

Opportunities for U.S. Renewable Energy and Smart Grid Exporters in Canada's Electricity Market

No foreign market will attract more U.S. renewable energy and smart grid equipment and services exports through 2015 than Canada. ITA's 2014 *Renewable Energy Top Markets Report* ranked Canada as the top export destination for the U.S. solar, ethanol, and hydropower industries as well as the second largest export destination for the U.S. wind industry.

This Market Intelligence Brief provides an analysis of Canada's energy market, with a focus on opportunities for U.S. renewable energy and smart grid exporters. It includes an overview of the electricity sector, a discussion of market dynamics, and a description of opportunities for each subsector.

Canada's vast energy resources and its proximity to the United States make it a critical market for many U.S. clean energy exporters, particularly those looking to sell products or services abroad for the first time. With growth expected in every clean energy subsector over the coming decade, it's important for American exporters to understand how the Canadian market functions, its key drivers, and the potential challenges facing U.S.-based suppliers.

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Canada's Current Energy Mix

Canada's large territory is endowed with a rich and varied set of natural resources, enabling the country to rank among the five largest energy producers globally. In fact, Canada is a net exporter of most energy commodities and is a significant producer of conventional and unconventional oil, natural gas, and hydropower. It is the largest foreign supplier of energy to the United States and home to several supply chain networks that are closely linked with firms on both sides of the border.

In 2013, Canada had an estimated 137 gigawatts (GW) of installed electricity generation capacity. Hydropower accounted for the majority of this total (approximately 75 GW), but the country is also a large and growing producer of wind energy, due in part to supportive policies at the federal and provincial level. According to the Global Wind Energy Council, Canada had 7.8 GW of installed wind capacity at the end of 2013 – a ten-fold increase over the 683 MW it had installed just eight years prior.¹

¹ "Canada: Background," U.S. Energy Information Agency, last modified September 17, 2012, www.eia.gov/countries/cab.cfm?fips=CA and the Global Wind Energy Council, www.gwec.net.



April 2014

Country Quick Facts

Size: 9,984,670 sq. km

Population: 34,834,841 (July 2014 est.)

Type of government: Parliamentary Democracy

Capital: Ottawa

Language: English and French

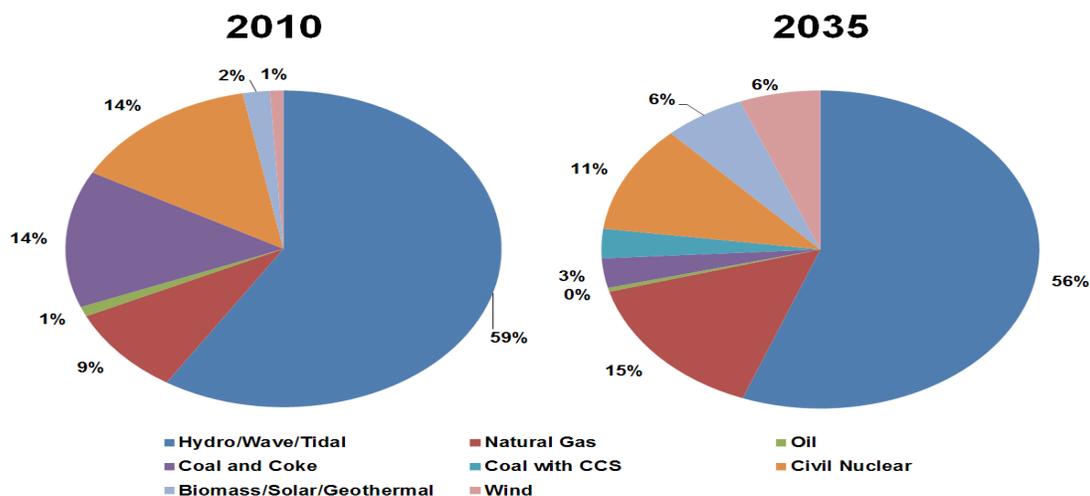


Source: CIA World Factbook



INTERNATIONAL
TRADE
ADMINISTRATION

Figure 1: Canada's Current and Future Energy Mix



Source: Canada National Energy Board

The growth in wind energy capacity is part of Canada's planned shift away from nuclear, large hydro, and coal generation. The National Energy Board expects that the contribution of renewable energy technologies (excluding large hydropower) will grow from just three percent in 2010 to 12 percent of Canada's energy mix in 2035. The sector's growth will occur concurrently – and in some cases, as a result of – growth in the natural gas industry, which is expected to contribute 13 percent of Canada's electricity by 2035, up from just six percent at the end of 2013.² Growth in Canada's nuclear and hydropower capacity is expected to remain flat or even fall, and the use of coal is expected to drop sharply, from 14 percent in 2010 to only three percent by 2035 [see Figure 1].³

Electricity Sector Overview

Provincial policies and regulations play a major role in the Canadian energy market and it is important for American exporters to clearly understand sub-national issues in order to be successful. Canada's ten provinces and three territories each govern their own natural resources, and each province has traditionally met its energy demand with local production. As such, each province has developed an electricity grid and market largely independent of either

national government support or cooperation with other provinces.

Due to a large hydropower endowment, electricity prices in Canada have traditionally been among the lowest in the world. However, anticipated investment in aging electric power infrastructure and the shift towards non-hydro renewable and low-carbon sources will likely increase prices over the next decade. Prices also vary across provinces, as each province has its own body with sole responsibility for tariffs and other regulatory issues. Ontario and Alberta, for example, have independent grid operators that provide market-based prices or grid management.

Canada's National Energy Board has jurisdiction over transmission lines that cross provinces, though the interprovincial lines were only designated recently and electricity is rarely traded between provinces. While each Canadian province operates its electricity sector independently, most are well integrated with the United States. Electricity routinely flows North/South from Canadian power plants (often large hydropower dams) to consumers in U.S. cities.⁴ To oversee electricity trade, the North American Electric Reliability Corporation (NERC) has established eight regional grid entities, three of which interconnect with and include Canadian jurisdictions.

