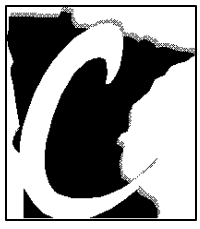
Energy Conservation Improvement Programs

Project Suggestions for
Municipal Utilities and
Rural Electric Cooperatives

Minnesota Department of Commerce



March 2002

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Introduction

Purpose

Minnesota Statutes 216B.241, subdivision 2(B) allows the Commissioner of the Department of Commerce to establish a list of programs that may be offered as energy conservation improvements. Attached is a list of those projects. The recommended projects are in no way intended to be an exhaustive list. The Department encourages and expects the implementation of new project ideas.

Energy Savings Estimates

Minnesota Statutes 216B.241, subdivision 1b(g) requires municipal and cooperative utilities to evaluate their CIP programs using a list of baseline energy and capacity savings assumptions developed with the Department. To facilitate this process the Department has provided energy savings estimates for some of the projects. It is easier to provide energy savings estimates for residential projects than for commercial and industrial projects because there are fewer residential projects and less variation in measures. The energy savings estimates are intended to serve as baselines to start for calculating energy savings. However, utilities are encouraged to make use of all reputable resources for calculating energy savings. For example, although the Department provided the Department of Energy's Energy Star estimates of energy savings for residential appliances, the Federal Energy Management Program's estimates are also valid. When reporting energy savings, utilities should identify the source of their savings estimates.

Demand (Capacity) Savings Estimates

It is the Department's intent to also provide demand savings estimates for recommended projects. However, demand savings for specific projects can vary greatly utility by utility, depending on the time of that utility's peak. The Department will work with interested parties to develop standard demand savings estimates. If you would like to offer input into this matter, please contact Chris Davis at Christopher.Davis@state.mn.us or 651-296-7130. The Department will provide these estimates when the Commissioner responds to the June 1, 2002 CIP filings.

Affordable Housing Project

Customer Class: Low Income
Direct Impact

The primary objective of the Project is to improve the energy efficiency of affordable housing built in Minnesota, including improvements to the building envelope, HVAC, lighting and appliances. The Project consists of natural gas and electric direct-impact measures:

- natural gas direct-impact measures,
- electric direct-impact measures, and
- indirect-impact measures.

The project may be administered in conjunction with a non-profit housing organization such as Habitat for Humanity.

Natural Gas Measures

The following natural gas measures are proposed to be included in the Project. Natural gas utilities are expected to cover the incremental cost of moving from the standard efficiency product used by the provider of affordable housing to a product that meets or exceeds the efficiency level provided below. Projected energy savings are shown in italics.

- Energy Star forced air furnaces equal to or greater than 92 percent Annual Fuel Utilization Efficiency (AFUE), *Energy savings of 10.5 Mcf* (approximately 570 kWh can be saved if the natural gas furnace has a variable speed drive),
- Energy Star boilers equal to or greater than 85 percent AFUE, *Energy Savings of 11.55 Mcf,*
- Sealed-combustion or power-vented water heaters equal to or greater than 62 percent Efficiency Factor, *Energy Savings of 3.2 Mcf,*
- Integrated space and water heaters equal to or greater than 90 percent Combined Annual Efficiency, *Energy Savings of 15.7 Mcf,*
- Heat recovery ventilation, and
- Low-flow showerheads, *Energy Savings of 11 Mcf if 2.2 gpm, 37 Mcf if 1.5 gpm.*

Electric Measures

The following electric measures are proposed to be included in the Project. Electric utilities are expected to cover the incremental cost of moving from the standard efficiency product used by the provider of affordable housing to a product meeting or exceeding the efficiency level provided below. Projected energy savings are shown in italics.

- Energy Star refrigerators (at least 10 percent above federal standards), *Energy savings of 56 kWh,*
- Energy Star air conditioners (at least 10 percent above federal standards), *Energy savings of 27-54 kW (see Energy Star Appliances for more info),*
- Energy Star clothes washers (at least 1.26 for a modified Energy Factor), *Energy savings of 550 kWh,* and
- Compact fluorescent fixtures for most commonly used lighting fixtures, *Energy savings of 80 kWh.*

Other Measures

This list is in no ways meant to exclude other potentially cost-effective energy-saving measures such as use of a Drainwater Heat Recovery System (GFX).

