addresses of customers receiving checks and savings bonds to ensure that the turn-in limit is not exceeded. The database system at Wisconsin Electric contains a control mechanism which notes the previous participation of customers in the APTI program. Phone surveys are used to gather customer feedback on the APTI program.

Wisconsin Electric also carefully monitors its cartage contractors. Security checks are run on all cartage contractor personnel who enter customers' homes. Wisconsin Electric conducts formal training with all cartage contractor employees. The contractors receive weekly feedback reports from Wisconsin Electric, which include customer compliments and complaints.

## EVALUATION

Wisconsin Electric has greatly expanded its DSM program evaluation since 1987. The 1992 evaluation budget of over \$1 million is more than double 1991 evaluation expenditures. Before 1989, most of Wisconsin Electric's evaluation efforts focused on process and market evaluation issues such as advertising effectiveness, customer satisfaction, customer response, and whether products were reaching the targeted markets. In 1989, evaluation efforts became more focused towards the product development, delivery, and implementation process. Specific study topics included market segmentation, trade ally response, and appropriate incentive levels. A 1990 process evaluation focused on demographic attributes of customers and customer awareness of the APTI program. Evaluation efforts initiated in 1991 that will continue in the future will: provide estimates and ranges of the demand

and energy impacts of the products offered under each program; evaluate persistence and reliability issues; and assess the process and marketing components of the products.

Specifically, Wisconsin Electric developed a detailed impact and process evaluation plan in 1991, geared towards the future. This Evaluation Plan covers all of the products offered under the Smart Money Energy program. The segment of the Evaluation Plan devoted to the APTI program will focus on the net and gross peak summer demand reductions, annual energy savings by measure and the program as a whole. The APTI evaluation plan will also seek to determine the potential of increasing program participation and evaluate continued program implementation. Environmental impacts of the turn-in program will also be studied. The comprehensive APTI evaluation is scheduled to begin in 1993 and end in 1993/1994.

Wisconsin Electric's "1991 Annual Evaluation Report for Wisconsin Electric's Demand-Side Management Programs" provides comprehensive results from the APTI program for 1987 through 1991. The 1991 Evaluation Report includes APTI information such as program benefits and costs, and many of the evaluation results are located throughout this profile, especially within the program costs and savings sections. [R#2]

## DATA QUALITY

Energy savings and capacity savings shown in the Savings Overview Table report net impacts. Wisconsin Electric defines net impacts as the estimated demand and energy savings at the power plant level (before transmission and distribution line losses) adjusted for free riders. [R#2]

---

Wisconsin Electric recognizes that only in some instances can it be assumed that energy and demand savings are 100% for each refrigerator that is removed from a participating customer's household. For example, the refrigerator that has been turned in to the utility may be the household's primary unit which has now been replaced either by a typical new refrigerator or a high-efficiency unit. Another possibility is that the household has two refrigerators: the secondary unit is turned in to the utility and is replaced by the primary kitchen unit, which in turn is replaced by a newly purchased unit. Finally, a secondary unit may have been turned in to the utility that was not replaced by any other unit (obviously the most desirable outcome from the utility's perspective). Wisconsin Electric utilized a decision tree analysis which attached probabilities to the possible actions by customers participating in an appliance removal program. Savings are discounted further to take into account units that are considered close to failure or would be disposed of even in the absence of the program.

Program savings are calculated as the present value of the weighted average of the estimated life cycle demand and energy savings, based on the decision tree method, using the company's avoided demand and energy costs. In 1992, the company assumed 526 kWh per unit net annual savings for single family and multi-family refrigerator units.

Similar approaches were used to estimate the impact of removing old room air conditioners and old freezers, to reflect whether such units are replaced by other similar units or in the case of the room air conditioner, are replaced by a central air unit.

The Results Center calculation of the cost of saved energy used the net annual savings as shown in the Savings Overview Table, incentive costs, as shown in the Cost Overview Table, and a lifetime of 11 years for each year of the program. Thus the "net" savings presented tend to be conservative, while the costs, which omit administrative costs, are similarly underestimated.

