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# Otter Tail Power House Therapy and Appliance Aid Profile #61

<b>Executive Summary</b>	<b>2</b>
<b>Utility Overview</b>	<b>3</b>
<i>Otter Tail Power 1992 Statistics Table; Utility DSM Overview</i>	
<b>Program Overview</b>	<b>4</b>
<b>Implementation</b>	<b>5</b>
<i>Marketing; Delivery; Measures Installed; Staffing Requirements; Number of Measures Installed (chart)</i>	
<b>Monitoring and Evaluation</b>	<b>7</b>
<b>Program Savings</b>	<b>8</b>
<i>Savings Overview Table; House Therapy Annual Energy Savings (chart); House Therapy Cumulative Energy Savings (chart); House Therapy Annual Peak Capacity Savings (chart); House Therapy Cumulative Peak Capacity Savings (chart); Participation Rates; Free Ridership; Participation Table; Measure Lifetime; Projected Savings</i>	
<b>Cost of the Program</b>	<b>10</b>
<i>Cost Overview Table; House Therapy Total Program Cost (chart); House Therapy Cost per Participant (chart); Cost of Saved Energy Table; Cost Effectiveness; Cost per Participant; Cost Components; Cost Components (chart)</i>	
<b>Environmental Benefit Statement</b>	<b>12</b>
<b>Lessons Learned / Transferability</b>	<b>14</b>
<b>Regulatory Incentives / Shareholder Returns</b>	<b>15</b>
<b>References</b>	<b>17</b>

# Executive Summary

Thanks is large part to the vision and charisma of program manager Ceedy Mewszel and her colleagues, Otter Tail Power Company has designed and implemented two rather exceptional programs to assist low income customers in Minnesota, North Dakota, and South Dakota. Their humor is apparent even in the programs' names, House Therapy and Appliance Aid, the latter of which comes complete with a "ten-step process" in fond recognition of the program's acronym, "AA".

While House Therapy began in 1988 as part of a mandated initiative it has evolved over time and is primarily designed to alleviate the financial pressures on low-income customers with all-electric heat, an expensive proposition in the cold winters of Minnesota. Over its five-year history the program has served 820 homes with deep levels of savings. The average savings per home is ~1,332 kWh per year at an installed average cost of ~\$1,600.

A House Therapy treatment may include any number of cost-effective energy efficiency measures. Measures installed include ceiling, wall, floor, foundation, and rim insulation; weatherstripping and caulking; water heater jackets, water heater pipe insulation and electric water heater replacement; door and window replacement; thermostat relocation; space heater replacement; energy-efficient light fixture installation; stratification fan installation; and residential demand controller installation.

Appliance Aid is currently in its pilot stage and is available as a free service to all low income customers regardless of their space heating source provided they have electric hot water heating. AA promotes the efficiency of customers' refrigerators, air conditioners, dehumidifiers, and other electric appliances. Compact fluorescent lamps, low-flow showerheads, water heater and pipe insulation, and if necessary a new electric water heater, are installed at no cost. On average Otter Tail spends less than \$130 per home for measures installed and labor costs.

One of the unique and successful features of both programs is that they are delivered through Community Action Program (CAP) Agencies rather than using in-house staff or contractors. The utility and the CAP Agencies both reap benefits from this arrangement. Otter Tail credits much of the programs' success to the CAP's ability to deliver the program as a result of their knowledge of the local communities. The sixteen CAPs involved deliver a valuable service to their customers and are allowed 7.5% of the installation costs to cover their administration of the programs. While providing a source of revenues for the CAPs, the delivery mechanism is also believed to provide substantial public relations benefits for Otter Tail Power.

## House Therapy & Appliance Aid

Utility: Otter Tail Power  
Sector: Residential  
Measures: Low-income weatherization measures including building envelope, lighting, water heating and space conditioning  
Mechanism: Audit and retrofits performed through Community Action Program Agencies  
History: Started in Summer 1988

### House Therapy 1992 Data

Energy savings: 366 MWh  
Lifecycle energy savings: 5,495 MWh  
Capacity savings: 0.11 MW  
Cost: \$264,300

### House Therapy Cumulative Data (1988 - 1992)

Energy savings: 2,740 MWh  
Lifecycle energy savings: 16,384 MWh  
Capacity savings: 0.328 MW  
Cost: \$940,900

### Appliance Aid 1992 Data

Energy savings: 59 MWh  
Lifecycle energy savings: 878 MWh  
Capacity savings: 0.012 MW  
Cost: \$26,700

## 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

Otter Tail Power Company (Otter Tail) is an investor-owned utility serving nearly 122,000 customers over a 50,000 square mile area in Minnesota, North Dakota, and South Dakota. Roughly 45% of the utility's service territory is located in Minnesota, including the company's headquarters in Fergus Falls, covering about one-quarter of the western portion of the state. Another 45% of Otter Tail's service territory includes most of the eastern portions of North Dakota and extends into the western half of that state. The northeastern corner of South Dakota comprises the remaining 10% of the service territory.[R#1] This area is largely rural with less than a dozen towns having a population over 3,000. Among the larger cities in the service area are Jamestown, North Dakota (population 16,280), Bemidji, Minnesota (10,949), and Fergus Falls (12,519). Although spread across great distances, 95,970 residential customers account for 79% of the utility's total customers.

The utility's energy sales are split fairly evenly among customers classes. In 1992, Otter Tail's 1,460 industrial customers purchased 1,397 GWh (39% of all energy sales). Residential customers purchased 942 GWh (26%), commercial and farm customers 523 GWh (15%), and the remaining sales of 731 GWh (20%) went to "other" customers.