Electric Water Heater Energy Saving Packet

Customer Class: Residential
Direct Impact

In this project residential customers with electric water heaters are provided a packet of energy-saving devices such as a water-saver shower head, a water-flow tester, a kitchen and bath aerator, pipe wrap insulation, and a water-temperature gauge card. The packet may be provided free or at a nominal charge. The packet may be given to customers who are purchasing a new electric water heater, or advertised through a newsletter. The benefits of this program are that it can be easy to administer and operated on a low budget. The disadvantage is that there is no guarantee that any of the measures are installed.

Below are the energy-savings estimates assumptions used by Otter Tail in its "Hot Pack" project. Since it is unlikely that all of the measures are installed or enacted, the energy savings should be reduced by 15 to 50 percent.

Faucet Aerator (each)	109 kWh
Low flow showerhead (each)	366 kWh
Pipe insulation (6-10 feet)	115 kWh
Reduce water heater temperature	109 kWh
Total HotPack savings:	699 kWh

Note that estimated energy savings for electric and natural gas water heaters can be found for the low-flow showerhead and faucet aerators at the Federal Energy Management Program's website:
http://www.eren.doe.gov/femp/procurement/begin.html

Energy Star Residential Appliances

Customer Class: Residential
Direct Impact

Background

The ENERGY STAR label shown above designates appliances, motors, lighting, electronics and other energy-using devices that exceed the energy code or standard by a specific amount. Manufacturers and retailers can affix the Energy Star label to all of their qualifying products to help consumers make easy choices about the efficiency of their purchases. (The designation was introduced by the EPA in 1992 as a voluntary labeling program designed to identify and promote energy-efficient products. EPA partnered with the U.S. Department of Energy in 1996 to promote the ENERGY STAR label, with each agency taking responsibility for particular product categories.) A large benefit from the ENERGY STAR label is that it is an easy way for customers to identify energy-efficient products with assurance from the federal government that the products are indeed more efficient than standard ones. Customers do not need to have a detailed understanding of what makes one product more efficient than another.

Objective

To increase the saturation of Energy Star appliances sold throughout Minnesota.

Strategies

Several strategies can be used to promote ENERGY STAR products. The strategies can be enacted alone or in combination with each other. Some of the strategies include:

- Educating customers about the ENERGY STAR label and the money-saving and environmental benefits of selecting Energy Star appliances.
- Reducing the upfront cost of the ENERGY STAR appliances to residential customers.
- Providing advertising and promotional support to appliance vendors.
- Providing financial incentives for stocking or selling ENERGY STAR appliances.

Which Appliances to Promote?

The Department of Energy's ENERGY STAR program is constantly adding energy-efficient residential appliances to its list of qualifying appliances and electronics. Although part of a utility's program can be to promote the purchase of ENERGY STAR appliances in general, it may be best to concentrate on only a few appliances. When making the choice, each utility should consider its customer needs, energy and capacity needs, and budget constraints.

Figure 1 below shows the U.S. Department of Energy's estimate of the Minnesota market penetration of a few electric residential ENERGY STAR products.

Figure 1: ENERGY STAR Market Penetration and Energy-Savings Estimates

Technology	Market Penetration	Average Savings per Unit (per year)
Room air conditioners	13%	27-54 kWh*
Clothes washers	15.5%	550 kWh
Dishwashers	16%	145 kWh
Refrigerators	15%	56 kWh
Audio electronics	30%	45 kWh
Lighting	NA	80 kWh
Variable Speed Drive on Furnaces	NA	570 kWh
Natural Gas Furnaces		11.5 Mcf
Natural Gas Boilers	NA	11.5 Mcf

* The amount of energy savings depends on what part of the state that the air conditioner is used. An air conditioner is used more often in the Twin Cities than in Duluth. Consequently, an efficient air conditioner saves more energy in the Twin Cities than in Duluth. For a map showing the breakdown of residential air conditioning hours of operation see www.ladwp.com/energyadvisor/EA-9fig2.html

Most estimates are provided by the ENERGY STAR program. For an on-line calculator of energy savings, see http://www.epa.gov/nrgystar/purchasing/2c_savings_calc.html, an ENERGY STAR site, or see the Federal Energy Management Program's (FEMP) website http://www.eren.doe.gov/femp/procurement/calc-index.html

The FEMP website has some calculations different from ENERGY STAR's estimates provided above. However, some of the calculations are more detailed. For example, energy savings for a dishwasher hooked up to a natural gas and an electric water heater are separated. Calculations from either source are acceptable. Utilities should identify their estimate source when submitting filings.

