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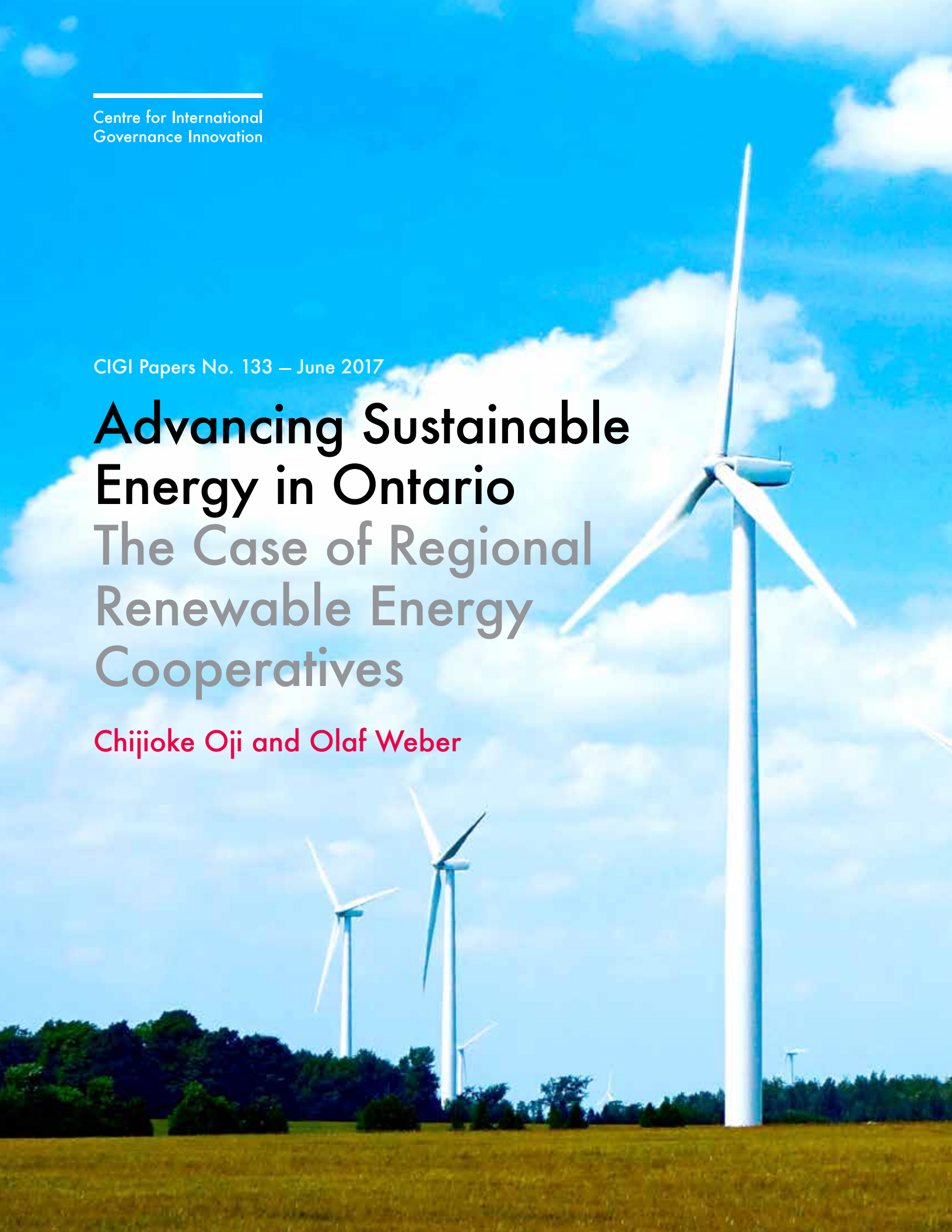

CIGI Papers No. 133 – June 2017

Advancing Sustainable Energy in Ontario

The Case of Regional Renewable Energy Cooperatives

Chijioke Oji and Olaf Weber

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Through its research, collaboration and publications, the Global Economy Program informs decision makers, fosters dialogue and debate on policy-relevant ideas and strengthens multilateral responses to the most pressing international governance issues.