Otter Tail's income is derived primarily from industrial and residential sales. At an average rate of 4.23 ¢/kWh, industrial sales accounted for total revenues of \$59 million (30% of total operating revenues) in 1992. The average residential rate in 1992 was 5.82 ¢/kWh and total revenues from residential energy sales were \$55 million (28%).

Most of Otter Tail's 635 MW of generating capacity is provided by three steam turbine plants with a total generating capacity of 543 MW. The remainder of Otter Tail's capacity is provided by internal combustion turbines (88 MW or 14%) and hydro (4 MW or less than 1%).[R#1]

Otter Tail has recognized that the potential for growth through electricity sales is limited within its service territory and has diversified by increasing the number of subsidiaries it owns. Mid-States Development, Inc. was formed in 1989 to purchase and oversee subsidiaries for Otter Tail. North Central Utilities, Inc. was established in 1992 to purchase regulated utilities. Through these two corporations, Otter Tail owns several utility and non-utility businesses. The utility intends to acquire other businesses to improve its overall financial performance.

## OTTER TAIL POWER 1992 STATISTICS

Number of Customers	121,997
Energy Sales	3,593 GWh
Energy Sales Revenues	\$195 million
Peak Demand	576 MW
Generating Capacity	635 MW
Reserve Margin	10 %
<b>Average Electric Rates</b>	
Residential	5.82 ¢/kWh
Commercial and Farms	6.28 ¢/kWh
Industrial	4.23 ¢/kWh

## UTILITY DSM OVERVIEW

Otter Tail Power implements demand-side management programs in each of the three states in its service territory. Regulatory requirements necessitate that Otter Tail implement a different portfolio of programs in each state. For example, Minnesota recently passed legislation requiring Otter Tail to spend 1.5% of its electric revenues generated from sales in that state to persuade customers to conserve energy by 1995. To date, the Dakotas have much less stringent DSM requirements.[R#1] As a consequence the utility has implemented eight programs in all three states with a total of eighteen programs in Minnesota. The programs implemented only in Minnesota must prove their cost effectiveness before expanding into North and South Dakota. The utility has not been required to quantify the impacts of its DSM programs in the Dakotas, nor in Minnesota for any year before 1992. [R#5]

In 1992, Otter Tail spent \$736,800 on DSM in Minnesota and \$1,032,200 overall.[R#6] The 1992 overall expenditure represents 0.5% of the company's total operating revenues for 1992.

The utility's DSM programs are roughly evenly distributed among residential, commercial and industrial, and agricultural customers. The majority of agricultural programs are being piloted in Minnesota. For commercial and industrial customers the utility's programs include an air conditioning rebate program, a motor rebate program, and an Energy Grant program, through which customers may receive financial incentives. ■

# Program Overview

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House Therapy and Appliance Aid are separate programs delivered in parallel by Otter Tail Power Company. Otter Tail has chosen to bundle these services to allow the Community Action Program (CAP) Agencies to deliver them at lower administrative cost while providing greater services. Because the CAPs deliver so many services to a community, they have close ties to the consumers targeted for the House Therapy and Appliance Aid programs. In fact, most customers learn of these programs through the CAPs. These organizations have sole authority to determine customer eligibility and secure participation.

Traditionally utilities have implemented low-income programs (whether in response to regulatory mandate or on their own initiative) on the basis of the program's social implications, rather than according to strict economic criteria. Many of these programs are also explicitly targeted as an attempt by the utility to reduce bill defaults, or at least mitigate the fiscal losses associated with these defaults. However, Otter Tail has few default cases, many fewer than the much larger utilities such as Southern California Edison or the City of Seattle, with low-income programs profiled by The Results Center (Profiles #2, #15, #20, & #22 address low-income programs). Neither the House Therapy nor Appliance Aid programs are specifically designed to address the bill default issue although the utility has recognized this link.

The House Therapy program was developed in 1988 in response to Minnesota legislation requiring investor-owned utilities to participate in the Conservation Improvement Plan mandated by the state. Originally House Therapy was implemented only in Minnesota, however, beginning in 1991 House Therapy was offered in South Dakota, and in 1992 the program became available in North Dakota. Otter Tail spends an average of \$1,600 (unlevelized) per home to pay for the installation of energy-efficient measures under the House Therapy umbrella.

House Therapy was offered in two distinct components during 1988-1989. Otter Tail implemented the program in conjunction with the U.S. Department of Energy (DOE) with DOE providing 50% cost sharing for the ma-

terials and labor involved. The utility paid the remaining 50% plus all additional program costs, such as administration. At the same time the utility implemented the program independent of its efforts with the Federal government. Costs and savings were tracked separately for the DOE and non-DOE components. After 1988-1989, co-funding with DOE was discontinued and Otter Tail implemented the program alone.

House Therapy provides weatherization services to Otter Tail's low income customers. Customers that rent or own their homes are eligible. All building types (single-family or multi-family) are eligible, but buildings must be primarily electric-heated. In conjunction with the House Therapy program the utility has successfully worked with the owners of large multi-family buildings to secure financing for weatherization retrofit projects from the government.

The most commonly installed measures include insulation, weatherstripping, caulking, and window and door replacement. The program also allows the replacement of existing electric water heaters with efficient models, the installation of compact fluorescent lamps and ceiling fans, and the relocation of baseboard thermostats to wall units. The actual number of measures installed in each participant's dwelling varies with each home based on the specific characteristics of the home.

The Appliance Aid program was introduced by the utility in 1992 as a pilot program. Appliance Aid was designed to work in parallel to House Therapy, providing appliance efficiency improvement measures to all low-income customers regardless of their primary heating fuel type.

