Person, Place, and Policy

No. 2 | July 2017

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Sault Ste. Marie's Alternative Energy Transformation: A Canadian City Thinking Outside the "Grid"

The Canada Institute's Person, Place, and Policy series links policy issues with real people and real communities. The person in this article is Kieran O'Neill, an energy expert who is helping to shape Sault Ste. Marie's energy priorities to assert the city as a leader in advanced electrical grid technologies.

PERSON: ABOUT KIERAN O'NEILL

A Sault Ste. Marie native, Kieran O'Neill is the Smart Energy Business Strategist at the Sault Ste. Marie Innovation Centre (SSMIC) where he investigates energy projects in order to drive business growth, facilitate research, and commercialize innovation in the region.

O'Neill recognizes that Sault Ste. Marie has a truly unique energy landscape. "There are few if any cities in North America that compare to the renewable energy mix of the Sault." He sees "big opportunities" in a city that "has been very busy adding wind farms, solar PV capability, industrial cogeneration, waste to energy projects and alternative energy manufacturing."

For the city to take advantage of its existing renewable assets and bolster energy innovation, O'Neill and city stakeholders are setting their sights on advancing "smart" grid technologies.[1] At the same time growth is hampered by infrastructure and cost limitations.

PLACE: SAULT STE. MARIE

Located at the confluence of Lakes Huron and Superior, the city of Sault Ste. Marie, Ontario established itself as an industrial powerhouse in the late 1800s when American entrepreneur, Francis Hector Clergue, saw the potential of the Sault rapids and established the first hydroelectric facility in the region. This new source of energy quickly transformed the small river settlement into an industrial trade center, connecting the American Midwest to Ontario. Powered by low-cost hydroelectricity, the steel and paper mills established in Sault Ste. Marie became the center of a thriving regional economy that drew interest from investors around the world.

Algoma Steel was established in 1901 to make steel rails for the growing railway industry. The company employed roughly 13,000 people at its peak in the early 1990s. It became Essar Steel Algoma in 2008 and is today one of Canada's largest steelmakers. Still, the steel plant has been hard pressed to maintain positive growth and has been under bankruptcy protection since 2015.[2] While Essar Steel Algoma remains the city's number one employer, today the industry employs fewer than 3000 people, roughly a quarter of its 1990s workforce.[3]

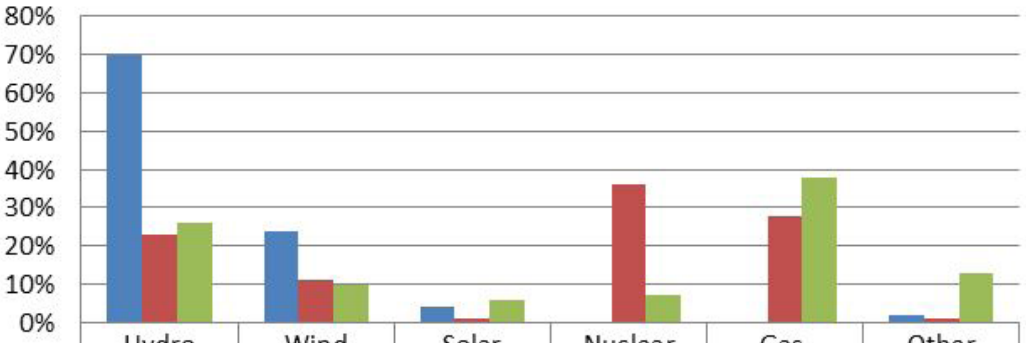
This once strictly "steel town", however, has returned to its energy roots. In 2008, in recognition of the city's growing portfolio of renewable energy assets, the Sault Ste. Marie City Council declared the city the Alternative Energy Capital of North America. With traditional industry in decline, the city is encouraging new business development in green energy as a way to reverse the trend of job losses.[4]

The Sault's Renewable Energy Assets

Endowed with a variety of natural resources, Sault Ste. Marie generates all of its electricity from renewable sources: hydro, wind and solar (see Figure 1). Currently, the city produces 1.6 times its needs in renewable power, making the city a substantial net exporter of power.

The Ste. Mary's Rapids help to power five hydroelectric facilities, together generating a total of 203 MW of renewable energy. But, increasingly, wind and solar are contributing to the region's renewable energy portfolio. Since 2006, Sault Ste. Marie has been home to one of the largest wind-energy projects in Canada, the Prince Wind Farm. With steady winds blowing off Lake Superior, one of the world's largest fresh water lakes by surface area, the Prince Wind Farm

FIGURE 1: SAULT STE. MARIE COMPARED TO ONTARIO AND THE WORLD, BY MIX OF ELECTRICITY-GENERATION TYPE (2014)



	Hydro	Wind	Solar	Nuclear	Gas	Other
Sault St. Marie	70%	24%	4%	0%	0%	2%
Ontario	23%	11%	1%	36%	28%	1%
Worldwide	26%	10%	6%	7%	38%	13%

Source: Sault Ste. Marie Innovation Centre (2017) and IESO (2017).