Acronyms and Abbreviations

CCA	Canada Cooperatives Act
COP	Conference of the Parties
FIT	feed-in tariff
GEA	Green Energy Act
GHG	greenhouse gas
kWh	kilowatt hours
IESO	Independent Electricity Systems Operator
LRP	Large Renewable Procurement
NGO	non-governmental organization
$MTCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatts
OCEC	Oxford Community Energy Cooperative
OREC	Ottawa Renewable Energy Cooperative
OSEA	Ontario Sustainable Energy Association
REPs	renewable energy projects
RET	renewable energy technology
SNGRDC	Six Nations of the Grand River Development Corporation
TREC	Toronto Renewable Energy Cooperative
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

Executive Summary

Renewable energy cooperatives have been instrumental in expanding electricity generated from renewable sources in Ontario. By developing solar, wind and bioenergy renewable energy projects (REPs), renewable energy cooperatives contribute to supporting the Government of Ontario's multifaceted approach to reduce greenhouse gas (GHG) emissions and combat climate change. Renewable energy cooperatives — business structures wholly owned by their members, who, in most cases, are part of the local community — foster community participation and ownership in REP development as mandated by the Independent Electricity Systems Operator (IESO) as a part of the Ontario feed-in tariff (FIT) program. The Government of Ontario followed through with its commitment to eliminate coal-fired electricity generation and accelerate GHG reduction.

As embodied in their operations, renewable energy cooperatives present a path to sustainable energy development from the community level, deploying operational models that also enhance the economic, social and environmental aspects of sustainability. As is evident in the IESO analysis of GHG emissions over a period of 10 years (2005–2015), REPs developed by renewable energy cooperatives, along with other sources of clean energy, have contributed to speeding up the decline in GHG production in the provincial electricity system. Additionally, renewable energy cooperatives have delivered benefits to the communities within which they operate or situate their REPs. These benefits include providing opportunities to diversify financial investments, promoting social cohesion in some communities and increasing the level of awareness on environmental issues such as climate change. Furthermore, local energy production supports the local economy and prevents the outflow of financial capital in order to purchase energy from sources outside the region.

Some of the challenges renewable energy cooperatives face include difficulty in raising capital to finance their REPs and, in some cases, obtaining Registered Retirement Savings Plan eligibility on their bonds. Furthermore, they are often held responsible for the increase in electricity costs in Ontario. Despite these challenges, renewable energy cooperatives have been largely successful in contributing their quota through REPs to actualize the Government of Ontario's plans for sustainable energy in the province.

Introduction

Since the negotiation of the United Nations Framework Convention on Climate Change (UNFCCC) at the Earth Summit in Rio De Janeiro in April 1992 and its entry into force in March 1994, many countries have made efforts to reduce their GHG emissions.[1] As the principal international environmental treaty focused on stabilizing GHG concentrations in the atmosphere to prevent negative consequences on the climate system, among other objectives, the UNFCCC provides a platform for country representatives to engage collectively in charting possible pathways to reduce GHGs. In the formal engagement process, through the annual Conference of the Parties (COP) conventions, countries negotiate to find common ground on targets for GHG reduction, based on a diverse range of factors that may affect the economies of individual countries. Over the years, countries have differed with regard to their targets for GHG reduction, although they are generally unified in the objective to reduce emissions to decrease the global impacts of climate change and advance efforts to achieve sustainable development.[2]

Reducing GHG emissions is a lengthy, arduous, complex and sometimes expensive process. In the process of reducing GHGs, countries are generally concerned about energy security, and how it intersects with and influences economic balance. Addressing these critical issues is central to a country's economic performance. Countries that possess an abundance of a particular energy resource tend to rely on it for energy production. Additionally, countries may have built high levels of competence around energy-generating resources that are abundant, based on an increased level of exposure to the resource. Therefore, viewing a commitment to reduce GHGs as a setback is a real possibility for some countries, in particular when the opportunity to operate in a business-as-usual manner exists. It is also not uncommon for countries lacking expertise in developing and maintaining clean energy technologies to carefully consider the long-term effects of this skills shortage on their respective domestic economies. Despite these challenges, it is evident from the

1 See http://unfccc.int/essential_background/items/6031.php.

2 Ibid.

consensus achieved on the Paris Agreement — agreed to at the twenty-first meeting of the Conference of the Parties (COP 21) in 2015,[3] and which unites countries in an ambitious effort to combat climate change — that countries generally agree that, at this point, reducing GHG emissions is the appropriate and responsible thing to do.

