

Improving Energy Efficiency



BUILDING A BRAND-NEW, SHINY, RENEWABLE ENERGY POWER SOURCE in your own community has a lot of appeal. Doesn't everyone want to have the latest, greatest and cleanest power plant to supply their power and stimulate the local economy? New renewable energy sources, such as the wind turbines being erected all over Minnesota, *do* get a lot of attention. However, there is a much less glamorous way to "produce" energy that is often cheaper and smarter than building a new plant. This great, unsung hero is energy efficiency – consuming less energy by using it more efficiently. Because energy efficiency reduces energy bills, it's also dollars smart. Due to energy efficiency technologies adopted since the shock of the 1973-74 Arab oil embargo, it is estimated that the US saves \$150 to \$200 billion annually in energy costs.¹

Minnesota could reduce future energy consumption 28 percent by aggressively implementing energy efficiency programs³.

THE ENORMOUS POTENTIAL OF ENERGY EFFICIENCY

The capacity of engineers to think of ways to do things faster, cheaper and better is astounding. We are most familiar with this in terms of computers – it seems that in the time it takes to get from the factory to our house, a new computer is obsolete. But while our society has an obsession with gigahertz, we pay relatively little attention to kilowatts – the energy consumed by the products we buy.

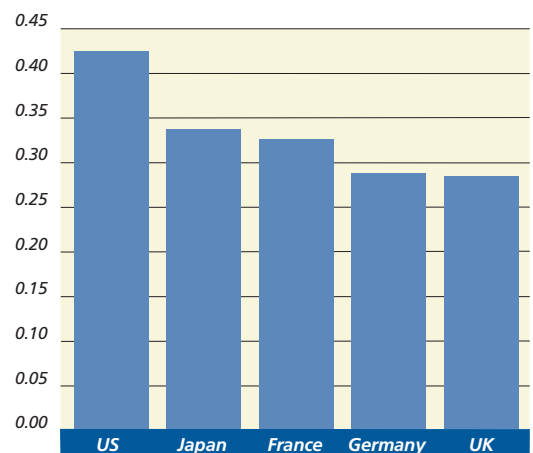
And yet just as computers continue to get faster and faster, so are there improvements in technologies and processes that can use less energy to provide the same level of service. These include compact florescent light bulbs, super-efficient appliances, variable speed motors, and ultra-efficient heating and cooling systems.

A compact florescent light bulb can produce the same amount of light as a standard incandescent bulb, but uses a quarter the power and can last 10 times as long. LED (light emitting diode) bulbs that are starting to enter the market are even more efficient and long lasting.

Simply replacing old light bulbs can result in significant energy savings. For example, at the University of Minnesota's Twin Cities campus, a light bulb replacement program resulted in savings of \$800,000 per year, which the University will benefit from for many years to come².

There is enormous potential to further increase our energy efficiency. The United States' economy is the least energy-efficient among industrialized countries. One study estimated that Minnesota could reduce future energy consumption 28 percent by aggressively implementing energy efficiency programs³.

Energy intensity of U.S. compared to other industrialized countries (TWh/billion\$GDP)⁴



Source: International Energy Agency, 2002

IMPLEMENTING ENERGY EFFICIENCY

The approach to implementing energy efficiency will vary slightly depending on whether it is in the residential, commercial or industrial sector. Implementing an energy efficiency project for a homeowner may be as simple as adding insulation and installing some efficient light bulbs but may be more complex if it involves ventilation and other “house system” elements. For larger projects, a systematic approach to energy efficiency involves 5 basic steps:

1. Identify Energy Efficiency Opportunities: the Energy Audit Uncovering the hidden opportunities of energy efficiency is the first step, and energy audits are an excellent way to do this. A skilled energy auditor will complete a thorough examination of a facility to identify all the opportunities for energy efficiency improvements. The more complex the facility, the more expertise required by the auditor. For residential buildings in Minnesota, energy audits may be available at a subsidized cost from the local utility.