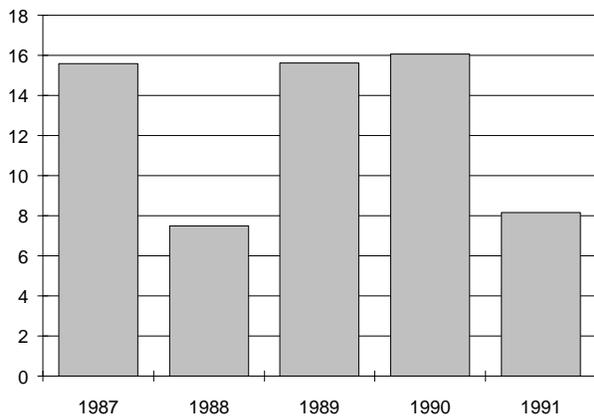
In 1992, Wisconsin Electric used a lifetime of 11 years for refrigerators, air conditioners, and freezers. Lifetime assumptions have varied somewhat since the inception of the program as new information has become available. In this profile a lifetime of 11 years was assumed. Measure lifetime drives both lifecycle savings, and the cost of saved energy.

Please note that the numbers in this profile that relate specifically to the Appliance Turn-In program reflect only the residential sector. Participation from other sectors is minimal.

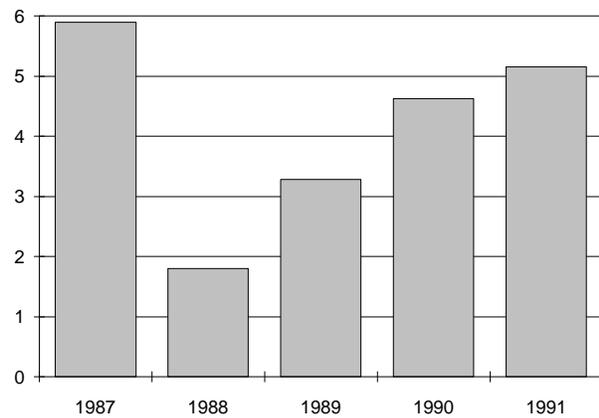
# Program Savings

Savings Overview Table	Annual Energy Savings (MWh)	Cumulative Energy Savings (MWh)	Lifecycle Energy Savings (MWh)	Annual Capacity Savings (MW)	Cumulative Capacity Savings (MW)
1987	15,593	15,593	171,523	5.9	5.9
1988	7,492	23,085	82,412	1.8	7.7
1989	15,637	38,722	172,007	3.3	11.0
1990	16,061	54,783	176,671	4.6	15.6
1991	8,184	62,967	90,024	5.2	20.8
Total	62,967	195,150	692,637	20.8	

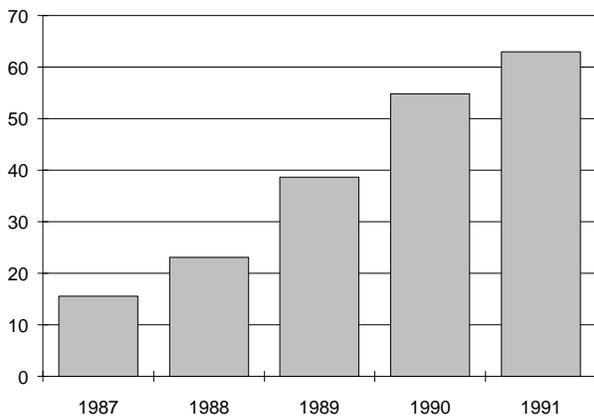
**ANNUAL ENERGY SAVINGS (GWH)**



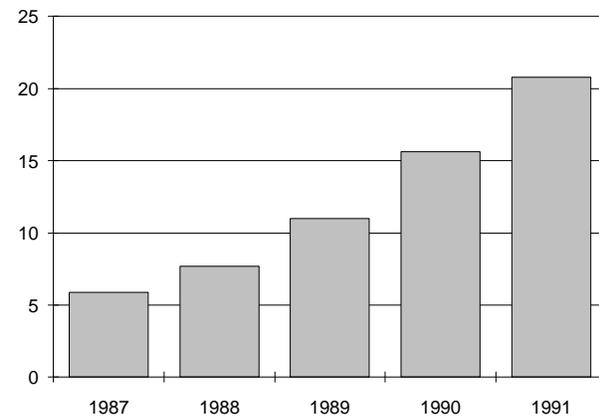
**ANNUAL CAPACITY SAVINGS (MW)**



**CUMULATIVE ENERGY SAVINGS (GWH)**



**CUMULATIVE CAPACITY SAVINGS (MW)**



From 1987 to 1991 the Appliance Turn-In Program has resulted in total annual net energy savings of 62,967 MWh, cumulative energy savings of 195 GWh, and lifecycle energy savings of 693 GWh. In terms of capacity, APTI has resulted in total annual net demand savings of 20.8 MW. In 1991, the program produced net energy savings of 8 GWh and net demand savings of 5.2 MW.[R#2]