Appliance Aid is a ten-step program through which participants' refrigerators, dehumidifiers, and air conditioner coils are cleaned, compact fluorescent lamps and low-flow showerheads are provided and installed, water heater and pipe insulation is installed, and if necessary, a new electric water heater is installed. ■

## MARKETING

The House Therapy and Appliance Aid programs are marketed primarily by the CAPs that implement the programs. Typically the CAPs promote and deliver House Therapy and Appliance Aid in conjunction with other low-income projects they are implementing. By bundling several targeted programs together the CAPs can make the most efficient use of their often limited resources. [R#3,4]

Because of their varying territories and customer needs each CAP may use a different approach to promote House Therapy and Appliance Aid. Otter Tail provides the CAPs with its fuel assistance customer list so they can target their marketing and delivery efforts. [R#3,4]

Otter Tail also promotes these programs by distributing bill inserts describing the programs to all of the utility's customers. Even customers that are not eligible for the programs receive the insert to inform them of Otter Tail's activities in the community.

Finally, the House Therapy program receives publicity in conjunction with CAP "appreciation days" that the utility organizes. Otter Tail uses these sessions, that occur once a year in each state, to recognize the enthusiastic implementation efforts of CAP employees, and to provide the CAPs both training and the opportunity to comment on the program's administration and implementation. An awards ceremony recognizing program achievements and individual dedication highlights these gatherings. To ensure that all of the CAPs are represented the utility covers the costs of these sessions including meals and accommodations.

Otter Tail firmly believes these efforts are instrumental to maintain its strong relationship with the CAPs, which provides the foundation for the programs' success.

## DELIVERY

Funding for the House Therapy and Appliance Aid programs is disbursed by Otter Tail to each CAP in accord with program plans presented by the CAPs to the utility at the beginning of each year. Funding criteria include the number of participants served by the CAP in the previous year and an estimate of the number of eligible customers remaining in the service territory. Program funds are provided by Otter Tail to the CAPs on a monthly basis when each CAP submits an invoice for the number of projects it has completed. Otter Tail and the CAPs have agreed to implement the House Therapy program at an average cost of \$1,600 per home and the Appliance Aid program at the rate of \$127 per participant (unlevelized). The CAPs can bill Otter Tail up to 7.5% for administrative costs incurred in implementing the program, thus providing the necessary funding to continue delivering the service. [R#4]

In most instances initial contact is made between the CAP and the eligible customer when the customer requests fuel or rent assistance from the CAP. At that time the CAP will determine the customer's eligibility for House Therapy or Appliance Aid. If eligible, the CAP will arrange the installation of energy improvements at the customer's convenience. Occasionally customers approach the utility directly with bill problems or for energy assistance. At that point Otter Tail will refer them to the appropriate CAP and encourage the customer to participate in the relevant program. [R#3]

Once the customer agrees to participate in a program the CAP conducts an energy audit of the dwelling including a blower door test. Otter Tail provides training for the CAP employees to become certified as energy auditors. The energy audit identifies which measures are applicable for the dwelling.

For the House Therapy program the utility funds standard improvements to the heating and cooling system, building envelope, lights, and water heater to bring the energy efficiency of the home to a minimum level equivalent to the U.S. Department of Energy's low-income weatherization requirements. ☞

## Implementation (continued)

Under Appliance Aid the CAP provides the customer with the relevant improvements from a prescriptive list of ten measures including appliance cleaning, water heater upgrades, and lighting installations.

Next, all identified measures are installed. Some of the CAPs in Minnesota are equipped to perform these installations with their own staff. However, most of the CAPs solicit bids from local contractors to install the recommended measures. These contractors enter into an agreement with the CAP to provide installation services.

After measures are installed state inspectors perform inspections of a random sample to ensure that improvements have been made in accord with the state building code. The CAP also has either a local or state inspector visit to ensure that all measures identified have been installed. Otter Tail incorporates the cost of the inspections into its funding disbursements to each CAP.

### MEASURES INSTALLED

A House Therapy treatment may include any number of cost-effective measures that improve the energy efficiency of a dwelling unit. Measures installed include: ceiling, wall, floor, foundation and rim insulation; weatherstripping and caulking; water heater jackets, water heater pipe insulation and electric water heater replacement; door and window replacement; thermostat relocation; space heater replacement; energy-efficient light fixture installation; stratification fan installation; and residential demand controller installation. The attached chart

shows the total number of each of the various measures that have been installed under the House Therapy program.

Appliance Aid has provided many similar services (for residential customers whose primary heating fuel is not electricity) such as: refrigerator, air conditioner and dehumidifier coil cleaning; water heater and pipe insulation installation, compact fluorescent bulb and low-flow showerhead installation, and installation of a new water heater.

