



Minnesota energy savings guide for industrial operations

Energy efficiency is good for business

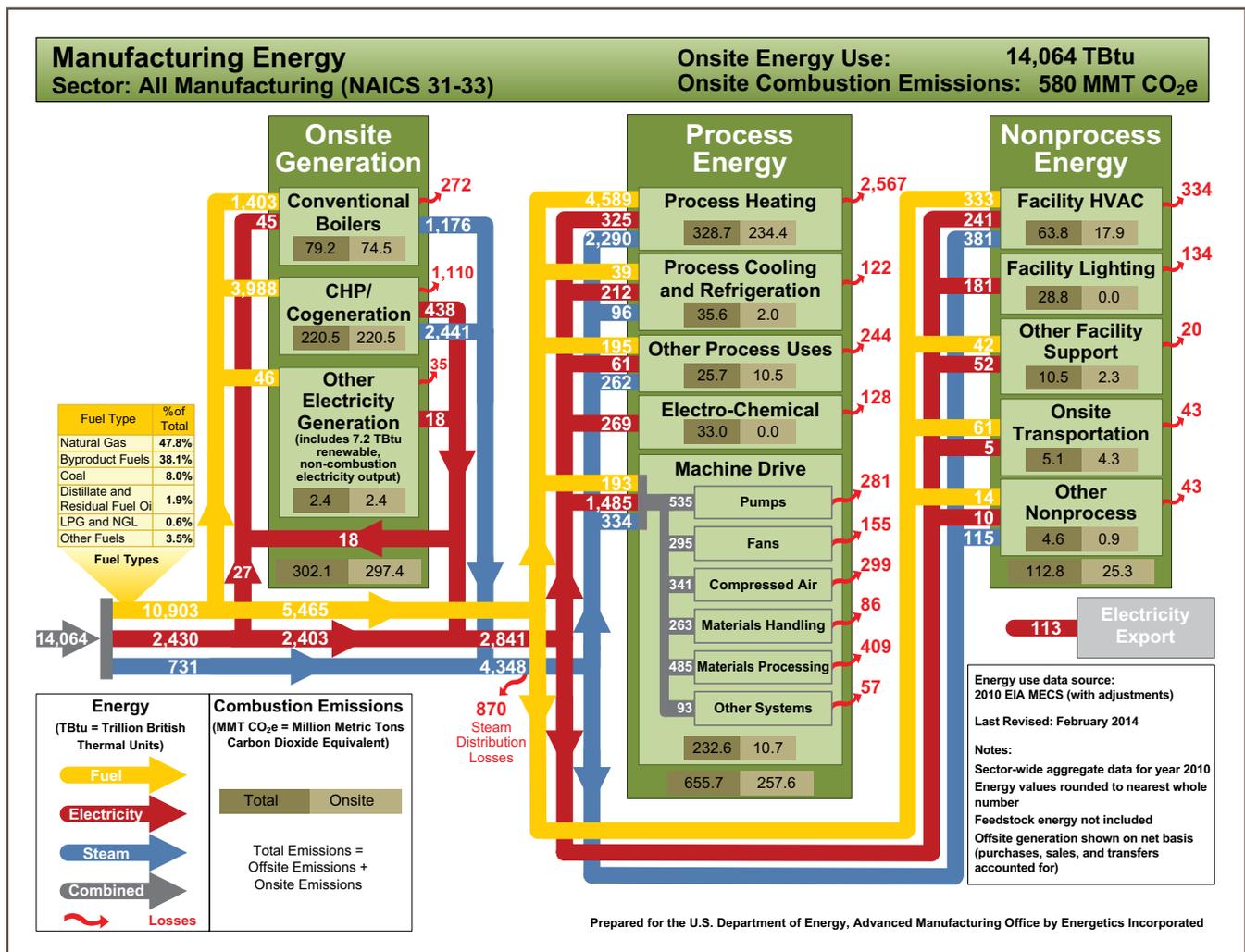
The industrial sector accounts for approximately 31 percent of all energy consumption in the United States—and much of this energy is used for manufacturing processes. On average, manufacturing facilities use 95.1 kilowatt-hours (kWh) of electricity and 536,500 Btu of natural gas per square foot annually, though actual consumption varies widely depending on the subsector.¹

Process heating, drivepower, cogeneration, and conventional boiler use generally consume the most energy in manufacturing facilities.