## PARTICIPATION RATES

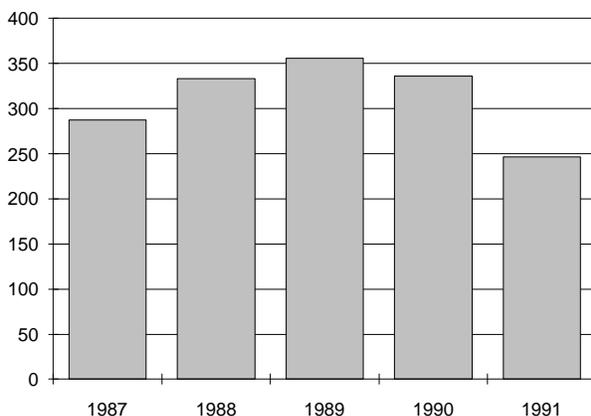
Wisconsin Electric has picked up 241,898 appliances from the residential sector during the course of the Appliance Turn-In Program from 1987 to 1991. The number of picked up appliances has varied from an all-time high in the program's first year of 65,071, to 26,959 in 1988, to 52,692 in 1989, and 57,339 in 1990. In 1991, 39,837 appliances were turned in.

Customer Participation Table	Number of Appliances Turned In	Approximate Number of Customers*	Annual Energy Savings per Customer (kWh)
1987	65,071	54,226	288
1988	26,959	22,466	333
1989	52,692	43,910	356
1990	57,339	47,783	336
1991	39,837	33,198	247
Total	241,898	201,582	

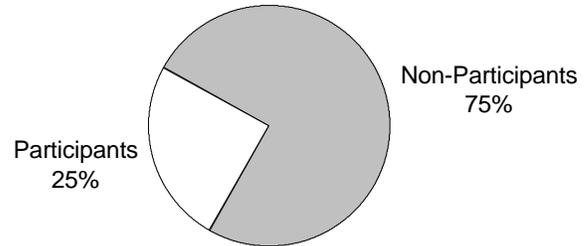
\* Based on average of 1.2 appliances per customer

[R#14]

### SAVINGS PER PARTICIPANT (KWH)



As shown in the Appliance Summary Table on page 6, over the course of the program 134,969 refrigerators, 24,641 freezers, and 82,288 air conditioners have been turned in. On average, each customer turns in 1.2 appliances. Thus, approximately 201,580 customers have participated in the



program. Wisconsin Electric had 814,078 residential customers in 1991, all of whom were eligible to participate in the program, thus participation in the program is about 25%.

## MEASURE LIFETIME

As discussed in the data quality section the measure lifetime used in this profile is 11 years. The utility recognizes the difficulty in estimating the remaining useful life of these appliances, and is considering future evaluation efforts in this area.

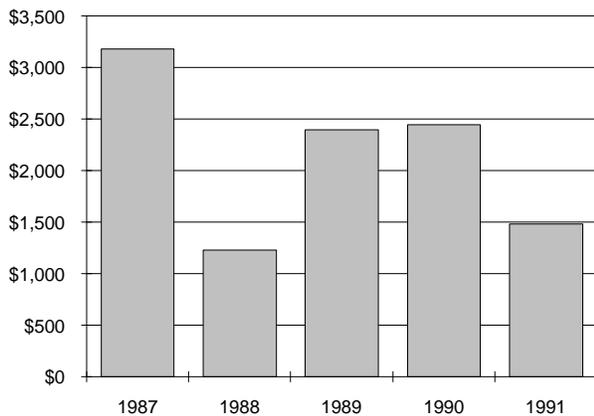
## PROJECTED SAVINGS

Lifecycle savings are presented above and in the accompanying savings overview table. Wisconsin Electric has projected savings for the APTI program through 1997. Annual capacity savings of 4 MW and annual energy savings of 14,000 MWh are expected. A comprehensive program evaluation scheduled for 1993/1994 will determine the future of the APTI program.