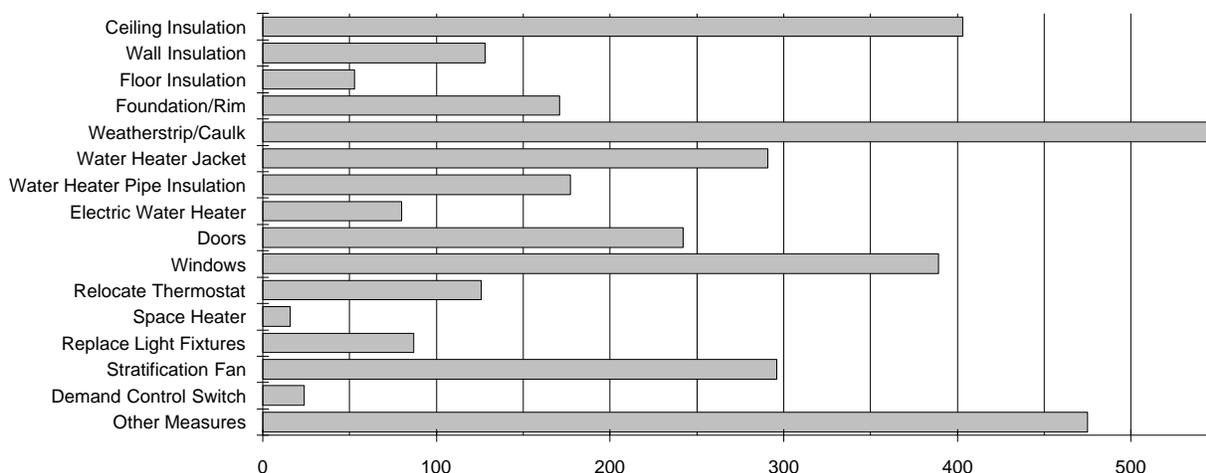
### STAFFING REQUIREMENTS

The programs are managed at Otter Tail by Ceedy Mewszel and Brenda Sandahl who are also responsible for overseeing and coordinating the CAPs. For the House Therapy program in 1993, there are eight CAPs implementing the program in Minnesota, six in North Dakota, and two in South Dakota, for a total of 16 CAPs. Appliance Aid was piloted through seven CAPs in Minnesota.

Each CAP also has personnel that devote time to these programs. Since they are delivering the House Therapy and Appliance Aid services in conjunction with other efforts, their time is not solely devoted to these programs.

In addition, evaluation staff at Otter Tail spend time on the programs as part of the utility's evaluation of all of its residential programs. Otter Tail has made no estimates as to the amount of time these programs require. ■

NUMBER OF MEASURES INSTALLED



# Monitoring and Evaluation

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## MONITORING

The utility tracks the installation of measures and costs for both programs through completion reports filed by the CAPs in conjunction with their monthly invoices. These reports include comments as to the condition of the home, appliances and equipment as found before the weatherization, and as left after service has been provided. Detailed demographic data, including the age and type of homes, number and age of occupants, and whether the occupants are renters or owners are also collected.

Otter Tail then tracks both programs through the use of spreadsheets (for the weatherization measures and energy calculations) and a dedicated accounting system to track all expenditures associated with the program. As noted earlier, Otter Tail has only recently begun to track program costs and energy impacts in response to a regulatory mandate in Minnesota. The utility has implemented similar tracking procedures in North and South Dakota for convenience and completeness although that information is not required by regulators in either state (see the Regulatory Incentives and Shareholder Returns section of this profile for a discussion of applicable regulations governing Otter Tail's DSM programs). The costs incurred during the joint program with the Department of Energy in 1988-1989 were tracked separately from those incurred without DOE's co-funding. Cost sharing was discontinued after that year.

## EVALUATION

Because the Appliance Aid and House Therapy programs are at different stages of implementation (pilot and mature, respectively), the evaluation of these programs is also at different points.

House Therapy, as a fully mature program, was first evaluated in 1988. An evaluation of the savings realized by 73 participants was used to calculate the energy benefits of the program, resulting in an estimate of 1,332 kWh of energy savings and 0.4 kW of winter peak demand reduction per participant. [R#2]

Appliance Aid has just completed its initial pilot phase. The evaluations are expected to be completed shortly. The evaluation will include a detailed cost-effectiveness analysis, and preliminary results may be found in the Cost of the Program section of this profile. The utility plans to leave survey cards with program participants to evaluate response to the service. Finally, a select sample of appliance end-use metering will be performed to validate the energy calculations.

Based on research performed by Bonneville Power Administration and the Wisconsin Center for Demand-Side Research, Otter Tail has calculated the following annual savings values for the Appliance Aid program: 940 kWh per water heater replacement, 435 kWh per water heater retrofit, 140 kWh per refrigerator retrofit, 280 kWh per lighting retrofit, and 100 kWh per remaining weatherization components. Additionally, the utility has calculated a 0.368 kW winter peak reduction and a 0.141 kW summer peak reduction per participant. ■

# Program Savings

Savings Overview	Annual Energy Savings (MWh)	Cumulative Energy Savings (MWh)	Lifecycle Energy Savings (MWh)	Annual Capacity Savings (MW)	Cumulative Capacity Savings (MW)
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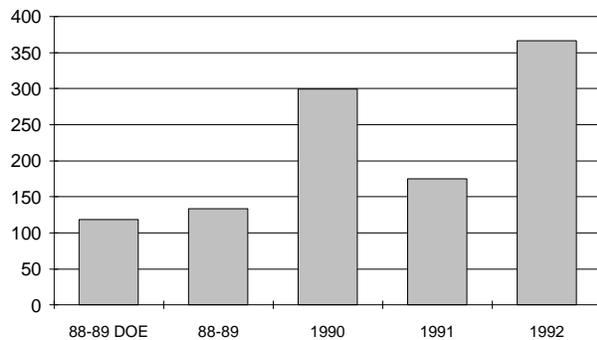
## House Therapy

88-89 DOE	119	119	1,778	0.036	0.036
88-89	133	252	1,998	0.040	0.076
1990	300	551	4,496	0.090	0.166
1991	174	726	2,617	0.052	0.218
1992	366	1,092	5,495	0.110	0.328
Total	1,092	2,740	16,384	0.328	