Prior to the Paris Agreement, some countries had embarked on a process to reduce GHGs using a variety of policy options and approaches. Importantly, some countries understood that in order to ease the impact of GHG reduction on the economy, efforts had to be linked to economic development to bring about local economic growth to buffer the possible economic losses countries may encounter in the process. In Canada, the Province of Ontario established its Green Energy and Green Economy Act (2009), commonly referred to as the Green Energy Act (GEA), in response to the global call to reduce GHG emissions. The policy aimed to create green jobs in the province while expanding renewable energy production and encouraging energy conservation. At the operational level, it was expected that the policy's objectives would be achieved, in part, through renewable energy co-operatives, a specific form of business largely uncommon in Ontario before the legislation of the GEA. This paper focuses on renewable energy cooperatives as a part of the GEA and their contribution to achieving the Government of Ontario's objectives for increasing the amount of electricity generated from renewable sources in the province.

Electricity Production in Ontario

Electricity generation in Ontario is carried out by a number of electricity-generating companies, such as Bruce Power, TransAlta Corporation and Atlantic Power Corporation, which are privately owned utilities, and Ontario Power Generation, which is wholly owned by the Government of Ontario. These electricity utilities operate diverse fleets of electricity-generating assets and produce electricity to cater to the Ontario population, which in July 2016 was approximately 14 million.[4] The IESO operates the electricity market in Ontario and directs operations in the bulk electrical system in the province. The Ontario electricity system has traditionally been characterized by the flow of electricity from large central power-generating stations through transmission lines to "load centres," such as cities or industrial areas where demand is concentrated. However, a review of the Ontario electricity system over a 10-year period (2005–2015), conducted by the IESO, showed that there has been an increase in generation embedded within the province's electricity system (IESO 2016). The distributed energy sources in the province include renewable energy resources such as wind, solar, hydro power, bioenergy, or combined heat and power facilities. At the end of 2015, the IESO estimated the amount of installed electricity supply from distributed resources at 3,600 megawatts (MW) (ibid.).

Under the period of review, a movement toward generating electricity from clean sources was observed and is reflected in Tables 1 and 2, which highlight the electricity production and supply mix in the province for the period. Electricity production in 2015 reflected the Ontario government's commitment to expand clean energy and reduce GHGs with the total electricity generated in the province (ibid.). Significantly, coal is not represented in the province's energy mix in 2015, as the Ontario government successfully eliminated coal-powered electricity production in 2014. This led to a significant decrease in GHG emissions. Ontario's installed electricity supply mix in 2015 also reflects the provincial government's focus on "clean" energy — where nuclear power is counted as such, although it is dangerous and generates hazardous waste. In line with the Ontario government's objective to reduce GHG emissions, the focus on clean energy resulted in a decline of GHG emissions in the electricity sector from 34.5 metric tons of carbon dioxide equivalent ($MTCO_2e$) in 2005 to 7.1 $MTCO_2e$ in 2015 (ibid.). This decline was mainly achieved through the phasing out of electricity production from coal.

3 Ibid.

4 See www.fin.gov.on.ca/en/economy/ecupdates/factsheet.html.

Table 1: Electricity Produced in Ontario in 2005 and 2015 and Contribution from Energy Sources

Electricity Produced in 2005		Electricity Produced in 2015	
Source	Contribution	Source	Contribution
Nuclear	51%	Nuclear	58%
Water	22%	Water	23%
Coal	19%	Natural gas	10%
Natural gas	8%	Renewables	9%
Renewables	Less than 1%	Coal	0%
Total	156 TWh	Total	160 TWh

Source: IESO (2016).
Note: TWh = terawatt hour.

Table 2: Electricity Supplied in Ontario in 2005 and 2015 and Contribution from Energy Sources

Supply Mix in 2005		Supply Mix in 2015	
Source	Contribution	Source	Contribution
Nuclear	37%	Nuclear	33%
Water	26%	Natural gas	25%
Coal	21%	Water	22%
Natural gas	16%	Renewables	18%
Renewables	Less than 1%	Demand response	2%
Total	31 GW	Total	39 GW

Source: IESO (2016).
Note: GW = gigawatt.