Manufacturing energy sectors:

- All manufacturing foundries
- Alumina and aluminum glass and glass products
- Cement iron and steel
- Chemicals machinery
- Computers, electronics and electrical equipment
- Fabricated metals plastics and rubber products
- Food, beverage and Textiles
- Forest products
- Leather and leather products
- Petroleum refining
- Printing and Publishing
- Process water systems
- Transportation equipment

The chart below visualizes the flow of energy—in the form of fuel, electricity or steam—to major end uses in manufacturing, including boilers, power generators, process heaters, process coolers, machine-driven equipment, facility HVAC and lighting systems.



¹Source: US Department of Energy



Energy efficiency opportunities are everywhere

If you're looking for energy savings in your industrial processes, team up with our energy advisors and account management team. We can help you identify energy efficiency opportunities and implement well-planned, long-term solutions to reduce your energy costs. We provide energy efficiency expertise and rebate programs to help you manage and control your energy

usage. From customized solutions to equipment efficiency, you can choose from a variety of reliable and affordable options. And by taking advantage of our energy audits and studies, you'll uncover more substantial energy efficiency opportunities. Studies range from whole-building energy audits to in-depth studies on specific equipment systems.

Life cycle cost analysis: A smart financial decision-making tool

Did you know that it's not uncommon for equipment in industrial facilities to have lifetime operation costs that can be higher than their purchase price? You might be tempted to consider only the sticker price when purchasing new equipment or retrofitting your building's shell. However, you may be able to realize substantial energy and cost savings in the long run if you consider the lifetime utility and maintenance costs of a purchase. This well-established practice is known as life cycle cost analysis and is used by businesses and institutions of all sizes.

A life cycle cost analysis allows you to compare the lifetime expenses of two or more options for a given building system. These lifetime expenses typically include the cost of owning, operating, maintaining and disposing of the system. Future costs need to be converted (or "discounted") to their present values to account for energy, labor, and parts price escalation

(inflation) as well as for the time value of money—the idea that a dollar received today is worth more than a dollar received in the future. The option with the lowest life cycle cost is the most economical choice.

Xcel Energy offers the Energy-At-Risk Financial Analysis Tool to customers considering energy efficiency improvements. This tool helps business customers make the case to management for energy-saving measures. You will receive the information and support you need to green-light your energy efficiency project within your organization. It's specially designed to quantify your potential energy savings which can translate into real dollars for your bottom line. Best of all, it's absolutely free.

Ways to increase industrial energy-savings potential

Optimizing compressed air systems

Although it's often viewed as an essentially free resource, compressed air (CA) is anything but free. In fact, in many industrial plants, air compressors consume more energy than any other single end use. And once the air is compressed to the desired pressure, it often needs to be dried and cooled before it is sent through the distribution system to the end use, requiring even more energy. According to the U.S. Department of Energy (DOE), CA accounts for 10 percent of industrial electricity consumption.¹

Minnesota businesses can earn significant rebates and reduce costs through better performance through our Fluid System Optimization studies and rebates. To offset your study cost, we offer study funding for the following systems:

- Blower
- Compressed air
- Fan
- Hydraulic
- Pump
- Vacuum

Process efficiency

Large Minnesota industrial businesses can gain long-term energy savings and develop a sustainable energy management plan with our Process Efficiency program. This holistic program focuses on continuous energy improvement. It provides resources to integrate energy efficiency into your manufacturing and business processes. We can help assess and improve your energy management practices to deliver measurable, sustainable energy savings.

Benefits:

When you take advantage of our Process Efficiency program, you can:

- Identify opportunities to save energy in both technical opportunities and business practices.
- Improve your energy efficiency and gain long-term energy savings that boost your bottom line.
- Gain additional funding for engineering and technical studies to fully scope energy conservation opportunities in your facility.
- Benefit from bonuses resulting from energy efficiency measures on your large industrial systems producing energy savings that surpass your annual goals.

When you take advantage of our Fluid System Optimization studies and rebates, you can:

- Receive funding for a study on how to improve your system
- Earn substantial rebates (an average of \$5,000 based upon \$400/kW saved)
- Offset up-front costs and shorten payback periods on new equipment
- Reduce waste
- Improve productivity and increase your profitability
- Enhance your system knowledge

Details:

We'll work with you to create a one to three-year sustainable energy management plan. You'll identify measures that can earn substantial energy savings and rebates for your business.