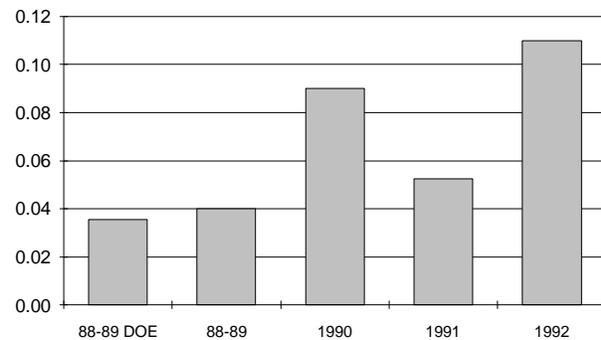
## Appliance Aid

1992 Total	59	59	878	0.012	0.012
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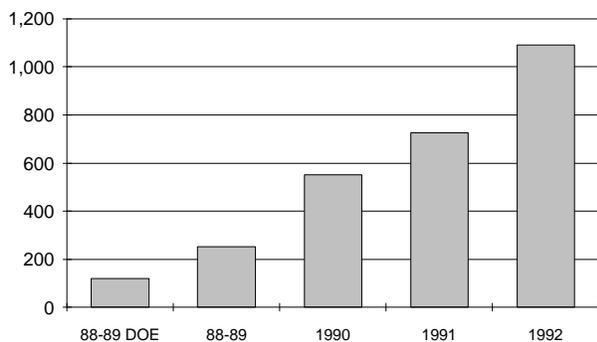
**HOUSE THERAPY ANNUAL ENERGY SAVINGS (MWH)**



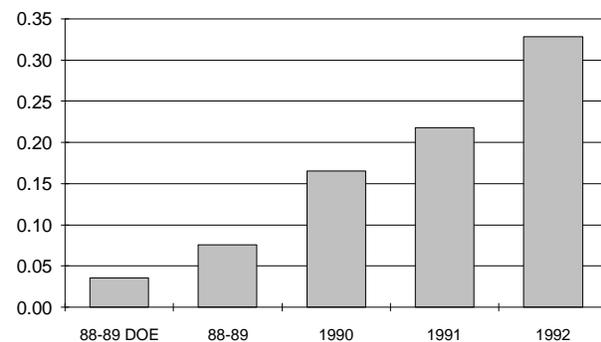
**HOUSE THERAPY ANNUAL PEAK CAPACITY SAVINGS (MW)**



**HOUSE THERAPY CUMULATIVE ENERGY SAVINGS (MWH)**



**HOUSE THERAPY CUMULATIVE PEAK CAPACITY SAVINGS (MW)**



**Data Alert:** House Therapy was offered in two distinct components during 1988-1989. One component was implemented in conjunction with the U.S. Department of Energy (DOE) and the other was implemented independently. Savings associated with the former are designated 88-89 DOE, and savings for the non-DOE program are noted simply as 88-89.

For the House Therapy program, savings for the years 1988 through 1992 totalled 1,092 MWh of energy and 328 kW of peak capacity. Energy and capacity savings correlate directly with the number of participants each year as the utility has calculated savings on a per participant basis. The largest annual savings, 366 MWh and 110 kW, were achieved in 1992, when 275 homes were retrofitted. Total lifecycle savings have been estimated at 16,384 MWh.[R#7]

Data for the Appliance Aid program exists only for 1992-1993 with participants during that time saving 58.516 MWh and 12 kW.[R#7]

## PARTICIPATION RATES

Otter Tail relies on the CAPs to produce participation targets for the program noting that these organizations have a much better knowledge of the financial state of consumers in local communities.

The number of participants in the House Therapy program rose each of the first three years and leveled off in 1991 and 1992 as the program began to saturate its target market, especially in Minnesota. In fact, three CAPs that had previously participated in the program did not do so in 1993 because there were no customers in their area left to serve. In 1992, the program had 180 participants in Minnesota, down from the high of 225 in 1990, but above the 1991 level of 118. The program has been implemented on a small scale in South Dakota, with 13 participants in 1991 and 12 participants in 1992. House Therapy was more widely implemented in its first year in North Dakota when 82 units were weatherized.

Forty-one customers in Minnesota participated in the Appliance Aid pilot phase in 1992. The utility expects this number to increase to 140 in 1993 as the program is expanded.[R#4]

## FREE RIDERSHIP

Like most low-income programs free ridership is not an issue for House Therapy and Appliance Aid. All of the customers in the target market for these programs are low-income customers whose financial priorities preclude investment in weatherization and other energy efficiency measures. Additionally, many of the participants rent their dwellings and are thus reluctant to pay the costs of energy-efficiency improvements as the landlord is likely to reap the long-term benefits of such an investment.

Participation	Participants	Annual Energy Savings per Participant (kWh)
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### House Therapy

88-89 DOE	89	1,332
88-89	100	1,332
1990	225	1,332
1991	131	1,332
1992	275	1,332
Total	820	

### Appliance Aid

1992 Total	41	1,427
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## MEASURE LIFETIME

The utility has assigned varying lifetimes for the different measures included in the House Therapy program. These figures range from five years for compact fluorescent bulbs to 20 years for insulation measures, with water heating and refrigeration replacements calculated to last ten years and demand controls and water heater retrofit measures (i.e., showerheads, jackets) fifteen years. The average lifetime of all installed measures will change each year depending upon the mix of measures installed in a given year, however the utility has not performed these calculations since it relies on a per participant measure of savings.

Otter Tail has adopted lifetime calculations from Bonneville Power Administration and the Wisconsin Center for Demand-Side Research for Appliance Aid. These figures are ten years for water heater measures, five years for refrigerator coil cleaning, and six years for all other applications.

The Results Center has used an average of fifteen years to calculate lifecycle savings for the program, similar to the figure used in other low-income programs.

