

Ontario's Water-Energy Nexus

Will We Find Ourselves in Hot Water... or Tap into Opportunity?

Energy and water are vital resources for all Ontarians; they are the essential ingredients for sustaining our livelihoods, recreation, health and ecosystems. These two resources are highly interconnected; energy is used to provide water services and water is used to generate energy.

It can be difficult to see the energy embedded in the water we use every day. But just as the glow from our lights and the exhaust from our vehicles remind us of electricity and gasoline consumed, the energy used for water can be seen steaming from a variety of everyday encounters.

The 40-metre high water tower that marks the entrance to many communities highlights the heights and distances that water is pumped to bring clean drinking water to our taps and toilets. The steam rising from our morning shower, a dishwasher at a local restaurant or a weekend car wash; the plume of steam escaping from an industrial plant that we pass on our way to work; or the long line of clothes washers we see through the window of a nearby laundromat – these all paint the picture of the large quantities of energy we apply to water each and every day.

As Ontario's population and economy grow, and our climate changes, the demand for energy and water will place increasing pressure on finite water resources and energy supplies. Strained water and energy resources typically mean rising envi-

- **Generating steam and pumping, treating and heating water consume 40% of Ontario's natural gas and 12% of our electricity usage.**

ronmental and economic costs for both, which can jeopardize future health and prosperity.

Although the energy-intensive nature of providing water services is often unrecognized, these activities consume enormous amounts of power and fuel. The energy embedded in the water we use for activities such as pumping, treating and heating water and generating steam consumes 40% of Ontario's natural gas and 12% of our electricity. In fact, providing water services uses more natural gas than any single economic sector in Ontario; this is more than the natural gas used by each of the industrial, transportation, residential and commercial sectors. Eighty percent of all energy used for water services is generated by fossil fuels, meaning it is typically dirtier than the energy used to power lights, appliances and electronics in our homes and businesses. This has significant negative consequences, including:

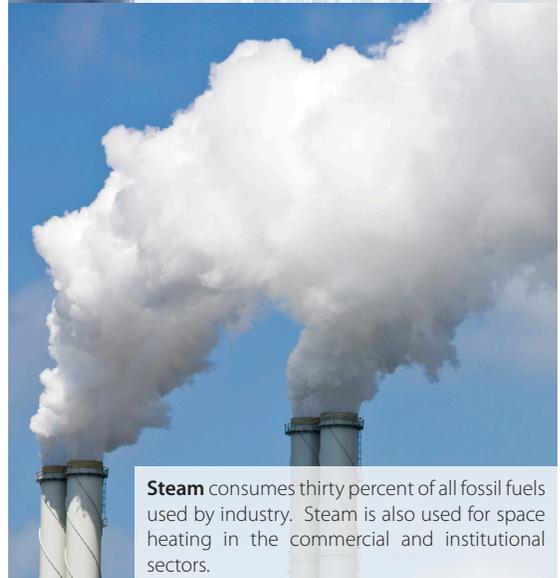
- Substantial costs to municipalities for the energy to pump and treat water;
- Release of greenhouse gases that contribute to climate change, resulting in the further need to find and treat more water;
- Rising water and energy costs for homeowners, business owners, farmers, hospitals and schools;
- Significant environmental, social and economic impacts of developing new energy sources to provide more water.



Pumping & Treating water and wastewater consumes enough energy to light every home in the province.



Heating Water for showers, faucets and laundry is the second largest source of greenhouse gas emissions in both the residential and the commercial sectors.



Steam consumes thirty percent of all fossil fuels used by industry. Steam is also used for space heating in the commercial and institutional sectors.



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The Energy Saving Opportunity of Water Conservation & Efficiency

The good news is that water conservation and efficiency opportunities are abundant. A recent report identified water saving opportunities in Ontario that have the potential to reduce water use by 46% for the residential sector, 36% for the commercial and institutional sector, 16% for the manufacturing sector and 41% of leaks in municipal systems.¹ And these estimates exclude water savings from process integration, water recycling and low impact development. Many existing conservation measures that save both water and energy can do “double duty” (e.g., toilets, clothes washers and boilers) by being adapted for use in new sectors. For example, conservation measures developed for the industrial sector could be used to conserve water in the institutional or agricultural sector and viceversa.

Existing municipal water conservation programs in Ontario, involving measures ranging from toilet rebates to industrial incentive programs, save approximately 6,500,000 m³ of water each year¹. Collectively, these municipal programs will save an estimated fifteen million dollars in energy costs over the next ten years for pumping and treatment alone. Importantly, the residents of these communities also benefit by decreasing their home and business energy costs, keeping water rates low by avoiding new water infrastructure and reducing their carbon footprint. And these efforts represent only a small fraction of the full potential for conservation and efficiency.

Encouragingly, a growing number of studies are reporting that provincial or statewide water efficiency programs and policies can provide additional energy savings that are economically comparable to current energy efficiency programs. For example, California found that “the energy savings [from water conservation programs] would achieve 95 percent of the savings expected from the 2006-2008 energy efficiency programs, at 58 percent of the cost”². The United States has recognized the energy saving benefits of water conservation since 1992, by adopting national efficiency standards for the sale of many water using fixtures such as toilets, faucets and showerheads. These standards were estimated to reduce water use by 8% over 20 years, saving \$7.5 billion in water infrastructure expansion costs and an additional \$28 billion in hot water savings for homeowners³. This type of integrated thinking around water and energy is gaining momentum internationally.

Forward Thinking

By seizing water conservation and efficiency opportunities, Ontario could reduce energy consumption, free up funds for struggling municipalities and contribute significantly to Ontario’s fight against climate change. While many of these opportunities are available at minimal cost and with payback periods of less than two years, barriers remain for homeowners, business owners and municipalities alike. New thinking and action is needed to increase participation in conservation programs and thereby build a more resilient future for Ontarians. Linking water and energy conservation efforts offers one such new way of thinking. Several opportunities exist to encourage a more integrated approach to water and energy as outlined in Box I.

The full research report offers technical practitioners and policy makers a comprehensive assessment of the energy embedded in water in Ontario as a basis for future work to identify measures, policies and programs that offer both water and energy savings. The significant amount of energy used for water-related services in Ontario suggests that water conservation and efficiency is likely to be the next frontier of energy saving opportunities. Energy conservation remains the best fuel and water conservation is the best source of new water.

BOX I: OPPORTUNITIES FOR INTEGRATED THINKING AND ACTION ON WATER AND ENERGY

1. **CHOOSE THE WATER AND ENERGY SOFT PATH** by prioritizing conservation of water and energy over new infrastructure. Recognize the impacts of new water infrastructure on energy use, and new energy infrastructure on water.
2. **BETTER INTEGRATE** water and energy monitoring, reporting, management and efficiency programs. Examine energy use and efficiency opportunities across economic sectors through a “water sector” lens that includes cold water, hot water and steam.
3. **COLLABORATE** by bringing together water and energy expertise to encourage development of innovative, synergistic solutions.
4. **INFORM** the public, policy makers and practitioners of the mutual benefits of reducing water and energy use.

References

- ¹ RMSi (2009) Assessing the Potential for Water Conservation and Efficiency in Ontario. Final Report for the Ontario Ministry of the Environment, April 6, 2009.
- ² Klein, G. et al. (2005) California’s Water – Energy Relationship. Final Staff Report. California Energy Commission. November, 2005. Available at: <http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF>
- ³ Dickinson et al. (2003) Benefits of the United States nationwide plumbing efficiency standards. Water Science and Technology 3 (3): 231-237.

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The full report is available at
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