Size of Rebates

The Department is not making any specific recommendations concerning the size of a rebate. In general, however, a larger rebate may be needed for appliances which have larger incremental costs. The size of the rebate should be tempered by the avoided costs the appliance/project gives the utility. Better said, utilities can afford to provide larger rebates for appliances that save more energy and demand (e.g., variable speed drive on furnaces, clothes washers, and dishwashers). Figure 2 shows a range of rebates awarded in Minnesota and across the country.

Figure 2: Range of Rebate Levels for Residential ENERGY STAR Technologies

Technology	*Range of Rebates*
Room air conditioners	*$25*
Clothes washers	*$25-150*
Dishwashers	*$20-$60*
Refrigerators	*$25*
Audio electronics	*Education*
Lighting	*$3-$5*
Natural Gas Furnaces	*$100*
Natural Gas Boilers	*$100*

Home Energy Audits

Customer Class: Residential
Indirect Impact

Utility customers often request home energy audits when their energy bills are high, they have uneven heating or cooling in the home, and/or they are interested in saving energy. The purpose of the audits is to educate homeowners on how they can cost-effectively reduce the energy use in their homes. An audit program is greatly enhanced when it is combined with a program to implement energy conservation measures, especially insulation.

On-site Audit

The traditional audit consists of an on-site visit by a trained auditor. In 1994 the Minnesota Department of Public Service (now the Department of Commerce) issued a residential energy audit protocol which was the be used by any energy project identifying itself as a Home Energy Audit, Residential Energy Audit, or a Home Energy Checkup. The protocol includes the following components:

1. Energy Bill Analysis
2. Client Assessment and Education
3. Shell Assessment
4. Mechanical and Electrical Equipment Assessment
5. Recommendations and Follow-up

For a copy of the protocol, please contact the Department at 651-296-7502.

On-line Audit

Recently utilities have been promoting their own or the Department of Energy's online home energy audit. In general, the Department believes that it is most cost-effective to link customers to an existing online audit service when it offers useful information to the utility customer. The Department recommends the Lawrence Berkley National Laboratory's online home energy audit which can be found at:
http://www.homeenergysaver.lbl.gov/

Load Control of Electric Air Conditioners/Water Heaters

Customer Class: Residential, Commercial
Direct Impact

This program provides residential or commercial customers an incentive (% rate reduction or specific credit per bill) in exchange for allowing the electric power provider to cycle (15 minutes on, 15 minutes off) or fully interrupt their central air conditioner during periods of high summer peak demand. In addition, some utilities offer the same interruption for water heating during high winter peak demand periods.

Residential

AC Energy Savings:	*20 kWh*
AC Peak Demand Savings:	*1 kW*
WH Energy Savings:	*30 kWh*
WH Peak Demand Savings:	*0.35 kW*

Commercial

Demand and energy savings vary greatly.

* Estimates from Xcel Energy. Some utilities have higher estimates for the energy savings.

Traffic Signal Initiative

Customer Class: Government
Direct Impact

Traffic signals that use LEDs consume 80-90 percent less energy and generally last five to seven years, compared to just a year for comparable incandescent light signals. LED traffic signals also offer significant peak demand savings since they operate 24 hours a day. In addition, ENERGY STAR traffic signals are a better value for consumers because they:

- rarely fail, lowering the risk of accidents at intersections and therefore lowering liability costs,
- have lower maintenance costs because they need to be replaced less frequently, and
- simplify inventory control by reducing the need to keep parts in stock.

The U.S. Environmental Protection Agency and Department of Energy have developed information on the purchase of Energy Efficient Traffic Signals. See http://yosemite1.epa.gov/estar/consumers.nsf/content/traffic_signals.htm

The Consortium for Energy Efficiency has additional tools and resources that can be used in designing utility programs for Energy Efficient Traffic Signal programs. See http://www.ceeformt.org/gov/led/led-main.php3

Xcel's current program for LED traffic signals includes the following rebates:

9" pedestrian signals.....*$25*
12" or larger pedestrian signals.....*$40*
8" red balls.....*$15*
8" green balls.....*$40*
12" red balls.....*$25*
12" green balls.....$65

For information on calculating energy savings for these products, see the website of the New York State Energy Research Development Authority (NYSERDA) at http://www.lrc.rpi.edu/Ltgtrans/nysled/xls/led-lcc.xls

Adjustable Speed Drive

Customer Class: Industrial
Direct Impact

Electronic Adjustable Speed Drives (ASDs) are devices that can greatly improve the efficiency of AC motors in applications with highly variable loads. ASDs, also known as Variable Speed Drives and Variable Frequency Drives, save energy by matching motor speed (and electricity used) to load, rather than restricting the load itself by means of throttling using valve and dampers. ASDs precisely control the electricity going to the motor.