If you're trying to decide whether or not to do an energy audit in a building, you might consider performing a benchmark evaluation to see how a building ranks in comparison to similar structures. A free benchmarking tool is available on the website of the Energy Star program of the U.S. Environmental Protection Agency (www.energystar.gov).



2. Decide which Opportunities to Implement

Often economic considerations dictate which opportunities are implemented. The most common criterion used is simple payback – how long does it take to pay back the cost of the improvement with the energy savings that result from the improvement? For example, if you buy a compact florescent light bulb for \$6 to replace a less-efficient bulb, and the new light bulb saves \$3/year in energy bills, the simple payback is 2 years.

The acceptable length of payback will vary depending on who is paying for it – businesses typically don't consider anything longer than a 2-year payback, while institutions or individuals may have a longer time frame, perhaps 7 to 10 years, or even longer. It is important to remember that after the payback period, the project will continue to reap energy savings for the life of the project; the “profits” of investing in the project.

Because the simple payback method does not take into account environmental costs, an environmentally committed individual or institution may even implement efficiency projects that cannot be justified by economic payback alone.

3. Financing In the long run, carefully chosen energy efficiency projects will not only pay for themselves, but reduce overall spending on energy. However, for large facilities it is sometimes difficult to come up with the initial



An energy auditor at work

CASE STUDY:

Reducing the “Hassle” of Efficiency: the One-Stop Shop Approach



SPONSORED BY XCEL ENERGY, and administered by the Center for Energy and Environment, the One-Stop Efficiency Shop (One-Stop) is an innovative, full service lighting rebate program for the small businesses sector. Small businesses are difficult to serve with traditional lighting rebate programs due to limitations in financial resources, time, knowledge of lighting products, and access to quality contractors. One-Stop is structured specifically to address these needs and concerns. One-Stop offers qualified business owners a free, no obligation audit, lighting rebates, and below-market rate financing that is paid on the owner's utility bill, with loan payments structured to match the owner's monthly savings so that

the owner does not experience any increase in monthly bills. Because One-Stop does not sell lighting products, auditors are able to offer customers unbiased recommendations. Yet, due to the collaboration with local electrical contractors, One-Stop is also able to offer standard program pricing quotes and a pool of qualified contractors to eliminate the hassle of collecting bids. This combination of services brings education, financial resources, and minimal time commitment directly to the customer.

Available in Xcel service territory.

For more information about this program, see www.mncee.org/oses.htm.

capital funds to finance these projects. There are several ways to overcome this problem:

- Set up a revolving loan fund for energy efficiency projects. Recognizing that the projects pay for themselves, the University of Minnesota Twin Cities campus set up a fund for energy efficiency projects that is replenished with the savings from previous projects.
- Consider having an outside company do the efficiency project. There are some companies that will do the assessment, implement and finance the project, in exchange for a share of the energy savings, which may make sense in certain situations.
- Grant and loan programs for energy efficiency projects. Utilities often offer rebate programs for high-efficiency products, and may have other programs – your local utility should know what programs you qualify for. Other financing programs exist; for example, schools have special financing available to them for energy efficiency projects, and the Minnesota Housing Finance Agency offers programs for qualifying homeowners and multi-family buildings.

4. Implementing the Energy Efficiency

Projects Once you've made a plan for what projects you want to do, you have to decide if you want to do them yourself, use staff within your organization, or contract for services. If you contract the projects out, choosing a qualified contractor to install the energy efficiency projects is key to realizing the energy savings.

5. Maintenance In some cases, maintenance of an energy efficiency project will not be an issue, but in some cases it is worthwhile to consider how the project will be maintained.

This is especially true in dealing with processes and systems. For example, many types of energy efficiency gains in complex Heating, Ventilation and Air Conditioning systems (HVAC) tend to diminish over time unless they are maintained.



