

5.0 ENBRIDGE'S CONSERVATION PROGRAMS

Minn. R. 7853.0260

Conservation Programs

Each application shall contain a section that relates to the conservation of energy.

As a common carrier, Enbridge does not buy or sell crude oil or petroleum products. Rather, Enbridge serves as a transportation company that ships crude oil to market where it can be refined. Thus, Enbridge's conservation efforts do not have any impact on crude oil supply or demand. Accordingly, the sections below discuss the conservation programs Enbridge has considered and/or implemented to reduce its own consumption of energy.

A. Enbridge's Energy Needs Determination & Coordination

Does the applicant have an energy committee or an individual responsible for determination or coordination of its energy needs?

Yes. Enbridge is committed to reducing its own consumption of energy and its greenhouse gas emissions. Energy conservation is a major concern at Enbridge because power costs represent the single largest recurring expense for pipeline operations. Enbridge routinely evaluates processes, designs, and other factors to identify the most efficient use of energy while minimizing cost. To this end, Enbridge has an Energy Management Group that is responsible for negotiating power supply contracts and a Power Optimization Group that is responsible for allocating power to assure the economical and efficient use of power for the Enbridge Mainline System, which includes the Project. Enbridge also continuously reviews and tracks firm and non-firm power requirements and works closely with electrical utilities in planning for its transmission and generation needs.

In addition, Enbridge has a Green Energy division responsible for the development of renewable and alternative power generation. Enbridge currently has interests in 2,200 megawatts (MW) of zero-emission energy which is enough electricity to supply nearly 750,000 homes with green energy.

B. Enbridge's Energy Conservation Goals & Objectives

Has the applicant defined energy or conservation goals or objectives?

Yes. As the operator of one of the world's longest and most sophisticated energy transportation systems, one of Enbridge's goals is to deliver energy in the most efficient way possible. As such, Enbridge's objectives are to reduce company-wide greenhouse gas emissions, invest in renewable and alternative energy technologies, and invest in energy innovation. More recently, Enbridge announced a new three year, \$3 million, Environmental

Stewardship Grant Program to support communities in North Dakota, Minnesota, and Wisconsin. This grant program will support community projects that advance local environmental priorities, such as projects that:

- Improve surface water quality;
- Mitigate temporary impacts to wetlands, wildlife and migratory birds; and
- Advance research into water quality, water impacts and protection of water and water based industry such as wild rice and tourism.

Eligible applicants include non-profit organizations, state government agencies, local governments, tribes, and educational institutions. Approximately \$1 million per year will be available for grants in 2015, 2016, and 2017.

C. Enbridge's Energy Efficiency & Conservation Programs

What major energy efficiency or conservation programs has the applicant considered?

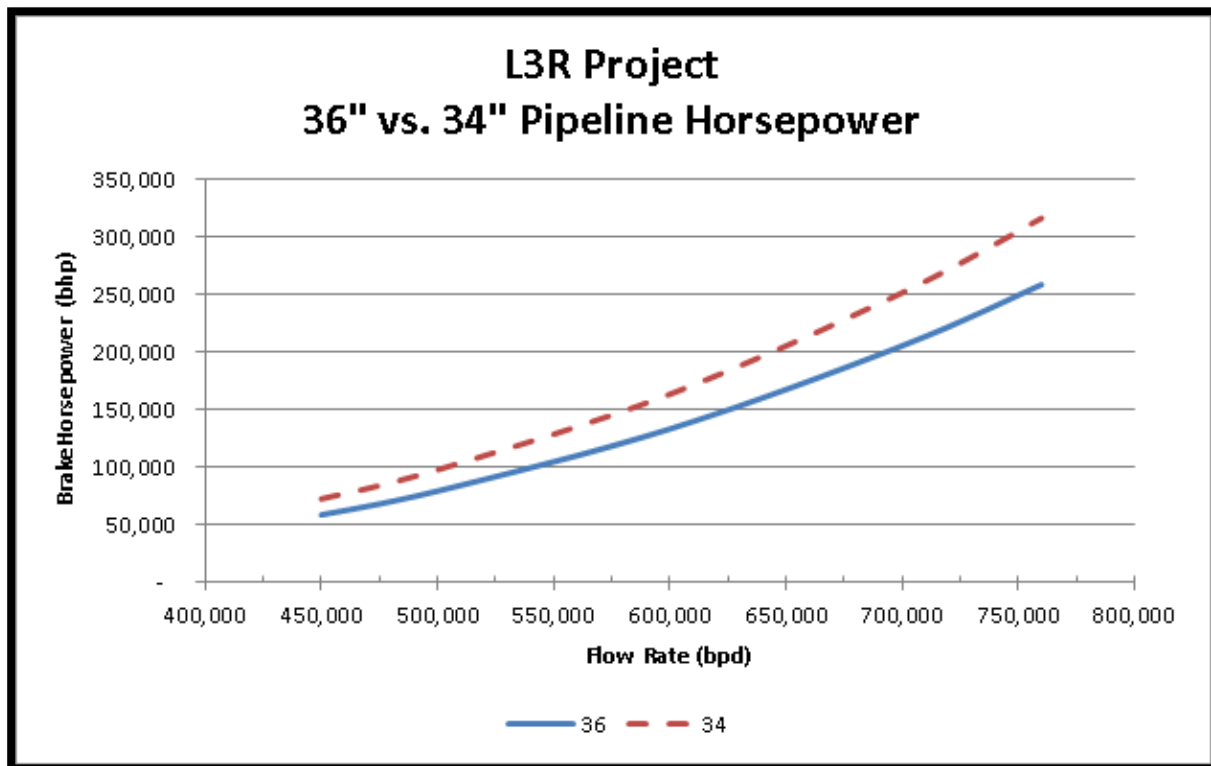
Enbridge has considered several energy efficiency and conservation programs to reduce its consumption of energy and greenhouse gas emissions. Below is an overview of the programs Enbridge reviewed during the Project development phase.