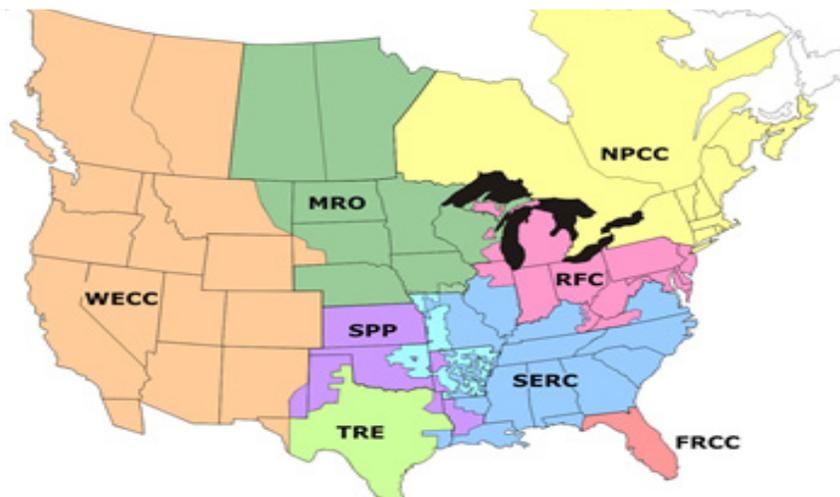
NERC serves as the regulatory authority for the reliability

² "Canada's Energy Future 2013- Energy Supply and Demand Projects to 2035- An Energy Market Assessment," National Energy Board, November 2013, <http://www.neb-one.gc.ca/clf-nsi/rnrgynfntn/nrgyprtr/nrgyfttr/2013/nrgftr2013-eng.html#ftn30back>.

³ "Canada's Energy Future: Energy Supply and Demand Projections to 2035-- Emerging Fuels and Energy Efficiency Highlights, National Energy Board.

⁴ "Canada: Background," Energy Information Agency, last updated September 17, 2012. Available at <http://www.eia.gov/countries/cab.cfm?fips=CA>.

Figure 2: NERC Regions



Source: North American Electric Reliability Corporation

of the bulk transmission power system of North America and is overseen by the U.S. Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC's role in Canada is defined by a memorandum of understanding with Canada's National Energy Board, as well as agreements with the regulatory authorities of border provinces. In Ontario and New Brunswick, NERC standards are mandatory and enforceable as a matter of provincial law and NERC plays a role in the development of standards in most other provinces.⁵

The electricity markets in each province are also distinct, with varying degrees of privatization. In provinces where consumers have only one option for their electricity provider (e.g. Prince Edward Island), the province's utilities board or commission approves rates and plays a consumer interest role as well. In deregulated markets like Ontario and Alberta, consumers can choose a default provider whose rates are regulated by the local utilities commission or contract with an alternate provider for a set price over a given period of time.

For instance in Alberta, the consumer may choose or default to their Regulated Rate Option (RRO) provider; or, they may choose a competitive retailer for either a better or more consistent rate. They could also opt to pay a potentially higher rate to receive a percentage of guaranteed renewable energy.⁶ Given the overall success

⁵ "Key Players," North American Electric Reliability Council, 2013. Available at <http://www.nerc.com/AboutNERC/keyplayers/>.

⁶ "Green Energy Companies," Utilities Consumer Advocate, Alberta

of deregulation and the ongoing market changes in that direction, ITA expects further market liberalization over the coming decades.

Provincial jurisdiction has also had a major impact on the development of the smart grid in Canada. Ontario was a global first-mover on smart grid deployment and counts over five million smart meters now in use. British Columbia, Manitoba, and, most recently, Quebec have followed with smart meter roll-outs. Still, Canada's federal government has played – and continues to play – a role in facilitating these deployments through funding opportunities and also by helping to drive the development of standards and interoperability for the smart grid. Measurement Canada, an agency of Industry Canada, develops and oversees key elements of smart meter standards and specifications for the approval of various smart grid applications as well. Industry Canada also played a leading role in identifying the 1800-1830 MHz spectrum for various applications in support of the management of the electricity supply.⁷

In the biofuels sector, the role of the federal government is stronger than in other sectors. Canada has a national minimum requirement of five percent average renewable

Government. Available at <http://ucahelps.alberta.ca/green-energy-companies.aspx>.

⁷ The Canadian Smart Grid Standards Roadmap: A Strategic Planning Document, Canada Standards Council, October 2012. Available at http://www.scc.ca/sites/default/files/publications/Smart_Grid_Report_FINAL_EN_3.pdf.

Figure 3: Key Players in Canada's Electricity Market

National level:

- Natural Resources Canada – The energy sector of Natural Resources Canada, a department of the federal government, creates federal energy policy for Canada, ensuring that its natural resources are used responsibly. CanmetENERGY, a research group, is housed within Natural Resources Canada.
- Environment Canada – Also a department of the federal government. Creates environmental programs and policies, issues national mandates, and preserves natural resources.
- National Energy Board (NEB)– Created in 1959, the NEB regulates the power, oil and gas industries as they cross international and interprovincial boundaries.

Provincial Level:

- Provincially-owned utilities – Most provinces are primarily provided their power through one vertically- integrated, publicly-owned “Crown corporation” utility, which contracts for and often owns the generation. They may also own the transmission and distribution systems. Most of the Crown corporations are hydroelectric such as BC Hydro, Hydro Quebec, and Hydro One.
- Investor-owned utilities—Most of the more deregulated markets are serviced by private utilities, such as TransAlta in Alberta.
- Independent system operators are present in Alberta, New Brunswick, and Ontario.
- Utilities boards – Regulate electricity rates, with the exception of competitive retail contracts.
- System planning organizations such as Ontario Power Authority.
- Provincial Ministries or Departments of Energy.
- Energy retailers such as RiteRate CA for natural gas in Ontario, Direct Energy for natural gas in North America, and Universal Energy Corporation for natural gas in Ontario and British Columbia.

Local/Municipal Level:

- Local distribution company, such as Oakville Hydro Corporation in Ontario and Saint John Energy in New Brunswick.

International (or U.S.):

- Regional electric reliability coordinators: WECC in the West, MRO in the middle, and NPCC in the East.
- The North American Electric Reliability Corporation (NERC) –NERC's reliability standards are mandatory and enforceable by provincial regulatory authorities on utilities operating in all provinces except Prince Edward Island, Newfoundland & Labrador - and their adoption is in process in Quebec.
- FERC- The U.S. Federal Energy Regulatory Commission has regulatory authority over NERC in the United States.

content in gasoline and two percent in diesel and other distillate heating oil.⁸

Market Drivers

As Canada's decentralized electricity market would portend, most policy drivers of the clean energy industry are at the provincial level. Yet, certain national level policy goals and trends do impact how provinces govern their electricity sector, making it important for American companies to understand both national-level policies and provincial-level regulations seeking export sales.

8 “Government of Canada Releases Final Regulations for Renewable Fuel Content in Gasoline,” Environment Canada, September 1, 2010. Available at <https://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=2D84D5D6-F152-4F5F-A4B9-BE973BE6821B>.