Prince Wind Farm, one of Canada's largest wind farms by energy generation located in Sault Ste. Marie.
http://innovation150.ca/story/sault-ste-marie-alternative-energy-capital-north-america

has the potential to generate 189 MW of clean energy – enough to power 60,000 homes.

The Bow Lake Wind Farm is the second largest wind farm in the region. It was built in 2015 and operates 36 wind turbines that together generate up to 58 MW of energy. Bow Lake is a partnership between Calgary-based BluEarth Renewables Inc., and the Batchewana First Nation. This relationship is the largest economic partnership between a First Nation community and a wind energy developer in Canada. The wind farm is expected to generate C$60 to 80 million in revenues over the next 20 years for the Batchewana community.[5] As a 50-percent partner, the Batchewana First Nation allocates funds from the project to community housing, infrastructure, health care and cultural programs.[6] Bow Lake Wind Farm is a successful example of the energy industry and the aboriginal community working together to feed the provincial grid, create jobs and develop expertise in a growing technical field.[7]

In addition to hydro and wind power, solar energy is the third largest source of energy in the Sault region. Fengate, a Toronto-based investment firm, operates three solar photovoltaic farms that comprise one of the largest solar PV facilities in North America. Together, the three farms generate approximately 69 MW of energy – enough electricity to power about 24,000 homes.

Heliene Inc., Ontario's first solar panel manufacturer, has created over 50 high-tech manufacturing value-added jobs in Sault Ste. Marie and expects to continue to grow production in the coming years. Solar panel manufacturers profit from affordable land and competitive labour costs, as well as close proximity to the United States. Currently, Heliene Inc. exports approximately one-third of its panels to the U.S., where demand is increasing by 30 to 35 percent annually.[8]

"As Sault Ste. Marie has gained a reputation for alternative energy and renewables development, we have been able to attract new investment in renewables technology and manufacturing. These new firms are attracted by Sault Ste. Marie's physical attributes such as Great Lakes winds, and proximity to U.S. markets, but as the number of firms in this sector increases they create scale benefits such as specialized skills and infrastructure that will help to establish the Sault as a Canadian renewables hub. This is where the long-term employment benefits of this initiative are going to come from."

-Daniel Hollingsworth, Executive Director, Business Development, Sault Ste. Marie Economic Development Corporation

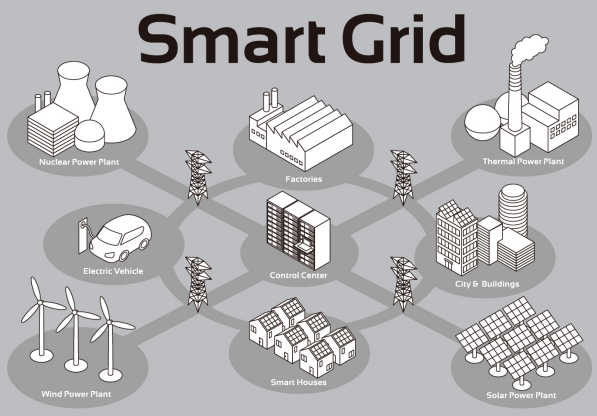
Canada's Aging Electrical Grid System and the Sault's Introduction of Smart Grid Technologies

Traditionally, Canada's electric grid development was driven by the twin objectives of reliably connecting users to a centralized grid and achieving cost savings through economies of scale. This centralized grid carries power from large generating stations, along transmission lines, to distribution wires, to the end customer. Canada's electric utility systems largely rely on infrastructure that was constructed in the early 20th century. The Sault has enjoyed reliable and relatively inexpensive electricity for over 50 years, but infrastructure first installed in the 1960s is aging and requires upgrading. The Sault's local electricity distributor, the Public Utilities Commission (PUC), is challenged with

Canada's electric grid system relies heavily on infrastructure built in the 1950s and 60s. Photo courtesy of Shutterstock.

What are Smart Grid Technologies?

The electricity industry in Canada defines smart grid technologies as a suite of applications and automation technologies that improve electric grid resilience, environmental performance, and operational efficiencies. Smart grid technologies include hard infrastructure like advanced metering infrastructure and energy storage, as well as soft infrastructure like cyber security standards and interoperable communication standards.



Once considered a niche application, smart grid technologies were used mostly by military bases and hospitals to protect mission-critical functions. However, such technologies are becoming recognized as a modernization tool for utilities, cities, communities and public institutions. A 2016 forecast from GTM Research, a US-based energy market research firm, anticipates a 30 percent increase in operational capacity of smart grid technologies in North America by 2020. Energy, environmental and security needs for the 21st century will accelerate both public and private sector investments in grid modernization technologies across North America.