Cooling system inspection

- Improves the environment
- Works well with agriculture
- Helps with reliability concerns
- Recycles waste materials and waste heat
- Offers community economic development
- Improves energy independence, local control, and energy security
- Promotes learning about energy

For every \$1 spent on energy efficiency programs, about \$3.50 in benefits are realized

BARRIERS TO ENERGY EFFICIENCY

So if energy efficiency is so marvelous and cost-effective, why aren't we doing more of it? Here is a summary of some of the main reasons.⁵

Information Gap Consumers and even contractors often aren't aware of energy efficiency options or the economic and environmental benefits they offer. Consumers also may not believe the potential saving estimates claimed by contractors and auditors.

Lack of Investment Dollars Residential, businesses and government customers may lack the up-front capital required to make investments in energy efficiency projects.

High "Transaction Costs" Making an informed purchase or considering energy efficiency measures often involves more time, money and hassle than the consumer is willing to invest.

Split Incentives If the person who pays the monthly energy bill is different than the person who pays for the equipment, there is a split incentive. This is most evident in landlord/tenant relationships. The landlord does not have an incentive to purchase the more expensive, higher efficient equipment because the landlord does not reap any of the benefits of lower operating costs. The tenant is often unaware of equipment upgrades and does not actually own the equipment; therefore the tenant does not invest in more efficient equipment even though they would capture significant savings. This same dilemma can also occur in large institutions where the person paying the energy bill is different than the person responsible for capital improvements.

Short Term Costs are Often Emphasized over Long Term Costs For example, builders try to keep construction costs as low as possible, without considering the long-term energy costs of inefficient construction methods.

OVERCOMING BARRIERS: POLICIES AND PROGRAMS TO ENCOURAGE ENERGY EFFICIENCY

Recognizing that some policy direction is necessary to overcome barriers and more fully capture the potential of energy efficiency, policymakers have created programs to stimulate energy efficiency. Below are some of the programs available in Minnesota.

The largest energy efficiency program in Minnesota is called the Conservation Improvement Program (CIP). In Minnesota, all gas and electric utilities are required to spend a percentage of their revenues on conservation efforts.⁶ These efforts include funding energy audits, educational efforts, rebates for energy-efficient appliances and other equipment, and design assistance to make new buildings more energy efficient.

The Minnesota Department of Commerce estimates that because of the CIP program, every year Minnesota saves the amount of electricity consumed by 41,000 retail customers and reduces peak demand by about 128 megawatts. The CIP program is also very cost-effective: every \$1 spent results in about \$3.50 in benefits⁷. Local utilities can provide more information on programs that they provide under CIP.

The Minnesota Department of Commerce runs the Energy Information Center, which produces numerous publications for residential, small business/commercial sites, and institutional and municipal buildings. Each section lists publications that provide practical, easy-to-understand recommendations for energy saving strategies. The Energy

CASE STUDY:

Designing Energy Savings

FOR 10 YEARS, XCEL ENERGY has offered a program called Energy Design Assistance (formerly Energy Assets) to encourage energy efficiency to be included in the design of large buildings. Xcel pays for the services of a consulting firm to work with the building owner, architect and engineers (the design team). The program's goal is to improve the energy efficiency of new construction projects by encouraging the design team to implement an integrated package of energy efficient strategies. Using sophisticated computer modeling and their knowledge of energy efficiency

practices and technology, the consultants analyze energy impacts and costs associated with a range of design options. The program has addressed almost 200 buildings with a total of more than 40 million sq. ft., saving well over \$15 million per year, and nearly 60 megawatts in electrical peak demand. Savings, compared to code levels, averages about 30%.

For more information, see www.xcelenergy.com > business > (enter zip code) Go > Save Energy and Money > Energy Design Assistance.

Information Center also makes Energy Specialists available to customers that can assist with energy conservation questions (see contact information on page 20).

Another state program is Rebuild Minnesota,⁸ a part of the US Department of Energy's Rebuild America Program that focuses on creating partnerships to implement conservation and energy efficiency projects. Rebuild Minnesota works with schools, municipalities and low-income family dwellings to identify solutions to meet local energy demand and build public and private partnerships among communities throughout the state. They provide assistance drawing community partnerships together and linking communities with the people and business that provide energy efficient products, services, information and strategies.