Climate Change Targets

At the national level, Canada's energy policy is increasingly driven by climate change targets. In 2010, the Canadian Government announced its target of 90 percent emission-free electricity by 2020. Federal regulations require that plants reduce GHG emissions to no more than 420 metric tons on average of CO₂ per gigawatt hour of electricity produced. Coal facilities starting operations after July 1, 2015 will likely have to employ carbon capture and storage (CCS) technology in order to comply with these regulations.⁹ At the provincial level, Ontario will phase out all its coal-fired plants by the end of 2014. Other provinces have also begun retiring older coal-burning facilities.¹⁰

9 “Canada's Energy Future 2013 - Energy Supply and Demand Projections to 2035 - An Energy Market Assessment,” National Energy Board, November 2013. Available at <http://www.neb-one.gc.ca/clf-nsi/nrgynfntn/nrgyrprt/nrgyfr/2013/nrgfr2013-eng.html#ftn30back>

10 “Ontario - First Place in North America to End Coal-Fired Power,”

These policies should create opportunities for investments in new clean energy facilities, as well as the transformation of legacy plants into renewable energy generators. For example, Ontario's former coal-burning Thunder Bay Generating Facility will be converted to an advanced biomass power plant.¹¹

ITA expects natural gas plants to predominately replace retiring coal facilities, but renewable sources should play an important role as well. Opportunities will likely vary by province. In Alberta, for example, where extractive industries are driving energy demand, a deregulated electricity market may allow solar energy developers to compete effectively. As energy demand in Alberta increases due to intensifying natural gas production, prices are expected to remain relatively high, making solar more cost competitive.

Climate change targets are also driving Canada's commitment to increased energy efficiency, creating an important opportunity for U.S. smart grid exporters. Often federal support for the smart grid is geared towards projects and initiatives that further these objectives.

Feed-in-Tariffs (FITs)

To date, the most impactful driver of clean energy investment in Canada has been significant FITs offered by Ontario and Quebec. Ontario's Green Energy and Green Economy Act of 2009 established a strong FIT scheme that facilitated the installation of 4.5 GW of new renewable energy capacity in just four years. When it was enacted, the FIT program targeted the installation of 10.7 GW of new non-hydropower renewable energy by 2018 and 9 GW of new hydropower capacity by 2030, putting Ontario on track to be a key global clean energy market.¹²

In 2013, changes to Ontario's FIT program brought about by a World Trade Organization (WTO) decision against the province's local content requirements caused renewable energy investment to slow. As a result, the program is under review and it remains to be seen whether Ontario can maintain its attractiveness to

renewable energy investors with new FIT rules in place. Early indications show that as other markets become more attractive, investment in Ontario's renewable energy projects may wane.

In Quebec, the provincial Energy Strategy mandates that an additional 4 GW of new wind energy and 4.5 GW of hydropower capacity be brought online by 2015. To support both goals, the Province of Quebec launched a cap-and-trade program in January 2013; the impact of the program remains unclear. Some analysts believe that over time the program will support additional renewable energy development, but ITA remains skeptical that the cap-and-trade program as currently designed will have more than a marginal impact on the sector.

Tax Incentives

Clean energy development in Canada is also driven by the availability of tax incentives. These incentives allow clean energy developers to recoup their investment in energy projects through the Canadian Renewable and Conservation Expense allowance, which is permitted under Canada's Income Tax Act. The incentives allow the immediate deduction of certain expenses related to "green" energy projects, and permit developers to issue "flow-through" shares to investors for "qualifying expenses."¹³ In essence, project investors can issue shares subject to a subscription agreement for a given amount related to the project, and purchasers of the flow-through shares are permitted to write off 100 percent of the cost from their income taxes.¹⁴

Clean Energy and Infrastructure Investment

The federal government has also taken important steps to help finance investment in the clean energy sector and infrastructure projects that support it. Canada's Gas Tax Fund, for example, continues to drive improvements in municipal infrastructure. Total payments were increased in 2009 to \$2 billion per year. The fund is allocated to provinces and territories based on population and then distributed by the provincial governments. Every municipality receives a percentage of the fund, and must

Office of the Premier, November 21, 2013. Available at <http://www.premier.gov.on.ca/news/event.php?ItemID=27605>.

11 "Ontario - First Place in North America to End Coal-Fired Power," Office of the Premier, November 21, 2013. Available at <http://www.premier.gov.on.ca/news/event.php?ItemID=27605>.

12 Ontario Ministry of Energy, "Ontario's Feed-In-Tariff Program: Two-Year Review Report," March 2012. Available at <http://www.energy.gov.on.ca/docs/en/FIT-Review-Report.pdf>.

13 Gowling Lafleur Henderson LLP, "Wind Energy Law in Canada." Report. 2010, p. 20. Available at <http://www.gowlings.com/knowledgeCentre/publicationPDFs/Wind%20Energy%20EN.pdf>.

14 Shannon, Greg P., "Canadian Renewable & Conservation Expense 'Green' Energy Tax Incentives." Miller Thompson LLP, April 2013. Available at <http://www.millerthomson.com/en/publications/newsletters/tax-notes/april-2013/canadian-renewable-conservation-expense>.

Figure 4: Ontario's Clean Energy Sector

Ontario is the leading Canadian province in terms of renewable energy and smart grid deployment. It also has the highest electricity demand in Canada, accounting for close to 35 percent of Canada's total energy consumption. The province committed to phasing out all of its coal-fired generation by 2015, and is on track to meet this goal. Ontario's leadership dates to its 2009 FIT program under its Green Energy Act, which guaranteed a price for power, up to 500kW, that was delivered into Ontario's electricity system.

The Green Energy Act also included stringent local content requirements that were challenged at the World Trade Organization and ultimately found to violate Canada's trade obligations. Ontario has since agreed to remove its LCRs from the Green Energy Act incentives for wind and solar development with further actions to support the WTO ruling likely forthcoming. ITA encourages U.S. companies to stay updated on Ontario's policy changes in light of the WTO action.

Ontario has also taken a leadership role in promoting green fuels, beginning with a FIT program created by the Green Energy Act. In mid-2013, Ontario ended its FIT for renewable energy fuels and introduced a competitive bidding process to take its place. During the most recent bid process, the Ontario bidding authority received almost 500 MW worth of applications.

Additionally, Ontario is currently discussing updates to its Long-Term Energy Plan, which is expected to include a significant amount of nuclear energy, while cutting natural gas and combustible fuels. The Ontario Ministry of Energy has estimated that "electricity and heat generation" are responsible for less than ten percent of Ontario's GHGs.