Ontario's Renewable Energy Policy

Prior to Ontario introducing the GEA, Canada showed leadership in commitments to curb GHG emissions. Among the significant and decisive steps taken over time, Canada's decision to ratify the United Nations' Kyoto Protocol — an international agreement aimed at reducing the effects of climate change and global warming — stands out for a number of climate and energy scholars as a turning point in the country's commitment toward tackling climate-related challenges on the global platform. In April 1998, Canada became one of the first countries to ratify the Kyoto Protocol, pledging to reduce GHG emissions by six percent over a five-year period spanning from 2008 to 2012 (Lao 2015). In the process, Canada demonstrated a high level of commitment toward preserving the environment, setting the precedent for clean energy development initiatives across the country. However, in 2011, Canada pulled out of the Kyoto Protocol, citing avoidance of penalties estimated at $14 billion for failing to meet emissions reduction targets (CBC News 2011).

The GEA, introduced in the Ontario legislature in February 2009, aimed to develop the clean energy industry in Ontario and, in the process, contribute to accelerating Canada's progress toward commitments to reduce GHG emissions. The GEA summarized the Ontario government's policy approach to reduce the emission of GHGs through a multifaceted strategy involving developing renewable energy technologies, creating clean

energy industries and jobs to increase economic activity, and improving air quality by phasing out coal-fired energy generation. The Ontario FIT program was launched as a framework through which the Ontario government's policy for clean energy development would be implemented.

The Ontario FIT program was comprised of the microFIT program, which focused on encouraging the development of REPs with a capacity of 10 kilowatt hours (kWh) or less. The microFIT program targeted homeowners to encourage renewable energy production at the residential level, as homeowners were able to supply electricity generated from their small REPs to the provincial electricity grid and receive financial compensation (IESO 2017a). Also, the FIT program was designed to cater to larger REPs, with capacities greater than 10 kWh, but not exceeding 500 kWh, to encourage commercial renewable energy production. The Ontario FIT program was executed in stages known as "rounds," where REP developers, mostly structured as renewable energy cooperatives, went through a selection process based on the number of points accumulated on their respective proposed REPs. In the review process, the IESO allocated points to potential REP developers based on proponent experience, financial capability and site due diligence (Rodger 2014). Between 2011 and 2017, the IESO, which was responsible for implementing the Ontario FIT program, recorded five major bidding rounds (IESO 2017a).

A review of the FIT program conducted by the Ministry of Energy two years after implementing the program showed that Ontario had become a clear leader in non-hydro renewable energy generation and procurement across North America due to the success achieved with the program. At the time, the province had contracted 4,600 MW of electricity generated from REPs through the FIT program and 2,900 MW of electricity capacity in FIT contracts were moving through the Renewable Energy Approval process. According to the review, Ontario was on track to procure 10,700 MW of non-hydro renewable energy generation by 2015 (Ministry of Energy 2012). The review also showed that the FIT program had attracted over $27 billion in private sector investment — $20 billion from project developers and lenders and $7 billion from the Green Energy Investment Agreement, an agreement entered into by the Government of Ontario with Samsung C&T Corporation and Korea Electric Power Corporation. Under the original terms of the agreement, these companies agreed to develop 2,500 MW of solar and wind REPs and establish manufacturing plants in the province. Also, at this time, Ontario's clean energy initiatives — which the FIT program was a part of — had created more than 20,000 jobs (ibid.).

In implementing the GEA, the Government of Ontario experienced a temporary setback in a ruling from the World Trade Organization (WTO), based on the conclusion that part of the GEA was illegal. Responding to complaints about the GEA's local content requirement put forward by Japan and the European Union in December 2012, the WTO ruled that that the local content requirement in the GEA, which was established to promote local development in terms of employment and equipment production, violated international free-trade rules. Based on the ruling, the Government of Ontario pledged to reform its procurement policy in the FIT program. However, the WTO ruling raised questions about the flexibility countries have to pursue agendas for national growth and, in particular, the challenge to develop other WTO-compatible initiatives to advance sustainable development as recognized by the United Nations (Sinclair 2013).

Renewable Energy Cooperatives in Ontario

The Canada Cooperatives Act (CCA) of 1998 established the law for self-governing entities comprised of individuals with similar economic, social and cultural needs through jointly owned businesses that are democratically controlled. Cooperatives apply the "one member, one vote" rule rather than weighting votes according to capital shares held. Across Canada and focusing, in particular, on Ontario, cooperatives exist in almost every industry. For the purpose of ensuring adequate delivery of REPs, the CCA was amended to provide for renewable energy cooperatives.[5] In contrast to conventional cooperatives, renewable energy cooperatives have only one client that is not a member of the cooperative, the IESO. The GEA focused on expanding the clean energy industry in