Sources: ¹ESource; ²U.S. Department of Energy

Motors and variable frequency drives

Did you know that motor-driven equipment accounts for 64 percent of the electricity consumed by U.S. industries? Energy-efficient motors can cut this energy use by at least 12 percent.² Even greater savings can be seen by adding variable frequency drives (VFDs). Since VFDs operate on an as-needed basis, they improve operating efficiency, reduce maintenance and may extend the life of your motor equipment. VFDs used on fans and pumps can qualify for cash rebates.

AC induction motors

In a single year, a fully-loaded motor operating continuously can consume energy worth about 10 times its initial cost. That's why even small improvements in efficiency can pay back quickly. To learn more about motor efficiency visit xcelenergy.com/MotorEfficiency.

Permanent magnet AC motors

Upgrading to a Permanent Magnet AC motor (PMAC) is an effective, energy-saving motors choice. PMACs are inherently efficient due to the elimination of rotor conductor losses, lowered resistance winding and a "flatter" efficiency curve. In addition, PMACs generally operate cooler, resulting in longer bearing and insulation life.

Planning for motor failure

The second time a motor fails in an industrial setting is often when facilities managers decide to replace it. The financial and environmental ramifications of this (often rushed) decision can be costlier than needed. Learn how to create a motor plan at the Motors Decisions Matter (MDM) website at motorsmatter.org.

Variable frequency drives

Variable Frequency Drives (VFDs)—also called adjustable-speed or variable speed drives—allow induction-motor-driven loads such as fans and pumps and PMAC motors to operate in speed ranges as wide as 10 percent to 300 percent of nameplate speed. By controlling motor speed so that it finely corresponds to varying load requirements, VFD installations can increase energy efficiency. They also can eliminate the need for expensive and energy-wasting throttling mechanisms such as control valves and outlet dampers.

In the right applications, variable frequency drives can increase energy efficiency in motor systems by as much as 50 percent while adding more control, extending the life of your equipment, reducing noise and improving process precision. Find out which systems offer the largest savings, and find out how to make the best choice.

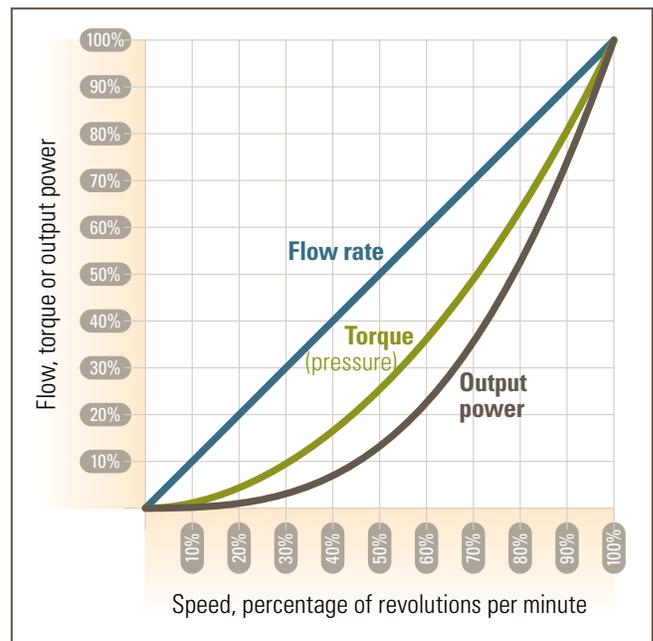
Prescriptive rebates now available for water well pump VFDs

Pumping systems can be critically important to a facility or plant's operations. In many industrial applications, such as power and petrochemical plants, pumps directly support production processes and run as often as—or even longer than—other equipment at the facility. The amount of energy consumed by many long-running pumping systems often results in a substantial addition to a plant's annual operating costs. In fact, about 27 percent of the energy consumed by motor-driven equipment in manufacturing facilities is used to operate pumps.¹ Therefore, pumping systems are a natural target in efforts to reduce energy consumption in motor-driven systems.²

Centrifugal fans and pumps offer the highest potential for savings

Example:

- Flow increase 10 percent
- Power increase 33 percent
- Small decrease in flow = bigger decrease in power



Savings vary by application. Applications such as extruders and conveyors are custom VFD applications and may experience savings, but not to the same degree as fans and pumps.