Ontario has also been a leader in smart grid development. Its Centre of Excellence has 14 smart grid projects underway or in its project pipeline. Most of these projects involve providing smart meters to customers to facilitate and encourage time-of-use (TOU) pricing. Ontario has already installed over 5 million smart meters across the province and nearly all residents have access to TOU rates with three rate categories: peak, off-peak, and mid-peak. Over 2.6 million customers can now access their smart metering data through a "Green Button" format which enables individuals to monitor their energy use with a variety of applications designed for tablet and mobile devices.

It should be noted that as a "first mover" on smart grid, Ontario has experienced a number of technical challenges resulting from its early smart meter roll-outs, including interoperability, pricing, and privacy issues. ITA expects Ontario to continue to address these issues through work with standards stakeholders and the development of privacy principles.

Led by its Information & Privacy Commissioner, Ontario has also been at the forefront in integrating privacy concerns into its smart metering planning. Ontario's Privacy by Design policy covers the three overlapping areas of information technology: accountable business practices, physical design, and networked infrastructure. The policy uses seven foundational principals to govern information flow such as proactive, not reactive, and visibility and transparency.

prioritize its projects locally. Municipalities can also pool, bank, and borrow against this funding. According to Infrastructure Canada, "the Fund supports municipal infrastructure projects that contribute to cleaner air, water and reducing greenhouse gas emissions... [including] community energy systems." As of April 2014, the eligible categories that communities could use the funding for was broadened to include highways, brownfield redevelopment, broadband, and a number of other relevant categories.¹⁵

Another notable fund was the now-defunct national Clean Energy Fund, which invested nearly \$800 million in large-scale carbon capture storage demonstration projects and smaller-scale demonstration projects of renewable energy,

smart grid, and clean energy systems technologies.¹⁶ Although ended, the program injected important momentum and financing into the industry and was critical in shaping the current market and future opportunities for U.S. exporters.

One such demonstration project supported by the Clean Energy Fund is the PowerShift Atlantic project, a maritime research demonstration effort to integrate wind energy into Canada's electrical system using residential and commercial utility customers.¹⁷ The primary objective is to determine if load shifting can provide more economical integration

¹⁵ "Gas Tax Fund," Infrastructure Canada. Modified March 31, 2014. Available at: <http://www.infrastructure.gc.ca/prog/gtf-fte-eng.html>.

¹⁶ "Clean Energy Fund," Canada's Economic Action Plan. Available at <http://actionplan.gc.ca/en/initiative/clean-energy-fund>.

¹⁷ "FAQs," Power Shift Atlantic, 2012. Available at <http://powershiftatlantic.com/newSite2012/faq.html>.

of wind.¹⁸ The \$32 million project was funded equally by the Fund and by the PowerShift Atlantic partners, which includes utilities, local governments, and universities from New Brunswick, Nova Scotia, and Prince Edward Island.

Another Clean Energy Fund project is a \$25 million smart grid zone demonstration in Hydro-Quebec's research institute to improve the distribution grid's efficiency and storage. One of the project's major accomplishments was to integrate real-time reactive power management for the first time in Canada.¹⁹ Significant funding also came from an accompanying federal program, whose funding window has also closed, called the ecoENERGY Innovation Initiative, which funded both R&D and demonstration projects,²⁰ including a program from IBM Canada to provide \$175 million to seven Ontario universities to catalyze new smart grid research.²¹

Canada's Green Infrastructure Fund, which likewise is now closed, also contributed important dynamism to the market. It funded larger strategic projects, including several landfill-to-renewable-energy projects, and the 287 kV transmission line connecting the Alaska and British Columbia power grids.²² It also connected First Nation communities to the grid, ending their reliance on diesel power.

Today, the value of these funds and their investment is demonstrated by the ongoing public and private investment in Canada's electricity infrastructure. Major transmission investments planned or underway in Canada include a \$3 billion project to construct two 500-KV transmission lines in Alberta and the \$1 billion Lake Erie Clean Power Connector (LECPC), which will involve underwater transmission lines to Pennsylvania. The LECPC will be an international project financed entirely by private investment.²³

18 "Electricity Load Control Demonstration" Natural Resources Canada, last updated November 29, 2013. Available at <http://www.nrcan.gc.ca/energy/funding/current-funding-programs/cef/4975>.

19 "Interactive Smart Grid Zone Demonstration in Quebec, Hydro-Quebec's research institute," Natural Resources Canada, last updated January 8, 2014. Available at <http://www.nrcan.gc.ca/energy/funding/current-funding-programs/cef/4957>.

20 "The ecoENERGY Innovation Initiative," Natural Resources Canada, last updated February 27, 2014. Available at <http://www.nrcan.gc.ca/energy/funding/current-funding-programs/eii/4985>.

21 "Smart grid in ontario: Top 4 Reasons to invest." *Ontario Canada*. Available at www.investinontario.com.

22 "Green Infrastructure Fund," Infrastructure Canada, last updated October 28, 2013. Available at <http://www.infrastructure.gc.ca/prog/gif-fiv-eng.html>.

23 "Lake Erie CleanPower Connector to Deliver Energy from Ontario Into Pennsylvania," MarketWired, September 12, 2013. Available at <http://www.marketwired.com/press-release/lake-erie-cleanpower-connector-to-deliver>

Several provincial governments have bolstered these national funds by developing complimentary initiatives targeted at renewable energy and smart grid development. Ontario, for example, created a structure that is particularly supportive of smart grid investment. The government has since awarded \$25 million for smart grid projects and announced a comprehensive Clean Energy & Environmental Strategy in mid-2012. The province recently established a Clean Energy Institute with \$500,000 in start-up funding to further its efforts. Similarly, New Brunswick Power has announced a public-private partnership with Siemens Canada to create a long-term energy roadmap for the province.²⁴

Many major companies are also investing in demonstration projects and R&D facilities that could drive opportunities for suppliers and other partners. In 2012, General Electric established a Grid IQ Innovation Center in Ontario, a \$40 million project focused on substation and distribution automation, as well as electrical grid protection and control. And in March 2014, Canadian Solar, with funding from the Ontario Ministry of Energy, opened a test center for microgrids in Guelph, Ontario. The facility will enable collaboration with utilities, universities, vendors, and other groups focused on developing off-grid and grid-tied microgrid projects in Canada.²⁵

Challenges Facing U.S. Exporters

Though growth in Canada's renewable energy and smart grid market is all-but-certain over the coming decades, several complicating factors will impact the competitiveness of U.S. exporters.

First, export growth is expected to be tempered by stringent local content requirements (LCRs) and by the presence of foreign-flagged manufacturers already in the market. Quebec has the most stringent LCRs for renewable energy projects in Canada, stipulating that 60% of a renewable energy project's cost (including construction), and 30% of wind turbine's cost be spent in the province.