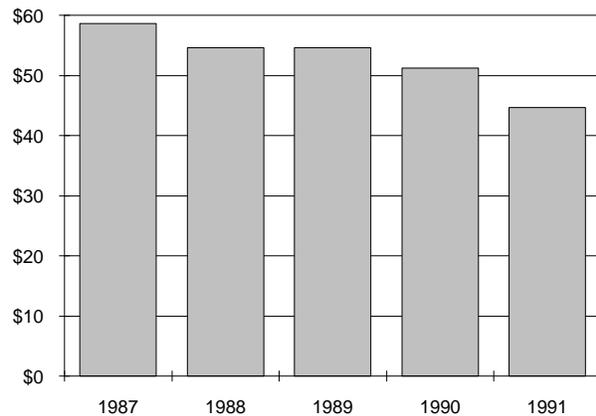
# Cost of the Program

<b>Costs Overview Table</b>	Incentives for A/C Component (x1000)	Incentives for Refrigerator / Freezer Component (x1000)	Total Incentive Cost (x1000)	Average Incentive Cost per Customer
1987	\$561.5	\$2,620.3	\$3,181.8	\$58.68
1988	\$262.3	\$964.7	\$1,227.0	\$54.61
1989	\$378.2	\$2,020.5	\$2,398.7	\$54.63
1990	\$419.6	\$2,027.8	\$2,447.4	\$51.22
1991	\$1,060.2	\$423.9	\$1,484.1	\$44.71
Total	\$2,681.7	\$8,057.3	\$10,739.0	

**TOTAL INCENTIVE COST (x1,000)**



**COST PER PARTICIPANT**



<b>Cost of Saved Energy Table (¢/kWh)</b>	<b>Discount Rates</b>						
	3%	4%	5%	6%	7%	8%	9%
1987	2.21	2.33	2.46	2.59	2.72	2.86	3.00
1988	1.77	1.87	1.97	2.08	2.18	2.29	2.41
1989	1.66	1.75	1.85	1.95	2.05	2.15	2.25
1990	1.65	1.74	1.83	1.93	2.03	2.13	2.24
1991	1.96	2.07	2.18	2.30	2.42	2.54	2.66

Since the program's inception, WE has spent more than \$10 million on incentive costs. Almost \$2.7 million was spent on air conditioners that are turned in and over \$8 million was spent on refrigerators and freezers. In 1991, the program spent \$1.5 million on incentives; this was the first year that more incentives were awarded for turned in room air conditioners than for refrigerators.

## COST EFFECTIVENESS

Wisconsin Electric has calculated benefit/cost ratios for the program, based on a decision tree analysis, which range from 1.09 to 2.49, based on 1993 estimated avoided costs. Various sources of information are used to estimate the cost effectiveness of this program, such as a biennial residential mail survey and contractor information.[R#7]

The Results Center calculated the cost of saved energy for the APTI at various discount rates based on the customer incentive only, as shown in the Cost of Saved Energy Table. At a 5% real discount rate, the 1991 cost was 2.18 ¢/kWh; for 1988, 1989, and 1990, the cost of saved energy at 5% discount rate was under 2.0 ¢/kWh.

## COST PER PARTICIPANT

The incentive cost per customer has dropped over the course of the program, from \$58.68 per customer in 1987 to \$44.71 in 1991.

## FREE RIDERSHIP

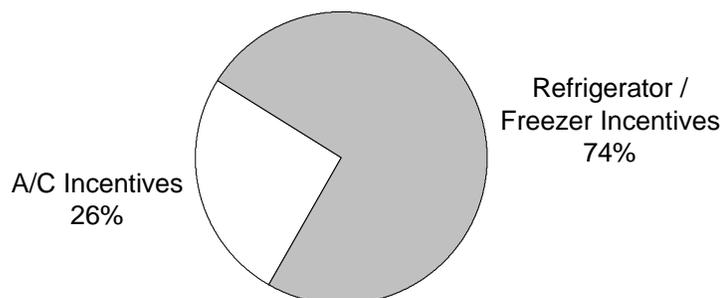
The application of free ridership is treated somewhat differently for this program than for any other Smart Money Energy Program at Wisconsin Electric due to the use of the decision tree method to determine the estimated per unit demand and energy savings. This may vary from year to year as new and additional information becomes available regarding this program.

Wisconsin Electric discounts savings by an additional amount to account for appliances that are close to failure or for which disposal would be imminent, even in the absence of the program. In essence, the customers who turn in such appliances are free riders.