In addition, The Minnesota Department of Commerce, University of Minnesota and the Iron Range Resource and Rehabilitation Agency are beginning a state level Industries of the Future (IOF) program to improve energy efficiency, environmental performance, and industrial process productivity in two of the state's most energy intensive industries, forest products and mining.

END NOTES

¹Interlaboratory Working Group, *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond* (5 labs report), (Oak Ridge, TN; Oak Ridge National Laboratory and Berkeley, CA; Lawrence Berkeley National Laboratory), LBNL-40533 or ORNL/CON-444. 1997. (www.ornl.gov/ORNL/Energy_Eff/labweb.htm)

²This savings estimate was made when the lighting retrofit program was 70 percent finished, at which time, costs of the program totaled \$3.1 million. Minnesota Building Research Center, *University Energy Efficiency Program Evaluation*, June 1992.

³Environmental Law and Policy Center, *Repowering the Midwest*, Chicago, 2001.

⁴Chart presents electric energy intensity from 2000 data; units (TWh/billion\$GDP) are terawatt-hours per billion 1995 dollars of gross domestic product, adjusted for purchasing power parity.

⁵Portions excerpted from Environmental Law and Policy Center, *Repowering the Midwest*, Chicago, 2001; and personal correspondence with Keith Butcher, Center for Energy and Environment, 3/3/03.

⁶The law requires all electric utilities to invest 1.5 percent of their state revenues in CIP (except Xcel Energy, which must invest 2 percent). Regulated natural gas utilities are required to invest 0.5 percent of their state revenues into conservation programs.

⁷Minnesota Department of Commerce, *Energy Planning and Policy Report 2000*, St. Paul, 2001.

⁸For more information regarding Rebuild Minnesota, see: www.commerce.state.mn.us.

PHOTOGRAPHS

page 15 – National Renewable Energy Laboratory;
page 16 – St. Paul Neighborhood Energy Consortium;
page 17 – National Renewable Energy Laboratory



HELPFUL RESOURCES FOR COMMUNITIES

All web links listed here are available (and updated if necessary) at www.mnproject.org (click on “publications”)

Minnesota Department of Commerce. Has information on the types of conservation programs available and provides useful publications on their website related to energy efficiency. In addition, they host the Energy Information Center, which has Energy Specialists waiting to answer questions you may have at the phone number below. 651-296-5175 or 800-657-3710 (toll-free) (www.commerce.state.mn.us)

Energy Star. A program of the US Environmental Protection Agency and US Department of Energy. To use the free benchmarking tool, simply click on the button that reads “Benchmark your building’s energy performance”. (www.energystar.gov)

Utility conservation programs. Many utilities have websites on their conservation programs, some are listed below. Contact your local utilities to find out about their offerings.

- Xcel Energy
(www.xcelenergy.com)
- CenterPoint Energy Minnegasco
(www.minnegasco.centerpointenergy.com)
- Minnesota Power
(www.minnesotapower.com/energy_tips)
- Ottertail Power Company
(www.otpco.com/asp/energywizard.asp)
- Alliant Energy
(www.alliantenergy.com)

Center for Energy and Environment (CEE). CEE is a nonprofit Minneapolis-based organization with a broad expertise in energy efficiency. CEE has provided energy, environmental and housing rehabilitation services to utilities, private corporations, neighborhood organizations, municipalities and public agencies for over 18 years. These services include financing, building audits, technical research, program design and delivery and evaluations.

Contact: Keith Butcher, Engineer, 612-335-5890, kbutcher@mncee.org (www.mncee.org)

St. Paul Neighborhood Energy Consortium (NEC). The Neighborhood Energy Consortium is a non-profit organization involved with many aspects of energy efficiency. It offers an energy audit program, an insulation program, custom home energy analyses, and community education. They also run an innovative car-share program.

Contact: Jimmie Sparks, Energy Program Manager, 612-221-4462 ext. 123, jimmies@spnec.org (www.spnec.org)