In December 2012, Ontario's local content policies were found to be inconsistent with Canada's WTO obligations. While the province has reformed its incentives, it remains

[energy-from-ontario-into-pennsylvania-1830107.htm](http://www.energy-from-ontario-into-pennsylvania-1830107.htm).

24 "Siemens Canada designing NB Power's energy roadmap for next 10 years." August 15, 2012. Available at [EBmag.com](http://www.ebmag.com).

25 "Canadian Solar Announces the Opening of Its Microgrid Testing Centre," Canadian Solar, March 14, 2014. Available at <http://investors.canadiansolar.com/phoenix.zhtml?c=196781&p=irol-newsArticle&ID=1908951&highlight>.

to be seen if the market will open substantially to foreign suppliers.

Given the WTO's ruling on Ontario's LCRs, Quebec may need to eliminate its policies in the future. Unfortunately, many non-U.S. firms have already established positions for in the Canadian market as a result of the LCRs, making potential U.S. export deals less likely. For example, two German-headquartered companies, Senvion (formerly REpower) and Enercon, are the only manufacturers to have operations in Quebec, and consequently now hold all the contracts for wind projects currently under development in the province.²⁶

Second, the impact of Canada's growing fossil fuel industry on U.S. clean energy exporters remains unclear. ITA expects that renewable energy will face increased competition for limited financial resources and political support compared to traditional fossil fuel sources, particularly in Western Canada. But overall increased energy demand may lead to some opportunities for co-production, particularly in the geothermal industry, and for heightened energy efficiency through smart grid development. If more fossil fuels are exported out of Canada, Canadian consumers may see electricity prices increase over the coming decades, leading to additional investment in renewable energy and smart grid technologies. If, on the other hand, international demand for Canadian oil and gas is limited, more of these fuels will be used domestically, perhaps depressing electricity prices and limiting the incentive to deploy new clean energy technologies.

Lastly, Canada's regulatory system can be somewhat daunting due to the overlap between local, provincial, and federal jurisdictions. While the 2012 Clean Energy Act (CEAA) sought to streamline the processes for environmental assessments, critics say that the new law fast-tracks projects that should be thoroughly vetted for environmental flaws. Until new projects under the CEAA have set the standard for assessments and proven that the process works as promised, investment could be delayed. ITA encourages exporters to monitor the situation closely, as any change in the environmental impact assessment process will likely change the timeline for both projects and export opportunities.

²⁶ A bout, then a drought, in the Great White North," Bloomberg New Energy Finance, February 22, 2013, pp. 13.

Opportunities for U.S. Exporters

Despite the above challenges, Canada is expected to attract more U.S. renewable energy and smart grid exports than any other market through 2015. U.S. wind, solar, hydropower, biomass, and ethanol exporters should all find opportunities in both the near-term and beyond. Smart grid development will likely follow renewable energy development in some places, but also proceed independently, supporting national-level energy efficiency goals and the development of electricity projects to meet increased demand in Canada and through interconnection to the United States.

For U.S. firms exporting services to Canada, ITA strongly recommends partnering with at least one local firm. Partnering with a Canadian firm can often make a firm more competitive in bidding situations, as Canadian government procurement officials have demonstrated a strong preference – sometimes mandated, sometimes not – to award major contracts to local firms or to bids with strong local content.

ITA maintains offices and representatives in four Canadian cities: Ottawa, Toronto, Montreal, and Calgary, which support U.S. commercial interests throughout the country. These professionals can assist U.S. renewable energy and smart grid exporters in locating potential qualified partners through customized matchmaking programs like the International Partner Search and Gold Key Service. The Client Finder service is a database driven, customized e-mail marketing solution for companies interested in identifying and reaching target clients in the Canadian market. For more detailed information on procurement, selling to the government, and other resources, please visit export.gov/Canada or contact the Department of Commerce's Commercial Service officers listed at the end of this report to receive a copy of "A Practical Guide to Doing Business in Canada."

In addition, ITA recommends considering partnerships with First Nations communities. As of January 2014, there were 27 hydro, wind, biomass, and major solar projects co-owned by First Nations communities; and 80 additional projects in various stages of development. Interested U.S. firms may contact the Commercial Service Calgary office to obtain a copy of the "First Nations to First Nations" initiative, a guide to doing business as well as upcoming matchmaking opportunities.

Hydro

According to ITA's 2014 *Renewable Energy Top Markets Report*, Canada will support more hydropower exports than any other market despite relatively little investment expected in the sector through 2015.

More than 60 percent of Canada's electricity production comes from hydropower,²⁷ the vast majority of this capacity is a result of large legacy dams. Canada is the third largest hydropower generator in the world.²⁸ Coastal provinces in particular rely heavily on hydropower and will continue to do so for the foreseeable future.²⁹ Many of these facilities will require refurbishments or upgrades in the coming decades, creating a substantial opportunity for U.S. companies with expertise in increasing the efficiency of existing dams.

Additionally, small hydro development in Canada is gaining investor interest with future development likely. Most new hydropower capacity will come from smaller, more sustainable dams. Exporters capable of providing consultancy or environmental impact assessment services, as well as the component parts for the small hydropower industry, should find opportunities from this development.

ITA expects Alberta to play a major leadership role in Canada's transition to smaller hydropower development. In 2012, Alberta's Standing Committee on Resource Stewardship recommended that run-of-river projects should be undertaken as public-private partnerships on Alberta's northern rivers with development occurring as soon as possible.³⁰

27 "Facts on Canadian Energy Production, Efficiency, and Initiatives," Canada's Action on Climate Change, last modified November 17, 2013. Available at <http://www.climatechange.gc.ca/default.asp?lang=En&n=4622629B-1>.

28 "Canadian Hydropower Association Welcomes Provincial Report on Developing Hydro in Alberta," Canadian Hydropower Association Blog, March 12, 2013. Available at <https://canadahydro.ca/fr/blog/posts/canadian-hydropower-association-welcomes-provincial-report-on-developing-hydro-in-alberta>.

29 "How Will We Power Canada's Future? Our Electricity System in Transition." Canadian Electricity Association. Discussion Paper: First Edition. Available at http://www.electricity.ca/media/ReportsPublications/lowFINALCEA_HowWillWePower_E7.pdf.

30 Standing Committee on Resource Stewardship, "Review of the Potential for Expanded Hydroelectric energy Production in Northern Alberta." Legislative Assembly of Alberta. Twenty-Eighth Legislature, First Session. March 2013.

Tidal Power

In the medium-to-long-term, U.S. companies that produce equipment or services for the ocean energy or tidal energy sector may also find export opportunities in Canada.