5 See www.fsco.gov.on.ca/en/coops/Pages/articles_of_inc_energy.aspx.

Ontario, specifically through building capacity in renewable energy, and successful implementation of the core policy depended largely on investment from financial institutions and practical knowledge of REP development from developers. Businesses that combine these two elements were necessary for implementing REPs in Ontario. As part of its focus, the GEA was established to promote community-scale REPs, and people with interests in community participation, renewable energy and GHG reduction, with the capacity to develop and raise capital to finance REPs clustered together to form renewable energy cooperatives in the province. Prior to establishing the GEA, only a few renewable energy cooperatives existed in Ontario. Upon legislating the GEA in 2009, Ontario recorded the incorporation of approximately 30 renewable energy cooperatives (Ministry of Energy 2012). A recent study, however, showed that in 2015, Canada had 89 operational renewable energy cooperatives. At this time, the total number of renewable energy cooperatives operating in Ontario was 52 (Lipp, Tarhan and Dixon 2016).

In the FIT program, the renewable energy cooperatives in Ontario are responsible for initiating and implementing community-scale REPs. As business entities, renewable energy cooperatives oversee the development processes of REPs in Ontario, from conceptualization and design to project completion, usually marked by REP connection to the provincial grid, signifying readiness for full-scale operation. Renewable energy cooperatives may be involved in various processes across the electricity supply value chain linked to generation and distribution of electricity, heat and renewable fuels for mobility (Lipp and Dolter 2016). In some cases, renewable energy cooperatives may provide services for renewable energy and conservation, and, in other cases, they may provide services such as technical advice, completing energy retrofits and installing solar panels. However, most of the renewable energy cooperatives in Ontario are involved in generating electricity from renewable sources and feeding it into the electricity grid of the IESO. While most renewable energy cooperatives conduct their operations in electricity generation and supply, they can be differentiated based on the technology adopted, the partnership structure, their approach to project REP development and the size of the REPs they implement (Lipp, Tarhan and Dixon 2016).

Ontario Renewable Energy Cooperative Models

In order to understand the operational structure of renewable energy cooperatives in Ontario and establish the operational models implemented, interviews were conducted with senior executives and managing partners at four renewable energy cooperatives and a renewable energy-focused non-governmental organization (NGO) in the province. In this section, the models for four renewable energy cooperatives are described. They are:

- Oxford Community Energy Cooperative (OCEC);
- LIFE Cooperative (LIFE);
- Ottawa Renewable Energy Cooperative (OREC); and
- Toronto Renewable Energy Cooperative (TREC).

Members of the Ontario Sustainable Energy Association (OSEA), a renewable energy-focused NGO in the province, were also interviewed to obtain information on renewable energy cooperatives in Ontario.

For community-scale REPs, finance plays an important role in determining the structure of renewable energy cooperatives. At the very least, the partnership structure established to develop an REP is influenced by the contributions of the parties coming together to finance the project. The partnership structures between cooperatives and the communities are briefly outlined in order to highlight the operational model of some renewable energy cooperatives (see Table 3).

In the case of OCEC developing the Gunn's Hill Wind Farm, an 18 MW REP, OCEC partnered with Prowind, an REP developer, and the Six Nations of the Grand River Development Corporation (SNGRDC), to implement the project. In addition to capital, Prowind provided technical expertise in wind power development, and the Six Nations contributed capital; their inclusion satisfied the Ontario government's policy for inclusion of First Nations and Metis people as co-owners of REPs in the FIT 1.5 round. Currently, OCEC, Prowind and SNGRDC own the Gunn's Hill Wind

Table 3: Examination of Renewable Energy Cooperatives

Renewable Energy Cooperative	Project Type	Partnership	Ownership
LIFE	Solar and wind	Project developers and farmers	LIFE and farmers
OCEC	Wind	Project developer and local community group	OCEC and the local community group
OREC	Solar and wind	Project developers and local community	OREC
TREC	Solar, wind and waste	Project developers and investors	TREC

Source: Authors' summary from data collected.

Farm. The project became fully operational in January 2017. OCEC's approach to financing and developing the Gunn's Hill Wind Farm is an example of a partnership model between a large community group, a project developer with technical capabilities in wind power generation and a renewable energy cooperative operating in a local community.[6] As a means to raise capital and increase community involvement, OCEC issued bonds to finance the project. OCEC raised the debt portion of the capital invested in the REP from three commercial banks in North America, located in Chicago, New York and Toronto.