The best uses of ASDs are for fans, pumps, and other fluid systems. Savings of up to 50 percent are possible with ASDs properly installed on fan motors and up to 75 percent on pumps. In addition to energy savings, ASDs increase motor and system life and present an unparalleled degree of control over the motor system.

Resources

Office of Industrial Technology: http://www.ase.org/media/techprofile/asd.htm

Federal Energy Management Program: http://www.energy.wsu.edu/cfdocs/tg/2.htm

For information on how to choose an ASD, see:
http://www.oit.doe.gov/bestpractices/energymatters/mar2000_maximize.shtml

Air Compressors

Customer Class: Industrial
Direct Impact

Background

Air compressor are used by industrial customers for filtration, refrigeration, power tool operation, conveyors, and many other applications. Leaky, inefficient systems can waste thousands of dollars a year. According to a report by E-Source, many plants lose 20 to 40 percent of compressed air to leaks. Improper use of compressed air can account for another 5 to 40 percent of compressed air volume. Improper use also reduces reliability and productivity. The Compressed Air Challenge (www.compressedairchallenge.org) states that electricity savings of 20 to 50 percent are possible with system improvements.

The operations of a customer's compressors can be evaluated through an efficiency study. The cost of the study depends on the size of the customer. Otter Tail Power estimates that the average study will be in the range of $4,000 to $6,000.

Rebate Examples

To motivate the customer to participate in the study, a utility can pay a specific percentage of the cost. For example, Xcel Energy partially funds the study costs, based on compressor size:

- 50 to 74 hp-Xcel Energy pays $2,000 of study costs
- 75 to 99 hp-Xcel Energy pays $2,500 of study costs
- 100 hp and greater-Xcel Energy pays 75 percent of study costs up to $15,000.

Xcel's payment is contingent on the customer making repairs result in reducing estimated air-loss by a minimum of 50 percent. In general, Xcel pays a rebate of $150-$200 per kW for air compressor demand savings.

Otter Tail Power's program will pay for up to 80 percent of the audit costs, with a maximum amount of $10,000 per participant.

Resources

For more information about compressed air, see the following websites:

www.nwalliance.org/projects/industrial.html
www.neep.org/html/incentives_main.html
www.cl-p.com/clmbur/indexclmbus.asp
John Henry Foster: www.jhfostermn.com
Minnesota Industrial Tool: www.mit-apollo.com

Building Recommissioning

Customer Class: Commercial
Direct Impact

Building recommissioning constitutes analyzing a building's energy uses to determine if they use more energy than necessary and implementing cost effective energy conservation measures to reduce their energy use. Recommissioning an existing building can result in the identification of system operating, control and maintenance problems, and the implementation of energy conservation measures with paybacks of as little as less than one year. Utilities can promote this activity by identifying qualified providers and by providing an incentive (rebate or percentage of cost) to a customer for a recommissioning activity.

Resources

For information on Xcel Energy's building recommissioning project, see: http://www.nspco.com/fb/fb_ps_br.htm

For information on the building recommissioning in Wisconsin, see the Energy Center of Wisconsin's web site: http://www.ecw.org/ecw/projectdetail.jsp?projectID=73

Computer Power Management

Customer Class: Commercial
Direct Impact

Office plug load is the fastest growing electrical end use in the commercial sector. Nationwide, PCs and monitors in commercial and industrial (C&I) settings use 32 billion kWh of electricity each year – over 1.5 percent of all electricity consumed by the C&I sector. More than half of this energy could be saved by taking two simple steps:

- Enabling power management functions that place monitors in low power mode during periods of inactivity.

- Turning off PCs and monitors after work.