According to the Pembina Institute, Canada's Bay of Fundy has the potential to produce up to 30 GW of electricity.³¹

Not coincidentally, the Bay of Fundy also contains the first deployment in Canada of commercial tidal-scale (total 64 MW) turbines, and the project is currently being studied by National Resources Canada's research group CanmetENERGY and the Fundy Ocean Research Centre for Energy (FORCE) for the introduction of in-stream tidal devices.³² FORCE has recently laid the first undersea data cable for the site, and Nova Scotia has offered two Feed-in Tariffs "with no limits on ownership."³³ Interested exporters should closely follow these developments and the shortlist of companies responding to Nova Scotia's first bidding rounds for the Bay's demonstration project.

Wind power

Canada also offers considerable export potential for U.S.-based wind energy companies. By the end of 2013, Canada had installed nearly 8 GW of wind energy capacity, with modest-but-steady growth projected into the future.³⁴ According to the Canadian Wind Energy Association (CanWEA), Canada is on a path to install 12 GW of capacity by 2016.³⁵

While most wind projects have been developed under the feed-in-tariff regimes in Ontario and Quebec and therefore have been mandated to use local content, development is expected to broaden into other provinces, creating an opportunity for U.S. exporters of turbines and larger wind components. For projects that still require local content, opportunities are likely to be limited to small component parts, as well as maintenance and operations (which are not subject to LCRs).

31 "Energy Source: Tidal Power," Pembina Institute. Renewable Energy & Efficiency. <http://www.pembina.org/re/sources/tidal>.

32 "FORCE Test Site," FORCE. Available at <http://fundyforce.ca/about/force-test-site-2/>.

33 "Tidal Array Feed-in Tariff," Nova Scotia Department of Energy. Available at <https://nsrenewables.ca/tidal-array-feed-tariff>.

34 Global Wind Energy Council. Available at www.gwec.net.

35 "Global Wind Energy Council Wind Energy 2014 Outlook: Major Markets Recover, Battling Policy and Grid Concerns." Renewable Energy World Magazine, January/February 2014. Available at http://www.gwec.net/wp-content/uploads/2014/02/Wind_Energy_2014_Outlook_Sawyer.pdf.

U.S. exporters of small wind energy products and services may also find increasing opportunities across Canada. Small wind projects are becoming progressively more popular for industrial complexes, smaller communities, and commercial operations like shopping malls, schools, or hospitals. In cities that lack grid access or must rely on energy produced far from the point of consumption, small wind may become increasingly viable over the coming decade.

Biomass

In the biomass sector, Canada serves as both an important export destination and a competitor in international markets for U.S. suppliers. Canada enjoys considerable biomass resources, particularly from woody biomass in British Columbia, Ontario, Quebec and the Atlantic provinces.³⁶ According to a study by the BIOCAP (Biological Capital) Foundation, Ontario could sustainably generate 27% of its power from forest biomass alone.³⁷

As Canada increases its use of biomass to produce electricity, U.S. suppliers of biomass-related technology and services should find increased demand for their products and expertise. Potential opportunities include the export of pellets for power generation, as well as the export of products used in the production of biomass power. Service exporters may also find opportunities, but other markets will likely remain more attractive.

Canada's increased capacity, however, is also leading to a new export focus for many Canadian firms, leading to competition with U.S. suppliers in some third-country markets. This competition should increase as additional export capacity is expected to come online in Ontario, Quebec and Nova Scotia.³⁸

Solar

Despite only modest investment and growth to date, ITA expects Canada to support more U.S. solar exports than any other market through 2015. Most of the Canadian solar industry has traditionally been concentrated in Ontario, but opportunities appear to be spreading to other provinces. Partly this is a result of local-level incentives that

are fostering investment in off-grid or residential solar.³⁹ It is also a result of falling solar prices, which is making solar development in other provinces increasingly attractive.

Fortunately for many U.S. exporters, Canada does not yet enjoy a full solar supply chain. As a result, whenever a solar project is constructed in Canada, at least some imports will be required. Given Canada's proximity to the United States and the close supply chain links that exist on both sides of the border, often these imports include a significant amount of U.S. content. Going forward, ITA expects additional opportunities for U.S. firms to license solar equipment designed and innovated in the United States, as well as the export of machinery used for the production of solar cells and modules.

Ethanol & Biodiesel

Like other renewable energy sectors, ITA also expects Canada to be the largest export destination for U.S.-produced ethanol through 2015. Although Canada currently accounts for only four percent of U.S. ethanol exports, ITA expects strong future growth.⁴⁰

In December 2010, Canada's national-level Renewable Fuels Regulations came into force, requiring an average of five percent renewable content in gasoline throughout Canada (Provinces are allowed to require a higher level). The Regulations fulfill the commitments under Canada's Renewable Fuels Strategy, which was aimed at reducing greenhouse gas emissions from liquid petroleum fuels while creating heightened demand for ethanol and biodiesel.⁴¹

Many of the federal programs which were launched as part of the Renewable Fuel Strategy, such as the \$1.9 billion ecoENERGY for Biofuels, have now expired. While future programs have not been developed, the Growing Forward 2 program is still operating, providing a \$3 billion investment to generate market-based growth in the agricultural and agri-food sector, of which biofuel development is one part.⁴²

Importantly, ethanol exporters should monitor sub-national announcements for potential opportunities, as much of

36 "About Renewable Energy," Natural Resources Canada, last modified April 11, 2014. Available at: <https://www.nrcan.gc.ca/energy/renewable-electricity/7295>.

37 "Exploring the Potential for Biomass Power in Ontario," BIOCAP Canada, February 23, 2006. Available at: http://www.biocap.ca/files/Ont_bioenergy_OPA_Feb23_Final.pdf.

38 Wood Resources International, "New capacity will grow Canadian pellet exports," Canadian Biomass, December 11, 2013. Available at <http://www.canadianbiomassmagazine.ca/content/view/4390/571>.

39 "About SolarBC," SolarBC. Available at <http://www.solarbc.ca/about>.

40 "Growing Beyond Oil Delivering Our Energy Future," Canadian Renewable Fuels Association, November 2010. Available at <http://www.greenfuels.org/uploads/documents/crfareportcardenglish2010final.pdf>.

41 "Renewable Fuels Regulation," Canadian Environmental Protection Act, GOC Canada Gazette, September 1, 2010. Available at <http://www.gazette.gc.ca/rp-pr/p2/2010/2010-09-01/html/sor-dors189-eng.html>.

42 "Growing Forward 2," Government of Canada, March 14, 2014. Available at <http://www.agr.gc.ca/eng/about-us/key-departmental-initiatives/growing-forward-2/?id=1294780620963>.