One of the main characteristics of the Ontario system is that projects are owned, at least partially, by renewable energy cooperatives for a certain time. In the Ontario FIT program, REPs are tied to renewable energy cooperatives, based on a special provision for involvement of renewable energy cooperatives in operating REPs, established by the IESO. Therefore, in the event that a default in loan repayment occurs, lenders are unable to take over the REP and operate it on their own as lenders are not renewable energy cooperatives. This creates a risk for potential lenders and investors, because they cannot run the project in case of a default of a renewable energy cooperative. This mainly excludes conventional loans for these projects. Therefore, many renewable energy cooperatives with FIT contracts struggle to raise capital for their REPs, even though they hold a 20-year contract with guaranteed tariffs. Access to capital has been highlighted as a major challenge for renewable energy cooperatives. To address this challenge, some renewable energy cooperatives found innovative means to finance their projects. In some cases, innovations around REP financing influence partnership structures and operational models for renewable energy cooperatives.

The renewable energy cooperative LIFE partners with farmers, who finance the debt portion by obtaining a loan from their credit union to develop REPs. LIFE could neither come up with the capital nor withdraw its commitment to developing the REPs as its withdrawal from the projects would nullify the agreement with the IESO to generate electricity, ultimately rendering the agreements with the IESO invalid. Based on the interest of the project partner — the farmers on whose barns solar panels had been installed — a loan agreement was established according to the partnership structure between LIFE and the farmers. With access to loans to operate farms, the farmers, as project partners, could increase their stakes in the projects by providing LIFE with loans to develop the REP. These kinds of agreements have been established for a number of projects and they influence the operational structure of the renewable energy cooperative. In this case, LIFE provided some of the capital and technical expertise necessary to obtain FIT contracts and the farmers designated to host LIFE's REPs provided capital, in the form of debt or equity, needed to develop the projects.[7] LIFE also sold bonds and shares to investors as a means to raise capital to finance its projects.

In another larger project, a significant portion of finance came from an institutional investor based

6 Interview with Helmut Schneider, OCEC, October 27, 2016.

7 Interview with Shane Mulligan, LIFE, October 14, 2016.

in Toronto. The parties involved in this project were the owner of the building where the roof had been leased to install the solar panels, the partnering cooperative LIFE who contributed a smaller part of capital and the institutional investor who bought a part of the stake of the original partner.

Some renewable energy cooperatives use different approaches in financing and developing their various REPs, depending on the size of the project. In the case of OREC, the renewable energy cooperative established agreements with tenants in social housing buildings to rent their roofs and install solar panels. A percentage of the electricity generated from the rooftops and sold to the Province of Ontario was paid by OREC to the tenants of the building, contributing regularly to the income generated by tenants in the buildings. For its larger projects, OREC relied on its members to finance the REPs by issuing bonds, operating a model that allows members to invest in the portfolio of projects implemented by the renewable energy cooperative. In essence, OREC's model does not tie members into a specific project; rather, members are part owners of the entire portfolio of REPs.[8]

In contrast, TREC, an umbrella organization that is the largest renewable energy cooperative in Ontario, operates a model that binds investors to particular projects. Essentially, in TREC's operational model, an investment made by a member is specific to a particular project and not the entire portfolio of projects operated by the renewable energy cooperative. TREC raises capital to finance its projects, securing capital for project development mainly by issuing bonds and inviting interested investors to purchase these bonds. Importantly, TREC embarks on a process to issue bonds for a particular REP and capital raised in the bond issue is directed toward development of the specific project. TREC's bond issues for specific REPs are made through its subsidiary renewable energy cooperatives, SolarShare and WindShare, among others.[9]

As outlined in the cases above, ownership in REPs is mostly determined by the financial contribution necessary for project development, characterized by the high upfront costs of community-scale REPs, and partnerships are necessary to satisfy capital requirements for constructing the REP.

Additionally, the Ontario government's policy on community participation and ownership in some rounds of the FIT program influenced partnership arrangements and, in some cases, the operational model of renewable energy cooperatives. Generally, renewable energy cooperatives in Ontario partner with the communities in which their REPs are developed. However, partnership structures with the local communities may differ from one renewable energy cooperative to another.