Resources

Free software from ENERGY STAR automatically puts computer monitors to rest when not in use – saving organizations a significant amount of energy and money. What's more, monitor power management will not affect computer or network performance. A simple touch of the mouse or keyboard "wakes" the machine within seconds. For general information about the program, see:
http://yosemite1.epa.gov/estar/consumers.nsf/content/power.htm

ENERGY STAR provides an energy savings calculator for this project at the following URL: http://yosemite1.epa.gov/estar/consumers.nsf/content/powercalculator.htm

For information about the Office Equipment Efficiency (OEE) Program in Northern California, see: http://www.energy-solution.com/off-equip

Cooling

Customer Class: Commercial and Industrial
Direct Impact

Cooling accounts for approximately 12 percent of commercial electric use and 37 percent of commercial summer peak demand. In the industrial sector it accounts for approximately 3 percent of electric use and 15 percent of summer peak demand. Minnesota's cooling demand is one of the primary drivers behind the state's future need for summer peaking capacity. Utilities can significantly reduce their peak electric demand and energy use through the promotion of energy-efficient cooling equipment. Efficient equipment includes rooftop units, unitary units, split systems, condensers and chillers.

Resources

The Consortium for Energy Efficiency has a High-Efficiency Commercial Air Conditioning and Heat Pumps (HECAC) initiative which promotes high-efficiency unitary (single-packaged and split-system) central air conditioning and heat pump equipment in commercial buildings (see http://www.ceeformt.org/resrc/facts/hecac-fx.php3). CEE currently has two efficiency levels, or tiers, available for adoption. Tier I specifies levels of high efficiency for commercial equipment that are at least 12 percent greater than the federal standard. Tier II specifies equipment efficiency levels that are 10 percent higher than Tier I. Utilities and other organizations promote the use of the tiers through education and rebate programs.

The average potential energy savings for CEE tier 1 and tier 2 qualifying units can be found at: http://www.ceeformt.org/resrc/facts/hecac-fx.php3

CEE's efficiency levels do not cover chillers. Xcel Energy's qualifying equipment and rebate levels are as follows:

Chillers (Full Load)	***Base Full Load kW/ton***	***Base Load NPLV***	***Base rebate $/ton***	***Incremental Rebate****
< 150 tons	*0.650*	*N/A*	*$20.00*	*$5.00*
>= 150 tons	*0.600*	*N/A*	*$20.00*	*$5.00*
Chillers (Part Load)	*0.600*	*0.560*	*$20.00*	*$2.50*

The Center for Energy and the Environment has a Practical Guide to Commercial Air Conditioning Rebates for Municipal Utilities at www.mncee.org, click on Energy Services and then on Municipal Utilities.

Design Assistance

Customer Class: Commercial and Industrial
Direct Impact

Virtually all new buildings fall short of their potential for energy efficiency. One of the primary reasons for this is that design firms, which must compete for business, have been forced to prioritize which services are delivered in what level of detail. Detailed energy analysis is among the first to be cut back. With a design assistance project, architects and engineers receive technical support and additional fees for exercising design options which use lower energy. Financial incentives for building owners help improve the cost effectiveness of the energy-efficient options. *Energy Assets*, an Xcel Energy project, is an example of this project. Xcel Energy works with The Weidt Group to deliver this project.

To be cost-effective, the buildings have to be large. Currently, Xcel provides a full analysis for buildings over 80,000 ft2.

Resources

Procuring Low-Energy Design and Consulting Services: A Guide for Federal Building Managers, Architects, and Engineers From the Federal Energy Management Program: http://www.eren.doe.gov/femp/techassist/low_energy.html

For a list of completed projects by The Weidt Group, see: http://www.theweidtgroupenergy.com/Engde.htm

Ground Source Heat Pumps

Customer Class: Commercial, Residential
Direct Impact

Ground source heat pumps use mild underground temperatures to increase the efficiency of both electric heating and electric cooling. Although the technology may be a winter load-building measure for electric utilities (since natural gas is the predominant heating fuel), this electric technology is as efficient or more efficient than the combination of efficient natural gas heating and efficient electric cooling, when compared on a common Btu basis.

Resources

For more information on commercial ground source heat pumps, see the Consortium for Energy Efficiency's High Efficiency Central Air Conditioning and Heat Pump Initiative: http://www.ceeformt.org/resrc/facts/hecac-fx.php3

For more information on residential ground source heat pumps, see: http://www.even.doc.gov/femp/procurement/gshp.html

Energy and demand savings are customer specific.