Figure 5: Status of Canadian Smart Grid Market

Smart Grid Application	Developed Provincial Market	Developing Provincial Market	Emerging Provincial Market
Advanced Metering Infrastructure	Ontario; Manitoba; British Columbia	Alberta	Quebec
Time of Use Rates or Dynamic Pricing (Household Customers)	Ontario		Quebec
Demand Response (C&I Consumers)	Ontario	British Columbia; Alberta	
Outage Management (Fault Detection, Isolation, Restoration)	Ontario	Ontario; Quebec; British Columbia	
Islanding/Microgrids			Ontario; Quebec
Reactive Power Control Systems	Alberta; Manitoba; British Columbia	Quebec; Ontario	
Energy Storage			Ontario; Quebec

the industry's growth will be driven by city or provincial level policy. The Going Forward 2 program, for example, is administered separately by each province. Other examples of provincial-level leadership include a 2013 study by the Montreal's transit agency of biodiesel-electric hybrid buses, which is intended to influence the introduction of similar buses across other parts of Quebec. The program followed an earlier demonstration project, which showed that switching to biodiesel resulted in a 30% fuel savings and equivalent reduction in GHG emissions.⁴³ ITA expects similar programs in other provinces.

Smart Grid

Canada is one of the most advanced countries in the world in terms of smart grid development. In 2013, Canada was the leading market for U.S. transmission and distribution exports, with \$684 million in export revenue. Investment in Canada's electric power infrastructure is strong and is expected to grow, creating opportunities for U.S. exporters of transmission & distribution (T&D) equipment, along with smart grid and energy efficiency solutions providers.

Canada's ongoing efforts to upgrade and extend the life of its aging electricity infrastructure should be a major driver of investment in the smart grid sector for years to come. Eighty percent of power-generation facilities in Canada are scheduled to be replaced in the next 10-15 years. The 2011

43 "The STM will soon test a standard-size biodiesel-electric Hybrid bus," STM, June 5, 2013. Available at <http://www.stm.info/en/press/press-releases/2013/the-stm-will-soon-test-a-standard-size-biodiesel-electric-hybrid-bus>.

Clean Technology Report published by Natural Resources Canada estimated that the smart grid industry in Canada could grow to as high as \$2.1 billion by 2020.⁴⁴

Today, nearly half of Canadian household's have "smart" or "advanced" meters installed. Although annual deployments of smart meters in Canada slowed in 2013, *Bloomberg New Energy Finance* predicts \$500 million in smart grid spending in Canada in 2014 with smart meter deployments expected to remain at approximately 1 million units per year for the next four years.⁴⁵

While all provinces have deployed smart meters to varying degrees, Ontario is by far the largest market and is the nation's leader in terms of smart grid applications, including the utilization of time-of-use (TOU) pricing. Importantly, other cities and provinces appear to be following Ontario's lead. Montreal has announced its plans to embark on new round of smart meter deployment, as well as its intention to examine TOU pricing. And while Alberta and British Columbia are not planning to switch to TOU in the near-term,⁴⁶ both provinces continue to show an increased interest in end-use efficiency.

The continued public sector focus on smart grid applications has had the important outcome of driving

44 Hiscock, Jennifer; Beauvais, David, Smart Grid in Canada 2011/2012, report # 2012-224 R/PANU 411 SGPLAN, Natural Resources Canada, October 2012, p. 29.

45 "Q4 2013 EST Outlook," Bloomberg New Energy Finance. Available by subscription.

46 "Global Smart Grid Federation Report," Global Smart Grid Federation, 2012. Available at https://www.smartgrid.gov/sites/default/files/doc/files/Global_Smart_Grid_Federation_Report.pdf.

utility investments in IT systems and analytic software platforms. In fact, Canada's regulators continue to work with smart grid stakeholders to address various issues impacting further development of the sector, including interoperability, privacy, and other technology and consumer concerns. ITA and other U.S. Government agencies welcome input and collaboration from U.S. smart grid exporters in our work to support Canada's efforts to address these issues.

Opportunities also exist for energy efficiency programs and systems marketed directly to consumers. According to a 2012 report by Smart Grid Canada, Canadian awareness of smart meters is higher than that in the United States.⁴⁷ As a result, there is a significant opportunity for U.S. smart grid service providers to engage Canadian consumers directly through technologies platforms that encourage, monitor, or track efficiency.

Electric Vehicles

The development of electric vehicle infrastructure in Canada could provide unique opportunities for a range of smart grid systems and applications. In 2009, the Government of Canada published a roadmap for electric vehicles, which highlighted Canada's opportunity to support the deployment of electric vehicles and fuel-cell technology through the use of smart grid technologies.⁴⁸

Although still considered an emerging technology, electric vehicles continue to gain market share in Canada. Both Quebec and Ontario now offer electric vehicle rebates and other provinces now offer similar incentive programs. In fact, Canada now has over 1,000 charging stations in operation for electric vehicles. In June of last year, Montreal began Canada's first 100% electric car-sharing program. The pilot program will involve 20 vehicles in the center of the city equipped with universal parking permits.⁴⁹ In Alberta, the Government is considering piloting plug-in electric vehicles charged by wind farms, which tend to be more active at night.⁵⁰ And in British Columbia, BC Hydro

is currently developing guidelines for the underlying smart grid infrastructure needed to support additional electric vehicles adoption. Residents in British Columbia can already receive incentives of up to \$5,000 for purchasing an electric vehicle and \$500 for installing a charging point at their home.⁵¹

47 Smart Grid Canada, *The Canadian Consumer and Smart Grids*, October 15, 2012. Available at: <http://sgcanada.org/wp-content/uploads/2012/10/Data-Report.pdf>.

48 *Electric Vehicle Technology Roadmap for Canada*. Available at http://emc-mec.ca/eng/pdf/EV_Technology_Roadmap_for_Canada_February_2010.pdf.

49 Loomans, Taz. "Communauto Introduces 100% Electric Car Sharing Service in Montreal," June 28, 2013. Available at <http://inhabitat.com/communauto-introduces-100-electric-car-sharing-service-in-montreal/>.

50 Haijan, Madhi; Zareipour, Hamidreza; Rosehart, W.D. "Environmental Benefits of Plug-In Hybrid Electric Vehicles: the Case of Alberta." Available at http://imch.ucalgary.ca/news/files/news/PHEV_study.pdf.

51 "Clean Energy Vehicle Program." *LiveSmartBC*. Available at <http://www.livesmartbc.ca/incentives/transportation/>.