Engineering Design

Pipeline Diameter

Replacing Line 3 with a 36-inch pipeline provides power savings at all flow rates as compared to replacing Line 3 with a 34-inch pipeline. At 760 kbpd the Project will save 108 GWh of energy as compared to the power required to move the same volume on a 34-inch pipeline. Saving 108 GWh equates to an annual reduction of over 74,000 metric tons of CO₂ emissions within Minnesota. Figure 5.C-1 below shows the approximate power consumption for a 36-inch and a 34-inch pipeline at varying throughputs. A 36-inch pipeline is more efficient than a 34-inch pipeline at the same flow rate because the greater internal area of the 36-inch pipeline means that the fluid moves slower than in the 34-inch pipeline. For the same type of fluid, a fluid moving more slowly will experience less friction and so will require less pressure to pump and therefore less power.

Figure 5.C-1: Approximate Power Consumption for 36" and 34" Pipelines at Varying Flow Rates



Energy Efficient Pumps and Motors

Enbridge utilizes high efficiency pumps and motors to minimize power requirements over the long term. Specifically, a high polish is used on the pump impeller, and motors are custom-designed for high-efficiency. For example, a fully-loaded 2,500 horsepower pump and motor unit, operating 300 days per year at 80 percent efficiency, will consume 17 million kilowatt hours (kWh) of energy annually and sets a demand of 2,331 kilowatts (kW). Increasing the efficiency by only one percent translates into 170,000 kWh of energy savings. Pumps are hydraulically designed and selected to obtain a high best efficiency point (BEP) at the desired flow rates. The throughput and commodity forecasts are continually being evaluated, and if the flow rate is outside the BEP range, impeller changes are typically implemented for improved efficiency.

Variable Frequency Drives (VFDs)

Variable frequency induction motor drives have been installed in accordance with an Enbridge standard that has been in place for approximately 20 years. VFDs allow the pipeline operator to vary the pump rotation speed, thereby controlling the pressure produced to match the desired flow rate in the pipeline. This eliminates the need to dissipate or waste pressure (energy) with pressure control valves. VFDs, however, do introduce energy losses and are therefore considered only when there is a range of operating conditions (primarily flow rate, density, and viscosity) that would require frequent changes in pressures produced by the pumps. Ideally, if operating conditions were constant, the pump would deliver constant pressure and eliminate the need for pressure dissipation. Operating conditions play a key role in designing the pumping stations, including the selection of motor drives for optimum efficiency.

Pipeline Control Center

The Enbridge Pipeline Control Center (Control Center) actively monitors all pipeline and terminal systems. Control Center operators are trained in applied hydraulics and pipeline control through the use of a computerized pipeline control simulation system. They are trained to operate the pipeline at an optimum flow rate using the most efficient combinations of pumps, thereby minimizing energy consumption. Operators may start and stop pumps, and monitor pipeline operating conditions to maximize energy efficient operations.

D. Enbridge Inc's Major Accomplishments

What major accomplishments in energy efficiency or conservation have been made by the applicant within the past five years?

Enbridge Inc. and its subsidiaries continue to consider and utilize all of the programs described in Section 5.C above in order to achieve energy efficiency. In addition to its liquid transportation systems, Enbridge Inc. has a growing presence in renewable energy, including solar, wind, waste-heat recovery, geothermal, and fuel-cell technologies. To date, Enbridge Inc's investments in renewable energy systems in North America exceed \$4 billion, and it has acquired (out-right or through partnerships) more than 2,200 MW of zero-emission energy (1,600 MW net) – which is enough electricity to supply nearly 750,000 homes with green energy. In 2014 alone, Enbridge Inc. invested approximately \$800 million in renewable and alternative energy projects and companies.