Building automation systems

Installing or upgrading a building automation system (also known as an energy management system) can save between 5 and 15 percent of overall building HVAC and lighting energy consumption across industries.¹ Learn how to reduce overall building operating costs by controlling building equipment so that it operates more efficiently. If you are adding more controls or updating your management system, our rebates can help justify the expense.

Here's how manufacturing plants can achieve centralized control over their HVAC systems.

By adding an energy management system plants are able to:

- Manage scheduling and operating functions via panel or web
- Monitor and control the system remotely from almost anywhere
- Increase energy efficiency by providing free cooling with outside air
- Create custom alarms and send them to remote locations with email and pagers
- Create custom trends to track various aspects of building operation, and generate reports
- Monitor and report on power consumption



Here are some of the many ways to use building controls to increase your energy savings:		
<p>Scheduling</p> <ul style="list-style-type: none"> • Holiday scheduling • Zonal scheduling • Override control and tenant billing • Night setup/setback • Optimum start and stop • Morning warm-up/cool-down 	<p>Resets</p> <ul style="list-style-type: none"> • Supply air/discharge air temperature • Hot deck and cold deck temperature • Entering condenser water temperature • Chilled water supply temperature • VAV fan duct pressure and flow • Chilled water pressure 	<p>Miscellaneous</p> <ul style="list-style-type: none"> • Simultaneous heating/cooling control • Zone-based HVAC control • Chiller staging • Boiler control • Building space pressure • Variable speed drive control • Heat recovery
<p>Ventilation control</p> <ul style="list-style-type: none"> • Carbon dioxide • Occupancy sensors • Supply air volume/OSA damper compensation routines • Exhaust fans • Air-side economizers • Typical air-side • Night ventilation purge 	<p>Lockouts</p> <ul style="list-style-type: none"> • Boiler system • Chiller system • Direct expansion compressor cooling • Resistance heat 	<p>Lighting</p> <ul style="list-style-type: none"> • Lighting sweep • Occupancy sensors • Daylight dimming • Zonal lighting control
	<p>Energy monitoring*</p> <ul style="list-style-type: none"> • Whole building or end-use • KWh or demand 	<p>Demand control*</p> <ul style="list-style-type: none"> • Demand limiting or load shedding • Sequential startup of equipment • Duty cycling

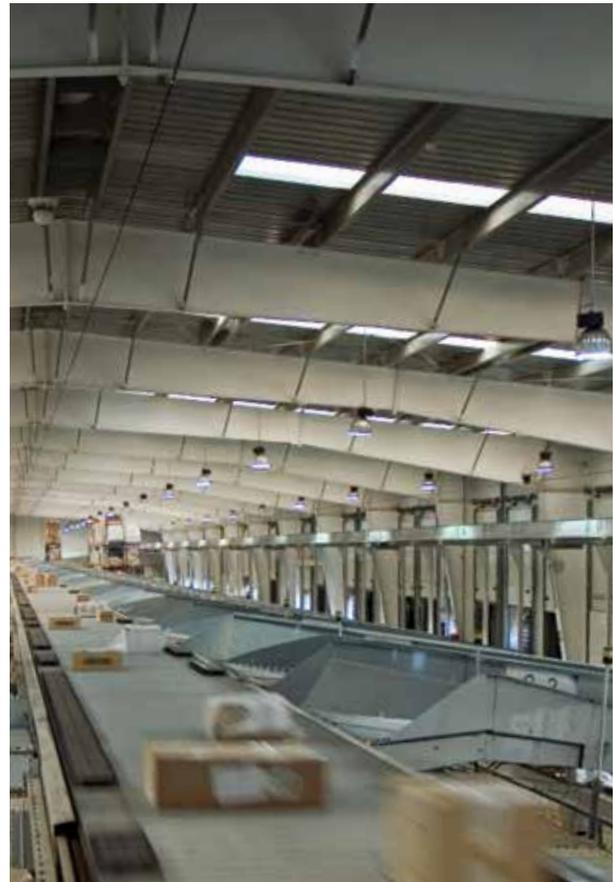
Source: "Energy Management Systems A Practical Guide," O&M Best Practices Series, Portland Energy Conservation Inc.
 *Tactics not specifically eligible for rebates, but have good O&M savings

Lighting efficiency

For most businesses, lighting is a main driver of energy bills. Depending on the industry, it can account for a majority of monthly electric costs. Every step to lower your lighting use, from installing energy-efficient lighting to limiting lights to where and when you need them, can significantly lower your energy bills and earn substantial rebates.