Important Contacts

For questions on this report, please contact the relevant staff members at the International Trade Administration's office:

U.S. Department of Commerce
Office of Energy and Environmental Industries
1401 Constitution Ave., NW
Washington, DC 20230

For Renewable Energy inquiries, please contact: Ryan Mulholland, Ryan.Mulholland@trade.gov

For Smart Grid inquiries, please contact: Andrew Bennett, Andrew.Bennett@trade.gov

On your next visit to Canada, please contact any of the four U.S. Commercial Service offices in Canada to discuss relevant business opportunities. Their contact information is below:

U.S. Embassy Ottawa
U.S. Commercial Service
Embassy of the United States of America
PO Box 866, Station B
Ottawa, Ontario K1P 5T1
Tel: (613) 688-5217
Fax: (613) 238-5999
Contact: Richard Steffens, Minister Counselor for Commercial Affairs

U.S. Consulate General Calgary
Servicing Alberta, Manitoba, Saskatchewan, British Columbia, and NWT Yukon
U.S. Commercial Service
615 Macleod Trail SE, 10th Floor
Calgary, Alberta T2G 4T8
Tel: (403) 265-2116
Fax: (403) 266-4743
Contact: Cindy Biggs, Principal Commercial Officer

U.S. Consulate General Montreal
U.S. Commercial Service
1155 Saint-Alexandre
Montreal, Quebec H3B 3Z1
Tel: (514) 398-9695 ext. 2220
Fax: (514) 398-0711
Contact: Rick Ortiz, Deputy Senior Commercial Officer – (613) 688-5222

U.S. Consulate General Toronto
U.S. Commercial Service
480 University Avenue, Suite 602
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Contact: Frank Carrico, Principal Commercial Officer – Ext 222
Contact: Doug Jacobson, Deputy Principal Commercial Officer – Ext 236

U.S. Consulate General Vancouver

*Requests for U.S. Commercial Service assistance in British Columbia should be directed to the Calgary office (listed above).

To find your nearest U.S. Export Assistance Center, visit: <http://export.gov/usoffices/index.asp>.

Additional Resources

General

Bloomberg New Energy Finance, <http://about.bnef.com/resource-centre/>

"Canada: Background," Energy Information Agency, <http://www.eia.gov/countries/cab.cfm?fips=CA;>

Canadian Electricity Association, <http://www.electricity.ca/>

Government of Canada, Infrastructure Canada, Gas Tax Fund, <http://www.infrastructure.gc.ca/prog/gtf-fte-eng.html>

Government of Canada, National Energy Board, <http://www.neb-one.gc.ca/clf-nsi/rcmmn/hm-eng.html>

Government of Canada, Natural Resources Canada, <http://www.nrcan.gc.ca/energy>

Natural Resources Canada, Call for Proposals page, <http://www.nrcan.gc.ca/energy/funding/current-funding-programs/12398>

North American Electric Reliability Council: <http://www.nerc.com/AboutNERC/keyplayers/>

U.S. Department of Commerce, International Trade Administration, Canada Country Commercial Guide, <http://export.gov/Canada/doingbusinessincanada/index.asp>

U.S. Department of Commerce, International Trade Administration, Renewable Energy Top Markets for U.S. Exports Report, http://export.gov/build/groups/public/@eg_main/@reee/documents/webcontent/eg_main_070688.pdf

Ontario

Association of Power Producers of Ontario, <http://www.appro.org/>

Building Privacy into Ontario's Smart Meter Data Management System: A Control Framework, http://www.smsip.ca/sites/default/files/resource_files/pbd-ieso.pdf

Ministry of Energy of Ontario, <http://www.energy.gov.on.ca/>

Modernizing Ontario's Electricity System: Next Steps, https://www.ieso.ca/imoweb/pubs/smart_grid/Smart_Grid_Forum-Report-May_2011.pdf

Ontario's Long-Term Energy Plan: <http://www.energy.gov.on.ca/en/ltep/#.U1bCXvldUeh>

Ontario Power Authority, FIT Program, <http://fit.powerauthority.on.ca/what-feed-tariff-program>

Ontario Smart Grid, https://www.ieso.ca/imoweb/pubs/smart_

[grid/Smart_Grid_Forum-Report-May_2011.pdf](http://www.ieso.ca/imoweb/pubs/smart_grid/Smart_Grid_Forum-Report-May_2011.pdf)

Ontario Smart Grid Progress Assessment, http://www.ieso.ca/documents/smart_grid/Smart_Grid_Progress_Assessment_Vignette.pdf

Ontario's Smart Metering Network, http://www.ieso.ca/imoweb/siteshared/smart_meter_information.asp?sid=ic

Renewable Energy

Canadian Hydropower Association, <https://canadahydro.ca/>

Canadian Renewable Energy Alliance, <http://www.canrea.ca/>

Canadian Renewable Fuels Association, <http://www.greenfuels.org/en.aspx>

Canadian Solar Industries Association, <http://www.cansia.ca/>

Global Wind Energy Council, <http://www.gwec.net/>

Smart Grid

Canadian Smart Grid Standards Roadmap: A Strategic Planning Document, http://www.scc.ca/sites/default/files/publications/Smart_Grid_Report_FINAL_EN_3.pdf

Canmet ENERGY, Smart Grids in Canada, <http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2012-224-eng.pdf>

Department of Energy, Smart Grid Investment Grant Program Progress Report, <http://energy.gov/oe/downloads/smart-grid-investment-grant-program-progress-report-october-2013>

Global Inventory and Analysis of Smart Grid Demonstration Projects, http://issuu.com/ggnl/docs/2012-10-22_global_inventory_and_ana

Global Smart Grid Federation Report, https://www.smartgrid.gov/sites/default/files/doc/files/Global_Smart_Grid_Federation_Report.pdf

International Renewable Energy Agency (IRENA) Report, http://www.irena.org/DocumentDownloads/Publications/smart_grids.pdf

Ontario Smart Grid, https://www.ieso.ca/imoweb/pubs/smart_grid/Smart_Grid_Forum-Report-May_2011.pdf

Smart Energy Networks Concept Development, WISE, <https://wise.uwaterloo.ca/sen>

Smart Grid Interoperability Panel, <http://www.sqip.org/>

About the Office of Energy and Environmental Industries

The Office of Energy and Environmental Industries (OEEI), a part of the International Trade Administration's Industry & Analysis unit, is dedicated to enhancing the export competitiveness of U.S. energy and environmental industries. Industry experts perform strategic research and analysis in order to shape and implement trade policy, create conditions that encourage innovation, lower the cost of doing business, and promote U.S. economic growth. For more information, or to access other OEEI reports, contact the office at (202) 482-5225.

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