## PROJECTED SAVINGS

House Therapy savings for the years 1992 and 1993 in Minnesota only are expected to total 90.4 kW and 322,050 kWh.[R#2] The Appliance Aid program will produce 272,433 kWh annually for its first five years, 246,961 kWh for the sixth year, and 116,651 kWh for years seven through ten.[R#4] ■

# Cost of the Program

Cost Overview	CAP Administration (x1000)	Materials (x1000)	CAP Labor (x1000)	CAP Support (x1000)	OTP Direct Costs (x1000)	Total Program Cost (x1000)	Cost per Participant
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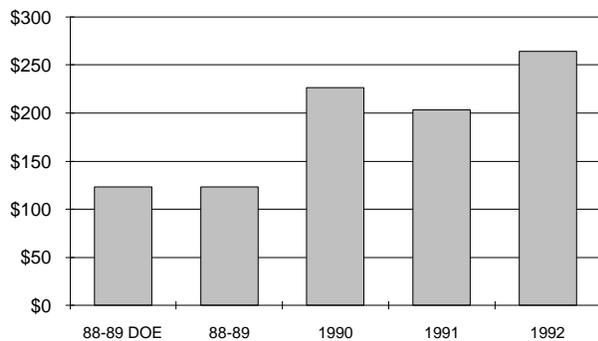
## House Therapy

88-89 DOE	\$4.9	\$52.8	\$58.8	\$0.0	\$6.9	\$123.5	\$1,387.24
88-89	\$7.8	\$58.3	\$31.7	\$13.6	\$11.7	\$123.2	\$1,232.07
1990	\$15.0	\$115.2	\$64.3	\$23.7	\$8.4	\$226.4	\$1,006.27
1991	\$12.2	\$89.0	\$50.7	\$23.1	\$28.5	\$203.6	\$1,553.83
1992	\$16.1	\$105.6	\$79.9	\$30.2	\$32.5	\$264.3	\$961.04
Total	\$55.9	\$420.9	\$285.6	\$90.6	\$88.0	\$940.9	\$1,147.46

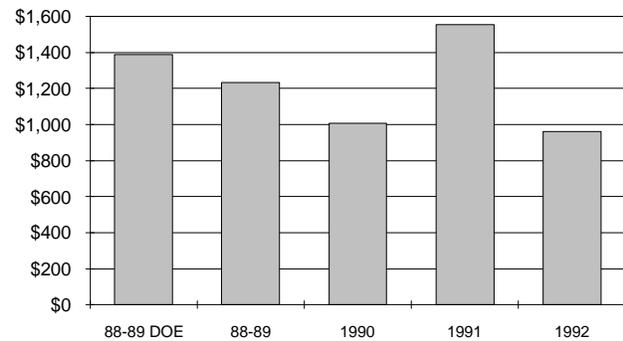
## Appliance Aid

1992 Total	\$0.9	\$10.5	\$0.0	\$1.2	\$14.3	\$26.7	\$652.28
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**HOUSE THERAPY  
TOTAL PROGRAM COST (x1,000)**



**HOUSE THERAPY  
COST PER PARTICIPANT**



Cost of Saved Energy (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%

## House Therapy

88-89 DOE	8.72	9.37	10.03	10.72	11.43	12.17	12.92
88-89	7.75	8.32	8.91	9.52	10.16	10.81	11.48
1990	6.33	6.79	7.28	7.78	8.29	8.83	9.37
1991	9.77	10.49	11.24	12.01	12.81	13.63	14.47
1992	6.04	6.49	6.95	7.43	7.92	8.43	8.95

## Appliance Aid

1992 Total	3.83	4.11	4.40	4.71	5.02	5.34	5.67
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**Data Alert:** House Therapy was offered in two distinct components during 1988-1989. One component was implemented in conjunction with the U.S. Department of Energy (DOE) and the other was implemented independently. Costs associated with the former are designated 88-89 DOE, and savings for the non-DOE program are noted simply as 88-89.

Between 1988 and 1992, Otter Tail spent a total of \$940,900 on the House Therapy program. Expenditures have roughly correlated with the number of participants in each year, with the highest costs, \$264,300, occurring in 1992. The lowest cost, \$123,200, was in 1988-1989. It should also be noted that the utility spent \$123,500 during 1988-1989 in conjunction with the Department of Energy (DOE). In its initial year the Appliance Aid program had a budget of \$32,100 of which the bulk (\$24,200) was allocated to the CAP agencies to implement the program. Actual costs were well under budget at \$26,700 with the bulk of costs devoted to materials (\$10,500) and other utility costs such as program development (\$14,300).

## COST EFFECTIVENESS

Using its conservation improvement program tracker account in combination with spreadsheets has allowed the utility to monitor the material and labor costs incurred by each CAP, as well as the administration and development costs of the utility. It is policy at Otter Tail to include all these costs in benefit/cost evaluations of a program. Thus a program implemented by Otter Tail may appear more costly than a similar program at another utility.

The House Therapy program scored low on cost-effectiveness tests conducted by Otter Tail in 1991 on LMSTM software. Because the program provides primarily winter capacity savings and Otter Tail does not foresee the need for any new winter capacity for several years, the benefit-cost ratios are less than one. House Therapy scored 0.336 and 0.417 using the non participant and societal tests, respectively.[R#2]

In contrast, the Appliance Aid program is expected to score 1.02 and 2.19 for the non-participant and societal tests respectively.[R#4] This difference can be attributed primarily to the substantially lower costs per participant of Appliance Aid as compared to House Therapy.

The Results Center calculated the cost of saved energy for each year of the House Therapy program as shown in the accompanying table. At a 5% discount rate the cost of saved energy has ranged from a low of 6.95 ¢/kWh in 1992 to a high of 11.24 ¢/kWh in 1991. Similar calculations by The Results Center for the Appliance Aid program show the cost of saved energy to be 4.40 ¢/kWh at a 5% real discount rate.