Also, in analyzing renewable energy cooperatives in Ontario, the authors found that, in many cases, the primary renewable energy technology (RET) promoted by a cooperative provides insights into the cooperative's technical focus in generating electricity and developing REPs (Community Power Fund et al. 2013). Many renewable energy cooperatives in Ontario focus on generating electricity using a specific technology based on the knowledge available to top decision makers. In essence, upon incorporation, renewable energy cooperatives with technical knowledge of wind, solar or bioenergy technologies would focus on developing REPs powered by the technology the renewable energy cooperative is most familiar with. In most cases, this can be observed in smaller renewable energy cooperatives in Ontario. However, most of the large renewable energy cooperatives in Ontario focus on implementing multiple projects using different technologies based on the capacity to raise capital to finance these REPs, the available talent to drive the different project development processes and regional opportunities for particular renewable energy sources.

Impact of Ontario's Renewable Energy Cooperatives

According to the IESO's progress report on contracted electricity supply, as of December 2016, the total capacity contracted to firms generating electricity from renewable sources (solar, wind and bioenergy) was 9,239 MW. At this time, the total contracted electricity capacity from currently operational renewable sources was 7,488 MW (wind 4,772 MW, solar 2,227 and bioenergy 489

8 Interview with David Cork, TREC, November 17, 2016.

9 Ibid.

MW), while contracted electricity capacity under development totalled 1,753 MW (wind 1,284 MW, solar 462 MW and bioenergy 7 MW) (IESO 2017b). Among other types of businesses delivering contracted electricity in Ontario through the FIT program, renewable energy cooperatives in the province have been instrumental in executing the Ontario government's Long-Term Energy Plan by actively promoting embedded electricity generation through community-based REPs, contributing to fostering energy sustainability in the province.

Renewable energy cooperatives in Ontario have helped to deliver economic benefits in the communities in which they operate (McMurtry and Lipp 2015). By establishing their businesses and inviting community members to participate in REP project development, renewable energy cooperatives in Ontario have provided investment opportunities yielding financial returns for community members. Renewable energy cooperatives provide options for responsible investment and financial benefits, in particular for communities seeking to contribute to advancing the sustainability agenda in Ontario. Financial returns from the sale of generated electricity accrue to members of the cooperative, who, in many cases, are part of the local community. Some renewable energy cooperatives in Ontario have also helped to increase employment opportunities and options for local community partners to diversify investment portfolios in order to generate the capital needed to finance other development projects within the community.[10] As an example, the partnership between OCEC, Prowind and SNGRDC resulting in the Gunn's Hill Wind Farm created employment opportunities for some members of the local community, and afforded SNGRDC the opportunity to invest in Ontario's electricity sector to generate capital needed for local community development in the long term.

Some renewable energy cooperatives have also helped to generate additional business opportunities for members and partners, generally leading to additional financial returns. This is evident in the case of the partnership between LIFE and farmers: hosting their REPs as a collaboration with a renewable energy cooperative afforded farmers the opportunity to expand their revenue base and generate income from a highly regulated industry, the electricity sector in Ontario. As a result of the technical expertise provided by LIFE, specifically the capacity to secure FIT contracts and implement community-based REPs, the potential for some farmers to generate additional revenue unrelated to their core farming operations increased. In terms of the ownership structure, in LIFE's model, projects are usually owned in part by the cooperative and the farmer who installs solar panels on the farm's roofs. LIFE's ownership in REPs ranges from 15 percent to 51 percent, and revenue generated from each project is shared on the basis of ownership in the project.

In addition to the returns from standard farming operations, farmers in partnership with LIFE benefit from the sale of electricity to the Ontario government, increasing the farmers' revenue and capacity to broaden their investment options with the newly generated income. In the event that the agreement between a renewable energy cooperative and a farmer is one where the farmer only leases land for a 20-year period, which constitutes the valuable life of the REP, the farmer still generates some income through the lease, increasing earnings and diversifying the revenue stream for the farmer. Some renewable energy cooperatives have also helped their members and the community acquire new skills and knowledge, especially relating to REP development, energy sustainability and GHG reduction.

OREC has a culture of engaging its members consistently in the various phases of project development as it implements its various REPs, and TREC Education imparts knowledge to elementary and secondary school students and to Indigenous communities. As a result, some community members have become more aware of options to foster change by reducing GHG emission at the individual level, to contribute in the short and long term toward creating the energy future for the province envisioned by the Government of Ontario. The cooperative structure has advantages for wind projects, in particular, although they are often criticized because, prior to the FIT program, community members had to accept the installation of wind turbines without receiving any benefits from the project. The GEA requires that membership of a renewable energy cooperative is established by community members in the particular region where an REP is installed. Consequently, community members can benefit from a wind project's income without being actively involved in setting up the project.