The main goals for industrial lighting are to provide these benefits:

- Good visibility for every activity
- Enhanced productivity and improved safety for employees
- Attractive and comfortable environment for work activities: Industrial lighting needs vary depending on the activity, so choose fixtures and wattages that are the most energy efficient for the specific task or area you are illuminating.
- Metal halide, pulse start metal halide, LEDs, fluorescents (LWT8) and high-bay fluorescent fixtures are good choices when color rendition is important for product matching and selection
- Energy-efficient equipment is available for general lighting and supplemental task lighting when you combine types of fixtures in work areas



Objective	Solution	Equipment	Benefits
Good visibility	<ul style="list-style-type: none"> • Position fixtures properly • Use high color rendering lamps • Provide adequate light levels 	<ul style="list-style-type: none"> • Task lighting • Metal halide or pulse start metal halide fixtures with upward light component • High-bay fluorescent or LED fixtures 	<ul style="list-style-type: none"> • Increases productivity, accuracy and speed • Improves safety; avoid hazards • Aids tasks requiring fine detail and long duration • Reduces the “cave affect”
Avoid glare	<ul style="list-style-type: none"> • Use low-glare fixtures • Select low-glare work surfaces 	<ul style="list-style-type: none"> • High-bay fixtures with good shielding of lamp • Low-bay fixtures with low brightness lens • Adjustable task lights 	<ul style="list-style-type: none"> • Increases productivity, accuracy and speed • Improves safety; avoid hazards • Increases visual comfort; avoids tired eyes
Match colors accurately	<ul style="list-style-type: none"> • Use high-color rendering lamps 	<ul style="list-style-type: none"> • Metal halide or pulse start metal halide • Fluorescent LWT8 • LEDs with high CRI 	<ul style="list-style-type: none"> • Effective and efficient color matching • Increases accuracy and speed

Turn Key energy assessment

Industrial businesses can take advantage of our low-cost Turn Key assessments to identify energy saving opportunities that often go unnoticed. This on-site, facility-wide assessment analyzes your existing equipment and industrial processes and will provide you with an in-depth report outlining recommended improvements, potential energy savings, paybacks and rebates you could earn. The program offers free implementation services that can help get improvement projects off the ground and completed, and bonus rebates are available for certain projects completed within a specified time frame.

Details:

- An on-site ASHRAE Level 1 Assessment conducted at your facility that identifies improvements which have the biggest impact on reducing your energy costs

- Buildings that are 5,000 sq. ft. to 75,000 sq. ft. will also receive a recommissioning (RCx), or tune-up analysis, to identify low- and no-cost adjustments that can be made to existing equipment to reduce energy use.
- An assessment report that outlines improvement upgrades, potential energy savings, paybacks and rebates you may be eligible to earn.
- 30 percent bonus rebate on most improvements you complete within a year of your assessment; and/or a bonus rebate of \$0.03/kWh or \$3/Dth for qualifying tune-ups completed within nine months.
- A wide range of free implementation services to help get your improvements projects off the ground and completed.

Xcel Energy offers customized solutions to help you develop long-term savings. Visit xcelenergy.com/Business for more information.

As you move forward with your energy efficiency goals, know that Xcel Energy is here to help you with all your energy needs. Remember, the prudent and conservative use of energy is one of the easiest and most cost-effective steps you can take to cut operating costs and increase profitability. We offer a variety of programs and rate savings options to help industrial and business customers of all sizes lower their energy bills and earn substantial rebates.

Team up with your account manager or an energy efficiency specialist to get free advice. The energy efficiency specialists at our Business Solutions Center are standing by to answer your questions, direct you or to help you get started on the road to efficiency.

Call **855.839.8862** to speak to an energy efficiency specialist today. Or email **energyefficiency@xcelenergy.com**. You can also find more information and a rebate application online at **xcelenergy.com/Business**.