Lighting

Customer Class: Commercial, Industrial, Government Direct Impact

Lighting is the single largest end use of electricity in the commercial sector, accounting for 37 percent of commercial electricity use. Lighting also accounts for about 13 percent of industrial electricity use. Some of the largest amounts of electric energy and demand savings in Minnesota have resulted from improvements in C&I lighting. Improvements include the installation of T8 lamps, T5 lamps, compact fluorescent fixtures and lamps, efficient HID lighting, induction lighting systems, electronic ballasts, and occupancy sensors. Lighting is typically an end-use in which both energy and summer peak demand (and sometimes winter peak demand) can be saved.

Rebates

Some projects grant lighting rebates based on customer demand saved. For example, the Center for Energy and the Environment operates an efficient lighting project for Xcel Energy's small commercial and industrial customers. The customer is granted a rebate of $437 per kW saved, up to a maximum of 60 percent of the installed cost. This rebate is larger than provided in some other lighting projects to address the needs of smaller customers, typically who require a larger subsidy and a full-service program to help them overcome substantial market barriers that inhibit their investments in efficiency.

For its main lighting project, Xcel Energy provides lighting rebates of approximately $200 per kW, granting larger rebates for newer technologies. For example, an occupancy sensor which has a cost of $80 may be granted a rebate of $12.

Examples of Energy Savings

Attached are a few examples of energy savings possible from lighting technology improvements.

Resources

For more information about commercial and industrial lighting, go to http://www.eren.doe.gov/femp/procurement/begin.html and look under "lighting technologies". The Center for Energy and Environment has a Practical Guide to Direct Installation Lighting Retrofit Programs for Municipal Utilities. Go to www.mncee.org, click on Energy Services and then on Municipal Utilities.

Examples of Commercial and Industrial Lighting Energy Savings

Measure	Efficient Product	Baseline Efficiency	Efficiency Standard	Energy Savings (kWh)
T8 Ballasts, 4 ft. or less 1 and 2 lamp	T8 Ballasts	60 lm / W	86 1m / W	1,274
T8 Ballasts, 4 ft. or less 3 and 4 lamp	T8 Ballasts	60 lm / W	86 lm / W	2,743
Lighting Reflector, 4. ft.	High-Efficiency Reflector	No reflector	Not applicable	319
T8 Ballasts > 4 ft. and <= 8ft. 1 and 2 lamp	T8 Ballasts	60 lm / W	86 lm / W	170
Lighting Reflector, 8 ft.	High-Efficiency Reflector	No reflector	Not applicable	191

All of these examples are taken from Xcel Energy's 2001-2002 Biennial CIP filing, Docket No. E,G002 / CIP-00-1457.

Premium Efficiency Motors

Customer Class: Industrial
Direct Impact

Background

Motors account for about 50 percent of all U.S. energy use and two-thirds of all industrial energy use. Motors associated with HVAC account for significant energy consumption in the commercial and institutional customer sectors. Because many motors operate 80 or more hours per week, even small increases in efficiency can yield huge energy savings. When running continuously at or near full load, the annual energy cost for running a motor can be 10-25 times its purchase price. This can make the incremental price increase of a premium-efficiency motor insignificant. Adjustable speed drives can also improve motor efficiency (see page 11).

Resources

For this initiative, the Consortium for Energy Efficiency CEE developed efficiency specifications for 114 classes of motors that are, on average, 1-2 percent higher than the federal minimum standards required by the Energy Policy Act of 1992 (EPAct). (See http://www.ceeformt.org/ind/motrs/Cee-nema.pdf) Motors covered by this initiative include the same equipment covered by EPAct: NEMA design A and B, three-phase, integral horsepower (hp), general purpose ODP and TEFC motors (1200, 1800, and 3600 RPMs) from 1-200 hp. The "efficiency specifications" link (above) compares CEE levels with EPAct. Utilities and other market transformation programs in 13 states are using the initiative as the basis for their motors programs and a growing number of manufacturers are producing motors that meet CEE's efficiency guidelines. More information about CEE's motor program can be found at http://www.eren.doe.gov/femp/procurement/motor.html.

