CASE STUDY

Net Zero Water

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The power of using what you already have: Selkirk's success story

ABOUT THE AUTHORS

Stephanie Andrade
Project Coordinator, Climate
Canadian Water Network (CWN)

Dana Mears
Project Manager, Urban Water Decarbonization
Canadian Water Network (CWN)

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Key insights

- Integrated climate policies and financial planning can strongly shape infrastructure decisions when they are fully embedded in organizational processes.
- Leveraging existing infrastructure can dramatically reduce the capital costs of implementing low-carbon heating and cooling technologies.
- Scaling proven solutions creates opportunities to extend net zero benefits to additional facilities and users.
- Low carbon heating and cooling systems can substantially reduce long-term operating budgets, offering both environmental and financial advantages.

Background

The City of Selkirk, located about 20 minutes north of Winnipeg, provides water and wastewater treatment services to roughly 10,500 residents. This system plays a vital role in supporting the city's growing population and business needs. Water is supplied from groundwater drawn through six wells, two of which provide water via an 11-kilometre pipeline.

The McLean Avenue water treatment plant is a two-part facility, with the original building constructed in 1961 and a major addition completed in 2011. In 2019, the City adopted its Climate Change Adaptation Strategy, followed by a Greenhouse Gas Accountability By-Law, as part of its broader commitment to achieving corporate net zero emissions by 2030. Through its annual greenhouse gas inventories, the City identified that in 2017, the water treatment plant was its second-largest source of emissions, due to the burning of fossil fuel for heating and cooling needs. Alongside contributing substantially to overall emissions, the facility also encountered year-round moisture-control issues, which caused equipment corrosion and created conditions conducive to mold growth.

Opportunity

In 2018, the condition of the facility's furnace, combined with insights from the City's capital asset management program, highlighted an opportunity to significantly reduce emissions by replacing the water treatment plant's heating system. The existing furnace relied on natural gas and replacing it with a similar unit was estimated to cost $200,000. Even with a new installation, the system would continue to require approximately $22,000 in annual costs, offering only minimal efficiency gains.

In evaluating replacement options, the City's climate targets guided decision-making and prompted the exploration of low carbon alternatives. A promising solution emerged by leveraging the facility's existing wells to support a geothermal heating and cooling system, ultimately becoming the preferred and successful alternative.

Geothermal energy typically draws on heat stored beneath the earth's surface using closed loop systems. In Selkirk's case, the approach is different. The City uses an open loop system that captures heat from the raw water supply as it enters the treatment facility. As water flows through the system, heat is either extracted or released using coils, helping to heat or cool the building before the water continues through the normal treatment and distribution process. This approach uses an existing resource to improve efficiency and reduce energy use.

The geothermal system was installed in 2018, initially serving the original portion of the building. One year later, the system was expanded to supply the entire facility and was found to have additional remaining capacity.

Strategy

Choosing geothermal represented a strategic opportunity for Selkirk, made possible by existing well infrastructure that substantially improved the project's return on investment. The business case evaluated both financial performance and emission-reduction potential.

The geothermal system cost $328,000, higher than the natural gas furnace option, yet offered significantly lower operating costs, below $10,000 annually over an anticipated 25-year lifespan.

Impact

When comparing annual operating costs, the geothermal system proved to be a cost-effective solution, projecting approximately $330,000 in savings over its 25-year lifespan. In 2018, the last full year prior to the partial conversion, the plant emitted 175 tonnes of CO_2e. By comparison, in 2020, the first full year after converting half the plant to geothermal, it produced just 74.7 tonnes of CO_2e. Now that the entire plant is operating on the geothermal system, the most notable reduction is the 77.5 percent reduction in emissions from 2023 to 2024 (80 tonnes $C0_2e$ to 18 tonnes $C0_2e$).

According to the City's 2024 Corporate Emissions Report, the geothermal system represented the largest single reduction in corporate greenhouse gas emissions achieved to date. The system's remaining capacity is now being explored as a potential heating and cooling source for the new future recreation centre or a nearby multi-family residential development.

The geothermal system has improved operational efficiencies for the facility, helping to better manage moisture levels. It has also helped cut costs related to replacing and repairing equipment, as well as managing mold.

The City's leadership has been recognized beyond the community. Manitoba's Minister of Environment and Climate visited the facility. It received a second-place award among 70 utilities at the 2018 Western Canadian Water Conference. In May 2019, Selkirk won the Canadian Network of Asset Managers' prestigious Tereo Award for leadership and innovation in Asset Management for its Climate Change Adaptation Strategy.

Lessons learned

Asset management: When evaluating renewable energy technologies, it is important to consider both existing infrastructure and any upcoming renewal or replacement needs. Selkirk's asset management approach helped identify that its well system was well-suited for integrating geothermal technology, enabling the City to replace an outdated natural gas furnace with a low-carbon alternative.

Return-on-investment considerations: Public scrutiny of utility costs continues to increase, underscoring the importance of evaluating full lifecycle costs, including capital investments, asset management implications, and operational efficiencies. By grounding its decision-making in established policy and asset management principles, the City was well-positioned to adopt an innovative and financially responsible solution.

Step-by-step: Phasing the integration of the geothermal system enabled Selkirk to achieve rapid emission reductions while also identifying unused system capacity for future mitigation efforts.