## COST PER PARTICIPANT

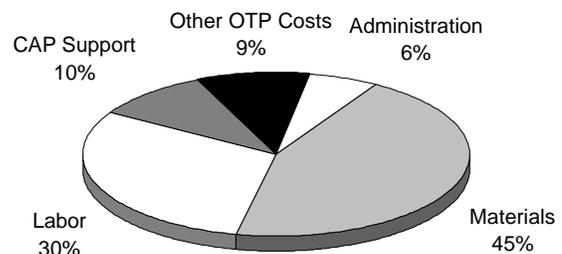
The program plans for House Therapy allow an average of \$1,600 (unlevelized), plus 7.5% (\$120) for administrative costs to be spent on each house by the CAP Agency.[R#2] With pre-approval by Otter Tail, a CAP may exceed these costs for a particular house to ensure that cost-effective measures are implemented. In fact, the utility has allowed costs over \$3,000 for one house.[R#3]

The Results Center calculated the average cost per participant for each year of the House Therapy program. These costs range from \$1,554 in 1991 to \$961 in 1992. It should be noted that in every year the average cost is below the allowed cost of \$1,600. The Results Center has calculated the cost per participant for the Appliance Aid program's initial year to be \$652. Costs may decrease as participation increases and delivery is refined.

## COST COMPONENTS

The utility has done a very thorough job of disaggregating the costs of these programs into major components. The primary components are materials, CAP labor, CAP administration, CAP support, and Otter Tail Power direct costs. The utility costs include Otter Tail's staff time as well as the "hidden" expenses of running a DSM program, such as development costs, postage and travel. Otter Tail has not yet been able to further disaggregate its costs to account for evaluation, implementation, and development costs but is currently in the process of doing so.

For the House Therapy program, materials and CAP labor dominate the total program cost, combining for 75% of all costs. Although allowed 7.5%, actual CAP administrative costs are only 6% of the total program costs, illustrating another benefit of delivering the program through the CAPs. ■



# Environmental Benefit Statement

**AVOIDED EMISSIONS: Based on 2,799,000 kWh saved 1988 - 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%	6,035,000	143,000	29,000	3,000
B	10,000	1.20%	6,435,000	55,000	19,000	14,000

**Controlled Emissions**

A	9,400	2.50%	6,035,000	14,000	29,000	0
B	10,000	1.20%	6,435,000	6,000	19,000	1,000
C	10,000		6,435,000	37,000	18,000	1,000

**Atmospheric Fluidized Bed Combustion**

A	10,000	1.10%	6,435,000	17,000	9,000	5,000
B	9,400	2.50%	6,035,000	14,000	12,000	1,000

**Integrated Gasification Combined Cycle**

A	10,000	0.45%	6,435,000	11,000	2,000	5,000
B	9,010		5,788,000	4,000	1,000	0

**Gas Steam**

A	10,400		3,510,000	0	8,000	0
B	9,224		3,048,000	0	19,000	1,000

**Combined Cycle**

1. Existing	9,000		3,048,000	0	12,000	0
2. NSPS*	9,000		3,048,000	0	6,000	0
3. BACT*	9,000		3,048,000	0	1,000	0

**Oil Steam--#6 Oil**

A	9,840	2.00%	5,080,000	77,000	9,000	9,000
B	10,400	2.20%	5,388,000	76,000	11,000	6,000
C	10,400	1.00%	5,388,000	11,000	9,000	3,000
D	10,400	0.50%	5,388,000	32,000	11,000	2,000

**Combustion Turbine**

#2 Diesel	13,600	0.30%	6,743,000	13,000	21,000	1,000
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**Refuse Derived Fuel**

Conventional	15,000	0.20%	8,005,000	21,000	27,000	6,000
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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 Otter Tail Power's level of avoided emissions saved through its House Therapy and Appliance Aid programs 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

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## LESSONS LEARNED

The House Therapy and Appliance Aid programs have been successful at delivering efficiency to a segment of the market historically quite difficult to reach, low-income customers. This success is largely due to the delivery of these programs through existing Community Action Program (CAP) Agencies, allowing the service to effectively reach customers at a low cost. Both programs have noteworthy energy savings per participant, in turn providing the low-income customers important financial savings. The utility credits the CAPs with much of the success of these programs.

Otter Tail has done an excellent job in tracking all of the costs associated with the House Therapy and Appliance Aid programs. In light of the current debate on the quality of DSM cost data and the actual cost-effectiveness of DSM programs, The Results Center is pleased to encounter such thorough data.

The House Therapy program has undergone substantial changes primarily in its availability. The program has been expanded to all of the utility's service territory from its initial offering in Minnesota and the number of CAPs that participate has increased correspondingly. The program will be refined to target its delivery to those areas, particularly in the Dakotas, where it has not yet penetrated the market.

The Appliance Aid program is scheduled for some fine tuning as a result of its pilot evaluation. The refrigerator coil cleaning component will be dropped and a mechanism to allow the utility to pay for the purchase and installation of an efficient refrigerator will be added.

The primary expansion of both programs will be through increased joint venture projects between the utility and the CAPs (with the occasional inclusion of other third parties, such as the Department of Energy). Otter Tail and its CAPs have already pursued some significant examples of this cooperation. In Minnesota, the utility and a CAP renovated a large, old home so that it could be sold via a lease-to-own arrangement to a single mother with four children. The payments on that house will be applied to the purchase of another home, so that the pro-

cess can be repeated. A similar effort is underway in North Dakota where joint funding has renovated twenty homes from an Air Force missile base and relocated those homes to another community.

## TRANSFERABILITY

Low-income programs are prevalent at utilities, even at utilities that are otherwise not aggressively pursuing demand-side management. Often these programs are implemented primarily as social programs or waste minimization efforts, rather than energy saving activities.

However, many utilities such as Otter Tail Power have put teeth into their low-income efforts by leveraging the utility's resources with those of other groups. Otter Tail has used local Community Action Projects to market and deliver the program as has Southern California Edison (see Profile #2) and United Illuminating (Profile #15). Both Seattle City Light (Profile #20) and Western Massachusetts Electric (Profile #22) enlist the assistance of community groups to promote the program, although delivery is done by city employees and contractors. Any utility seeking to replicate the successes of the Otter Tail program would be advised to develop a strong relationship with existing organizations serving the low-income community.