Source: Canadian Electricity Association (2016) and GTM Research (2016)

upgrading infrastructure while meeting growing demand for renewable integration. Upgrades are expected to cost in the range of C$10-15 million to replace poles, switches and substations.[9] The aging grid infrastructure is also struggling to cope with the operational challenges presented by renewable energy, such as intermittency, voltage rise and oversupply. Since 2012 regional transmission lines to Southern Ontario have reached capacity and halted additional renewable energy generation indefinitely.[10]

Smart grid technologies for the Sault present an opportunity to extend the life of existing infrastructure and reduce equipment upgrade costs while opening up space for more renewables to join the grid. Indeed the city has become home to several smart grid technology projects including a 7 MW lithium-ion battery facility. The first project of its kind in Canada, the storage facility became operational in May 2017 and is expected to inject C$2 million dollars into the city's economy, utilizing the city's surplus solar and wind power.[11] The battery charges at night when energy is cheaper and demand is low and then discharges during the day during peak times. The facility, which came at no cost to the city or taxpayers, was developed by New York and Toronto-based Convergent Energy and Power who secured a three-year contract with the Ontario government to feed surplus renewable power to the provincial grid.

POLICY: GOVERNMENT ACTIONS IN SUPPORT OF SMART GRID TECHNOLOGIES

Ontario has been an early adopter of smart grid technologies, making major investments in the development and deployment of technologies and programs across the province to make the grid more efficient. Since 2011, with the launch of the C$50-million Smart Grid Fund, the government has been helping local distribution and smart grid companies test and build the technologies needed to modernize the grid. The SSMIC in partnership with the PUC received support from the 2014 Smart Grid Fund to develop software to analyze smart grid investment options for local utilities.[12]

While Ontario indicated in its 2013 Long-Term Energy Plan that smart grid technologies are "an essential element of Ontario's electrical grid future,"[13] investments in grid infrastructure will likely cause potential rate increases. In a jurisdiction where electricity prices are rising faster than any other in North America, additional rate increases to

fund grid investments are not a top priority for Ontario utilities. There are also significant regulatory constraints affecting utilities seeking to make changes in their operations. Smart grid technologies have proven to increase grid efficiency, but full utilization may have to wait for better timing or be staged incrementally.

At the federal level, it remains uncertain if local demand for smart grid technology growth will be considered a national priority. However, investments in the clean economy outlined in the 2017 Federal Budget look promising, with C$100 million to support next generation smart grid, storage, and clean electricity technology demonstration projects over the next 11 years.[14] Furthermore, Canada's ambitious climate agenda to implement a national carbon pricing system by 2018 and its commitment to meeting its Paris targets will likely be a strong driver for smart grid deployment across the country. Smart grid technologies that directly facilitate reductions in greenhouse gas emissions and increase the resilience of critical infrastructure to the effects of climate change are well-positioned to capitalize on the ambitious actions being led by the federal government.

At this early stage of smart grid deployment across Canada, public sector support through funded pilot programs will help to spread the burden of technological and operational development more equitably. Moreover, this approach will allow industry as a whole to learn from the initiatives of their peers, thus reducing the overall cost of development. Fortified by its renewable energy assets, closeness to U.S. markets and ability to attract new investment in renewable technology, Sault Ste. Marie is well placed to increase smart grid technology pilot programs. Together, these pilot programs will provide the technological base to incrementally upgrade and modernize the electrical grid.

ENDNOTES

1. In 2012, the SSMIC in partnership with the Sault Ste. Marie City Council released the, "Smart Energy Strategy" outlining four priority areas for the Sault to increase further investment and growth in the clean-energy sector: 1) development of a smart regional grid; 2) community branding and outreach; 3) accelerated activity in conservation, energy efficiency and heat recovery; 4) creation of a community investment company. For the full report: Nicholas Parker, Melissa Felder, and Julie Molinaro. "Sault Ste. Marie's Smart Energy Strategy." Sault Ste. Marie's Innovation Centre (2011).
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4. Chris Turner, "Tilting at Windmills," *The Walrus*, November 14, 2015, https://thewalrus.ca/tilting-at-windmills/.
5. Peter Kuitenbrouwer, "Sault's big energy future," *Sudbury Star*, August 16, 2016, http://www.thesudburystar.com/2016/08/16/saults-big-energy-future.
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12. Sault Ste. Marie's Innovation Centre, "Sault Ste. Marie Innovation Centre Receives Support from Ontario's Smart Grid Fund," November 5, 2014, http://www.ssmic.com/

documents/assets/uploads/files/en/smart_grid_funding_announced_2014.pdf

13. Ministry of Energy, "Achieving Balance Ontario's Long-Term Energy Plan," September 28, 2015, http://www.energy.gov.on.ca/en/ltep/achieving-balance-ontarios-long-term-energy-plan/.

14. Government of Canada," Building A Strong Middle Class #Budget2017," March 22, 2017, http://www.budget.gc.ca/2017/docs/plan/budget-2017-en.pdf.

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