## COST COMPONENTS

Precise marketing and implementation costs for the APTI program were not available. Note that cartage and recycling costs are not included in the incentive costs discussed earlier. WE reports that marketing and administration costs are quite small, and are significantly less than the utility's average cost of processing a rebate under its other incentive programs.[R#14]

Overall incentive costs for the program for the years 1987 to 1991 have averaged about 25% for air conditioners, and 75% for refrigerators and freezers.



# Environmental Benefit Statement

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

## Coal Uncontrolled Emissions

A	9,400	2.50%	420,743,000	9,982,000	2,018,000	202,000
B	10,000	1.20%	448,650,000	3,864,000	1,303,000	966,000

## Controlled Emissions

A	9,400	2.50%	420,743,000	998,000	2,018,000	16,000
B	10,000	1.20%	448,650,000	386,000	1,303,000	64,000
C	10,000		448,650,000	2,576,000	1,288,000	64,000

## Atmospheric Fluidized Bed Combustion

A	10,000	1.10%	448,650,000	1,181,000	644,000	322,000
B	9,400	2.50%	420,743,000	998,000	807,000	61,000

## Integrated Gasification Combined Cycle

A	10,000	0.45%	448,650,000	794,000	129,000	322,000
B	9,010		403,570,000	288,000	97,000	19,000

## Gas Steam

A	10,400		244,718,000	0	558,000	0
B	9,224		212,518,000	0	1,331,000	63,000

## Combined Cycle

1. Existing	9,000		212,518,000	0	816,000	0
2. NSPS*	9,000		212,518,000	0	386,000	0
3. BACT*	9,000		212,518,000	0	54,000	0

## Oil Steam--#6 Oil

A	9,840	2.00%	354,197,000	5,367,000	633,000	601,000
B	10,400	2.20%	375,664,000	5,324,000	796,000	386,000
C	10,400	1.00%	375,664,000	760,000	640,000	202,000
D	10,400	0.50%	375,664,000	2,233,000	796,000	123,000

## Combustion Turbine

#2 Diesel	13,600	0.30%	470,116,000	936,000	1,453,000	79,000
-----------	--------	-------	-------------	---------	-----------	--------

## Refuse Derived Fuel

Conventional	15,000	0.20%	558,129,000	1,438,000	1,893,000	421,000
--------------	--------	-------	-------------	-----------	-----------	---------

**Avoided Emissions Based on 195,150,000 kWh saved (1987-1991)**

---

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

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

## HOW TO USE THE TABLE

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

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

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.

## UTILITY-SPECIFIC AVOIDED EMISSIONS

Wisconsin Electric has recovered substantial amounts of chlorofluorocarbon refrigerants from appliances collected as part of the Smart Money Appliance Turn-In Program. The 1991 and program to date savings, for both refrigerators and air conditioners, represent over 55,000 pounds of refrigerants that have been recycled. In 1991 alone, almost 18,000 pounds were recycled. For both the annual and cumulative data, the air conditioner program has resulted in the majority of the recycled refrigerants.

Wisconsin Electric estimates its avoided emissions for all of its DSM programs, using a coal plant as its marginal power plant. Between 1987 and 1991, WE estimates that the Smart Money Energy Program can be credited with reducing sulfur dioxide emissions by 6,150 tons, nitrous oxide emissions by 2,150 tons, and carbon dioxide emissions by 971,854 tons.

### \* Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

# Lessons Learned / Transferability

---

## LESSONS LEARNED

Wisconsin Electric went through a quick learning curve in 1987 with the Appliance Turn-In Program. The major problems were resolved in the first year, but the program is continually being refined. Many changes have taken place in the APTI program as a reaction to program difficulties. Initial problems included lack of quality communications with customers, higher than expected participation, unreliability of the service provided by cartage contractors, confusion about savings bonds, and even the problem of leftover food in the appliances. These problems were addressed in the following ways:

Wisconsin Electric expedited the processing of orders by switching to an electronic system instead of relying on written documents. Increased automation of the processing system is a continuing goal of the utility. The newer processing system also provides better customer communications.

The biggest problems arose initially with the cartage contractors. The contractors were overwhelmed with work and subcontracted the excess load. This problem occurred because contractors were bidding on service areas that were much larger than the firms could handle. There were many customer complaints initially about the cartage staff. Pick up and dismantling procedures among contractors were also very inconsistent. In response to these problems, Wisconsin Electric no longer allows contractors to subcontract, and contractors can only bid on smaller service areas. By having many cartage contractors covering small areas, Wisconsin Electric can better monitor the performance of each contractor. Security checks are now run on all contract employees who enter customers' homes.