The other feature of note when considering the transferability of these programs is the market for House Therapy and Appliance Aid. Both of these programs are targeted at customers with substantial electric service, in the form of space heating, water heating, or both. While this is clearly the priority of an all-electric utility such as Otter Tail, a combination utility may reap higher savings by implementing a fuel-blind program that offers customers all possible energy reductions. In fact, United Illuminating has carried the collaborative approach to a further level by integrating its program with the low-income efforts of the local gas utility. This integration provides least-cost energy services for the customer, takes full advantage of the opportunity to implement energy-efficiency measures during a single encounter with a low-income customer, and maximizes the savings per expenditure that both utilities receive. ■

# 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.)

Otter Tail Power company provides electric service about evenly between the states of Minnesota, North Dakota, and South Dakota. The following text focuses on regulatory reform in Minnesota related to DSM, where the bulk of the House Therapy and Appliance Aid work has taken place, and then briefly covers the status of regulation in North Dakota and South Dakota.

## MINNESOTA

As part of the IRP rules adopted in Minnesota in 1990, each of the state's utilities with more than 1,000 retail customers is required to file biennial resource plans. In addition to formalizing its integrated resource planning process, the Minnesota Public Utilities Commission has taken several steps in the past few years to reduce barriers to DSM and to create incentives for DSM.

In February of 1991 the Commission ordered each of the state's investor-owned utilities to file shareholder incentive proposals. Currently three utilities in the state, including Otter Tail Power, have approved shareholder incentive mechanisms; six utilities in the state, including Otter Tail Power, have approved mechanisms for recovering lost revenues, or what are called "lost margins" in Minnesota. [R#8]

Also passed in 1991, the State legislature's Omnibus Energy Act requires electric utilities in the state to spend 1.5% of revenues on conservation. Under the same law, gas utilities in the State were ordered to spend 0.5% of revenues on conservation. [R#8]

## TREATMENT OF DSM EXPENDITURES

Utilities in Minnesota file biennial DSM resource plans or what are called Conservation Improvement Plans (CIPs). CIP tracker accounts are used for DSM program cost recovery. The accounts record actual CIP collections and expenditures to ensure dollar-for-dollar recovery at ratemaking time. Thus over-and under-expenditures are reconciled at the time of the next rate case. Note that OTP has not filed for a rate increase since 1985, and will likely not do so soon as it is experiencing stable electricity sales and it serves an area marked by economic decline. As such, its DSM programs are evaluated every two years by the Department of Public Service for prudence, and at the time of the next rate case the Commission will also evaluate OTP's DSM expenditures for prudence before rectifying the deferred account by assessing the account balance to rates. [R#8,9]

Otter Tail filed its Conservation Improvement Plan (CIP) incentive proposal in October of 1991 and on March 12, 1992 the Commission approved the mechanism. In March 1992 the Commission authorized Otter Tail to accrue carrying charges on the balance in its CIP tracker account. In other words, OTP will be able to recover interest (or the cost of capital) from its ratepayers at the time of the next rate case, for the balance in the CIP tracker account. [R#8,9]

## Regulatory Incentives (continued)

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State statute in Minnesota permits utilities to capitalize CIP expenditures, but only one utility in the state, Northern States Power, currently capitalizes expenditures. Otter Tail Power expenses its DSM costs each year.[R#8,9]

### TREATMENT OF LOST REVENUES IN MINNESOTA

Otter Tail Power may recover “lost margins” due to the successful implementation of CIP programs. Lost margins are defined as the difference between lost revenues and cost reductions related to saved variable costs from power plant operations.[R#8,9]

### INCENTIVE MECHANISM

As discussed above, each of Minnesota’s investor-owned utilities were asked to file shareholder incentive mechanisms with the PUC. Otter Tail’s mechanism was approved by the Commission in March of 1992 and allows Otter Tail to earn an incentive via a bonus/penalty mechanism tied to kWh saved through cost effective CIP programs. The amount of the bonus or penalty is determined using a sliding scale tied to Otter Tail’s success in achieving its DSM goals.[R#8]

All direct impact programs – those which provide direct customer incentives – are lumped together and evaluated against the utility portfolio’s projected performance to determine the appropriate incentive. Note also that low income programs, like House Therapy, are treated specially by the Omnibus legislation and need not be cost effective to be eligible for cost recovery and shareholder incentives.[R#8,9]

The “straight, one-time bonus” proposed by OTP and approved by the Commission, begins at zero for 50% of projected achievement and increases linearly up to 2 cents per kilowatt saved for achievement of 100% or more of the goal. (In other words, if OTP projected and achieved 500 MWh of savings, it would get a one-time bonus of  $100 \text{ MWh} * 1000 \text{ (to convert to kWh)} * 2\text{¢}$ , or \$10,000.) If performance falls below 50% of the goal, Otter Tail will be subject to a penalty, beginning at zero and ranging to a maximum penalty for achievement of 40% or less of goal of 0.4 cents per kilowatt-hour of goal not achieved.[R#8,9]

### NORTH DAKOTA

In North Dakota no formal rules or legislation apply for integrated resource planning (IRP). DSM costs are expensed as operating expenses in rate case test years. (Northern States Power is an exception to this rule and has been able to capitalize its DSM expenses and amortize them over five years.) Note that in terms of cost allocation, the costs of DSM activities are allocated to customer classes based on class contribution to energy and/or demand class revenues, and class eligible to participate in specific programs. There is no formal recovery for lost revenues and no formal action has been taken in the area of DSM incentives for utility shareholders.[R#8]

### SOUTH DAKOTA

Like North Dakota, South Dakota has no formal IRP process in place. DSM program costs are expensed in the same manner as operating and maintenance expenses. There are no provisions for recovery of lost revenues and no shareholder incentives exist.[R#8] ■

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