In the U.S., Enbridge Inc., as 100 percent owner or joint venture partner, has invested in the following projects:

- Cedar Point Wind Farm – a 250 MW farm located in Limon, Colorado, commissioned in the fourth quarter of 2011.
- Silver State Solar Power North – a 50 MW installation located in Primm, Nevada, commissioned in the second quarter of 2012.
- Neal Hot Springs Geothermal Facility – a 22 MW facility located in Malheur County, Oregon, commissioned in the fourth quarter of 2012
- Keechi Wind Farm – a 110 MW farm located in Jack County, Texas, placed in service in January 2015.
- Magic Valley Wind Farm – a 203 MW farm located near Harlingen, Texas.
- Wildcat Wind Farm – a 202 MW farm located near Elwood, Indiana.

In addition, Enbridge Inc. is investing in alternative and emerging technologies related to energy-efficiency and renewable energy. For instance, as Enbridge Inc. generates more renewable energy, it is participating in efforts to find ways to store it – particularly during non-peak demand hours. In 2013, Enbridge Inc. made an equity investment in Temporal Power, a developer and manufacturer of energy storage systems. Energy storage systems such as these help to advance society's use of intermittent energy sources such as wind and solar.

As well, Enbridge Inc. has invested in the following emerging energy projects, technologies, and companies:

- Skyonic, a carbon-capture technology company that is working towards cost-effectively capturing carbon emissions and turning them into useful products.
- Genalta Power, which owns and operates independent power plants that produce and sell environmentally friendly electricity generated from waste sources.
- Morgan Solar, a next-generation solar power technology company that is pioneering a whole new approach to designing and manufacturing solar concentrate photovoltaic modules. The technology provides an innovative means of generating solar power more efficiently, less costly, and with a lower environmental footprint.
- Hydrogenics, whose water electrolysis technology will convert surplus renewable energy into hydrogen gas, which can be injected into the natural gas distribution system.

E. Enbridge Inc.'s Future Programs

What major energy efficiency or conservation programs will be implemented within the next five years?

Enbridge Inc. recognizes that climate change is a critical global issue and believes that meaningful greenhouse gas (GHG) reductions will require effective public policies and regulations based on collaboration between government, industry, communities, environmental organizations and consumers. While Enbridge does not produce the fossil fuels it transports, Enbridge Inc. is committed to advancing climate solutions within the company. Enbridge's energy and climate change strategies continue to focus on reducing greenhouse gas emissions from our existing operations and designing new infrastructure to maximize energy efficiency (as discussed above). Enbridge Inc. tracks and publically reports on its greenhouse gas emissions and continues to take steps to lower them.

Enbridge Inc's strategic priorities for the next five years include:

1. Reduce direct GHG emissions across the company.

In 2011, Enbridge Inc. reduced the GHG emissions from its Canadian operations by 21 percent below their 1990 levels. Likewise, in 2014, Enbridge Gas Distribution reduced its GHG emissions by 5 percent below its 2011 levels. Enbridge is now setting new targets for its own reduction of emissions and energy use.

2. Reduce methane emissions across the company.

In 2012, Enbridge Gas Distribution completed a project to remove all cast iron pipes from its natural gas delivery system, which has been a major contributor to the reduction of the company's methane emissions. In addition, Enbridge Inc. continues to use advanced technologies to track, detect, and reduce fugitive emissions, such as methane, from its natural gas pipelines.

3. Reduce energy consumption across the company.

Enbridge Inc. and its subsidiaries strive to reduce their own energy consumption through energy efficiency and conservation efforts. For example, Enbridge Inc. has reduced energy use in its offices and buildings through efforts to build new facilities to LEED¹ standards. In addition, as described in Section C above, Enbridge Inc. strives to build, operate, and maintain

¹ LEED, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class building strategies and practices.

its system operations to maximize energy efficiency. For example, Enbridge continually monitors pipeline flow rates and line splits to optimize pipeline operating pressures, thus reducing electricity requirements.

4. Continue to help natural gas residential and commercial customers use energy wisely through demand-side management programs.

Through its natural gas delivery systems, Enbridge Gas Distribution Company delivers natural gas to residential and commercial customers. Enbridge Gas Distribution Company creates initiatives to help its natural gas consumers improve energy efficiency, reduce natural gas consumption and lower GHG emissions. Since 1995, these initiatives have saved approximately 16.5 million tons of CO₂ emissions – similar to taking approximately 3.2 million cars off the road.

5. Continue investments in renewable and alternative Energy.

As described in Section D above, since 2002, Enbridge Inc. has invested approximately \$4 billion in renewable and alternative energy projects in Canada and the United States. Of that total, Enbridge invested approximately \$1.9 billion (about 47 per cent) in the last three years.

Enbridge's renewable and alternative energy business is diverse and includes a variety of energy sources and delivery systems. Enbridge Inc. is Canada's third largest renewable energy producer and, in the United States, Enbridge Inc. continues to be a growing renewable energy player with investments in wind, solar and geothermal. Enbridge also continues to invest in a wide range of alternative energy projects, including waste heat recovery and run-of-river power² generation, and Enbridge is exploring technologies to store renewable energy.

² Run-of-the-river hydroelectricity is a type of hydroelectric generation whereby little or no water storage is provided.