Initially, contractors were requested to distribute WE-supplied training literature to their employees. This literature usually was not read for a variety of reasons. Wisconsin Electric has produced a training video and contract staff are required to view the video prior to receiving their mandatory ID card. Customers are encouraged to ask to see the Wisconsin Electric ID card when their appliance is picked up.

Some problems arose on the customer side of the APTI program. Customers often did not clean out the appliances before they were picked up. The APTI program now stipulates that appliances must be cleaned, plugged in, and operating when the cartage contractor arrives.

Wisconsin Electric quickly realized that a very small number of customers were gathering as many appliances as possible and having them collected. Wisconsin Electric now keeps a careful watch on the number of checks being sent to the same address or being made out to the same name.

Apparently, customer confusion with savings bonds has yet to be overcome. A strong majority of APTI customers still choose to receive checks. The cost to Wisconsin Electric of issuing savings bonds has recently increased as the Federal government has increased the processing and handling costs. Wisconsin Electric will discontinue the use of savings bonds in 1993.

The problems experienced in 1987 with appliance pickup in winter months were solved by offering pickup services only in warm weather months. Wisconsin Electric maintained this practice until 1992, when it became apparent that some people buying new appliances were not willing to wait for fair weather to arrive so that their old appliance could be picked up. In 1992 Wisconsin Electric adopted a pickup period running from February 1 to November 30, and will further extend the offer in 1993 to include January.

The most important lesson learned was to keep lines of communication open between all involved parties (customers, contractors, and utility staff). Companies starting an appliance turn-in program may wish to not offer any rebates for at least the first year because many customers will participate simply because they want an old appliance removed. [R#8]

## TRANSFERABILITY

Wisconsin Electric was the first utility to have a large scale appliance turn-in program and the transferability is obvious due to the subsequent turn-in programs implemented at other utilities. Wisconsin Electric has shared its experiences with dozens of utilities and municipalities, both within the U.S. and Canada and around the world. One such program is now being offered by Power Smart Inc. (See Profile #10) and recently the New England Electric System instituted an appliance turn-in program. Southern California Edison implemented the very first appliance turn-in program, but it was on a very small scale and it has since been discontinued.

# Regulatory Incentives and Shareholder Returns

---

## HISTORY OF IRP IN WISCONSIN

Wisconsin's procedures for rate review, use of future test year in annual rate cases, and accounting for DSM expenditures have removed many of the financial disincentives to DSM. The Wisconsin Public Service Commission has tested a variety of shareholder incentives mechanisms with the four major utilities in the state since 1987. No shareholder incentive mechanism is active in the state at this time. [R#9,13]

State power plant siting law requires utilities to file Advance Plans approximately every two or three years. The integrated resource planning process is implemented in Wisconsin through these plans, which must include an analysis of alternative resources. In 1986 the Commission ordered utilities in the state to use a least-cost integrated planning process in which all reasonable options for both supply and demand are assessed, including long term social and environmental costs. An environmental externalities adjustment, or "noncombustion credit", of 15% is applied to selected nonfossil fuel resources ; this credit was instituted in 1989. This was replaced with explicit cost adders for greenhouse gases in 1992. [R#8,13]

## DSM COST RECOVERY

Utilities in Wisconsin have been able to recover DSM expenditures either as expenses or as capitalized expenditures through a conservation escrow account. The rate order on the escrow account goes back to 1977; the rate-basing treatment provision was the result of an order passed in 1986. The conservation escrow account, like a balancing account mechanism, allows the utility to collect DSM expenditures, dollar for dollar, reconciling actual with recovered expenditures. [R#10,13]

## DSM INCENTIVES AT WISCONSIN ELECTRIC

In 1986, the Commission ordered WE to scale up its investment in conservation activities beginning in 1987. The same order allowed the utility to capitalize the financial incentives it provided to customers for DSM since they were considered to have long-term benefits. These investments were allowed to earn the utility's current rate of return. At the same time the Commission instituted an incentive mechanism for WE that allowed the utility to earn an additional 1% return on unamortized portions of its conservation investments for each 125 MW of demand savings achieved through its conservation programs. This program was concluded in 1990. [R#8,13]