As can be seen in the link above, the size, efficiency and running times of motors varies so much that providing a single estimate of energy savings is difficult. However, attached are two examples from Otter Tail Power's 2002-2003 CIP filing:

Otter Tail Power Motor Rebates

Type of Measure	Baseline				After			Participant rebate	Participant incremental cost
	Description	kW	kWh	hours	Description	kW	kWh		
15 hp-16 hour day	average 15 hp	1	4,064	4,064	effic. Motor	0.64	2,617	225	$300
15 hp-24 hour day	average 15 hp	12.59	110,276	8,759	effic. Motor	12.23	107,159	225	$300

Refrigeration

Customer Class: Commercial and Industrial
Direct Impact

Refrigeration accounts for about 10 percent of commercial electric use and 2 percent of industrial energy use. Refrigeration can be a high energy user end-use for commercial customers such as supermarkets, grocery stores, refrigerated warehouses, and for many industrial customers. Refrigeration systems can be improved by addressing the compressor systems, condenser systems, sub-cooling systems, refrigerated display cases, anti-sweat controllers, and display case anti-sweat controllers. In general, utility refrigeration programs have had both a prescriptive (set rebates for specific measures) and custom rebate (rebate depending on each individual application) components.

A potential target customer for refrigeration programs is local ice arenas.

Examples of Prescriptive Rebates

Both Xcel Energy and Otter Tail Power Company have prescriptive rebates for commercial and industrial refrigeration. For example, Xcel's measures and prescriptive rebates include:

Measure	*Rebate*
Compressor strategies	*$30/hp*
Condenser strategies	*$15/hp*
Subcooling strategies	*$50/hp*
Display case fan motors	*$10-$20/fan motor*
Display case anti-sweat controller	*$25/door*

Resources

Refrigeration information from grocery and convenience stores can be found at http://www.epa.gov/smallbiz/grocery_convenience.html

Information on Energy Star solid door refrigerators and freezers can be found at http://yosemite1.epa.gov/estar/consumers.nsf/content/refrigerator.htm

Distributed Generation/Renewable Resources

Minnesota Statutes require 5 percent of a utility's CIP Program be allocated to Renewable Energy and Distributed Generation Projects.

> ***216B.2411 Distributed energy resources.***
>
> *(a) To the extent that cost-effective projects are available in the service territory of a utility or association providing conservation services under section 216B.241, the utility or association shall use five percent of the total amount to be spent on energy conservation improvements under section 216B.241, on:*
>
> *(1) projects to construct an electric generating facility that utilizes renewable fuels as defined in section 216B.2422, subdivision 1, such as methane or other combustible gases derived from the processing of plant or animal wastes, biomass fuels such as short-rotation woody or fibrous agricultural crops, or other renewable fuel, as its primary fuel source; or*
>
> *(2) projects to install a distributed generation facility of ten megawatts or less of interconnected capacity that is fueled by natural gas, renewable fuels, or another similarly clean fuel.*
>
> *(b) For public utilities, as defined under section 216B.02, subdivision 4, projects under this section must be considered energy conservation improvements as defined in section 216B.241. For cooperative electric associations and municipal utilities, projects under this section must be considered load-management activities described in section 216B.241, subdivision 1, paragraph (i).*

Guidelines for Distributed Resources

When considering what technologies would be appropriate, consider the following three factors:

- High efficiency,
- Heat recovery, and
- New technologies not widely available in marketplace.

For additional assistance on distributed generation resources, including renewables, call the Department's Energy Information number at 1-800-657-3710.

What Makes a Project Cost Effective?

In general, if it is a less expensive way to supply power than other means, a distributed generation project can be deemed cost-effective.

Comparing a distributed generation project can consider the following factors:

- generation efficiencies,
- transmission and distribution costs,
- other factors such as whether heat recovery is included.

Research and Development

Minnesota Statutes 216B.241, subd. 1 b states:

> *(d) Each municipality and cooperative electric association subject to this subdivision may spend and invest annually up to ten percent of the total amount required to be spent and invested on energy conservation improvements under this subdivision on research and development projects that meet the definition of energy conservation improvement in subdivision 1 and that are funded directly by the municipality or cooperative electric association.*

Subdivision 2c states:

> *(c) Each public utility subject to subdivision 1a may spend and invest annually up to ten percent of the total amount required to be spent and invested on energy conservation improvements under this section by the utility on research and development projects that meet the definition of energy conservation improvement in subdivision 1 and that are funded directly by the public utility.*

Consequently, research and development funding is intended for projects that meet the definition of energy conservation improvement in the statutes. The relevant statutes include:

> *(e) "Energy conservation" means demand-side management of energy supplies resulting in a net reduction in energy use. Load management that reduces overall energy use is energy conservation.*
>
> *(f) "Energy conservation improvement" means a project that results in energy conservation.*

Utilities should review these definitions and justify their expenditures based on the statutes.