In 1989, the Commission staff asked the utilities to consider an Electric Revenue Adjustment Mechanism (ERAM) as an alternative incentive mechanism. The utilities rejected ERAM as a better alternative for Wisconsin because of its short term perspective and potential effects on large customers. No ERAM has been instituted in Wisconsin. [R#8]

WE requested a replacement incentive for the 1991 test year which tied the amount of stockholder incentive to the amount of net benefits the demand-side programs achieved. WE's main arguments were that the incentive would help to encourage and reward utilities for aggressive DSM efforts as well as protect the shareholders from loss of earnings potential associated with effective DSM. WE brought Eric Hirst of Oak Ridge National Laboratory in to testify on behalf of stockholder incentives. [R#13]

But, in a somewhat unusual turn and seemingly radical departure from national regulatory trends, Wisconsin's Public Service Commission moved away from providing incentives to utility stockholders and toward providing incentives, in the form of bonuses, directly to the utility staff that promote the installation of DSM measures. In WE's 1991 test year the Commission instituted an employee incentive program for WE whereby utility employees (other than top management) considered to be instrumental in achieving demand-side benefits were eligible to earn incentive bonuses based on performance. The Commission granted the utility about a half a million dollars for employee incentives, versus the approximately \$5.5 million that WE had requested for utility shareholders. [R#3,8]

According to the Wisconsin Public Service Commission staff, what's happening in Wisconsin may not suit other states at all but certainly presents an interesting case study. [R#11] Wisconsin has dropped stockholder incentives at least for the time being, but not for a lack of effort. Wisconsin remains one of the most aggressive DSM states in terms of the percentage of gross revenues spent on DSM. The individual utilities and the Commission are still looking for a mechanism to encourage DSM efforts and agree upon a level of measurement that is acceptable to both utilities and intervenors. [R#8,11]

## FUTURE DIRECTIONS IN WISCONSIN

In the current Advance Plan 6 order, the Commission expressed that it is still interested in stockholder incentive mechanisms and said it will certainly consider any proposed mechanisms. In anticipation of utility proposals, the Commission presented a set of criteria, or guidelines, that utilities must

## Regulatory Incentives (continued)

---

meet to be eligible for the incentives. Another Wisconsin utility, Wisconsin Public Service Corporation, applied for a shareholder incentive in their 1993 test year rate case but one was not provided. [R#11,12]

Incentives are being considered for renewable energy developments, but that's in large part due to the fact that the state's utilities have declining amounts of renewables in their advance plans. Renewables, unlike DSM, can be metered, and thus the issue of verification is much more straight forward. [R#9,13]

Currently Wisconsin Electric is evaluating DSM incentives in light of the Commission's set of guidelines, and will make a determination whether to file for incentives in May of 1993 for the 1994 test year. [R#13]

# References

---

1. Wisconsin Electric Power Company, "1991 Annual Report."
2. Wisconsin Electric Power Company, "1991 Annual Evaluation Report for Wisconsin Electric's Demand-Side Management Programs," March 1992.
3. Wisconsin Electric Power Company, Appliance Turn-In Brochure, 1991.
4. Wisconsin Energy Corporation, "1991 Statistical Report."
5. Wisconsin Electric Power Company, Smart Money Rebate Guide (pocket booklet), 1991.
6. Wisconsin Electric Power Company, Appliance Turn-In Program flyer, "With just one phone call, Jane got \$50, saved \$75 and helped save the earth."1992.
7. Marti Schmall, Wisconsin Electric, personal communication, October-November 1992.
8. Kathy Barbian, Senior Specialist, Wisconsin Electric, personal communication, October 1992.
9. Wisconsin Electric Power Company, "1990 Annual Evaluation Report for Wisconsin Electric's Demand-Side Management Programs," March 28, 1991.
10. National Association of Regulatory Utility Commissioners, "Incentives for Demand-Side Management", Committee on Energy Conservation, January 1992.
11. Paul Newman, Wisconsin Public Service Commission, personal communication, October 1992.
12. Shel Feldman, Executive Director, Wisconsin Center for Demand Side Research, personal communication, October 1992.
13. Dave Carlson, Manager, Customer Planning, Wisconsin Electric Power Company, personal communication, November 1992.
14. Donna Conant, Supervisor, Program Evaluation, Wisconsin Electric Power Company, personal communication, November-December 1992.
15. Wisconsin Electric Power Company, "Synergy," October 16, 1992.

Special thanks to Donna Conant for her guidance and support throughout the development of this profile.