10 Interview with Christine Koenig, OSEA, September 14, 2016.

This approach has contributed to significantly reducing local resistance to wind power projects.

In addition to contributing to shaping the dialogue for clean energy production in Ontario, renewable energy cooperatives in the province have helped to foster development within the local community. By collaborating with local organizations to finance development initiatives within their immediate communities using surplus funds from electricity sales, some renewable energy cooperatives promote local economic development within the communities where they operate. The renewable energy cooperatives generating electricity also contribute to increasing energy security levels in the province. In the movement toward generating electricity from cleaner sources, renewable energy cooperatives developing community-based REPs play an important role in avoiding reliance on imported fuels that may be harmful to the environment and contribute to the outflow of financial capital.

From a social perspective, renewable energy cooperatives in Ontario have promoted social cohesion within the communities in which they operate. For example, in the case of OREC, citizen engagement fora have provided a platform for community members to discuss broad community development agendas in relation to proposed or developed REPs in the community. In particular for community members who have invested in the REP, regardless of the amount invested, there is a sense of ownership and belonging as households unite around the development of an REP. In situations where there has been friction in the community, specifically around the site of an REP, open engagement between community members and leaders from the renewable energy cooperative has resulted in stronger cooperation between the renewable energy cooperative and the community. This was evident in the preliminary stages of engagement between OCEC and some members of the local community concerning the site of the Gunn's Hill Wind Farm. Continuous interaction through community engagement platforms resulted in direct cooperation and mutual benefits for OCEC and the community. Other renewable energy cooperatives, such as LIFE, follow similar approaches.

Broadly, renewable energy cooperatives have also contributed to advancing the Ontario government's strategy for environmental sustainability. In developing REPs, renewable energy cooperatives have helped to promote low-carbon energy development options as feasible sources of clean renewable energy across the province. Acknowledging the Ontario government's vision to eliminate coal-fired electricity generation, renewable energy cooperatives have helped to stabilize electricity supply across the province, while displacing GHG emissions produced from coal. As the carbon emissions profile for Ontario from 2005 to 2015 in the IESO's 10-year period of review shows, as the years progressed, carbon emissions dropped significantly, decreasing from 14.9 $MTCO_2e$ in 2009, when the GEA was legislated, to 7.1 $MTC0_2e$ in 2015 (IESO 2016). Additionally, the renewable energy cooperatives in Ontario have played an important role in replacing finite sources of energy, such as coal, with renewable sources of energy, such as wind and solar, offering an alternative to nuclear energy, which is relatively expensive and has been viewed as controversial by some energy systems experts in the province.

Challenges and Setbacks

Despite evidence that renewable energy cooperatives have played an important role in expanding renewable energy generation in Ontario, as a collective, renewable energy cooperatives have faced severe challenges and setbacks. They have experienced challenges with raising capital to finance their REPs, despite having valid FIT contracts with the IESO to supply electricity. Although an REP developed by a renewable energy cooperative represents an asset with the capacity to generate revenue for a period of 20 years based on the FIT contract, raising capital through lenders to finance projects is challenging. This is due to provisions in the FIT contract requiring compulsory participation of renewable energy cooperatives in operating REPs.

Dependence on the IESO is another challenge for renewable energy cooperatives in Ontario. As established earlier, the IESO operates the electricity system in the province, thereby making the institution the only client for renewable energy cooperatives in Ontario. In essence, the scope for business operations for renewable energy cooperatives in Ontario is highly limited. Also, renewable energy cooperatives in Ontario

are dependent on one specific policy — the FIT policy — which forms the basis of the relationship between renewable energy cooperatives and the IESO: to generate and supply electricity from renewable sources to the provincial electricity grid. In Ontario's FIT program, a FIT contract is valid for 20 years. With respect to longer-term energy planning and the generation of electricity from renewable sources to achieve sustainability beyond the duration of FIT contracts, the future for renewable energy cooperatives operating in Ontario under the FIT program is uncertain. Over the past few years, electricity bills for Ontario residents have increased. Some residents and non-renewable-resource electricity producers have levelled criticism against producers of electricity from renewable sources and the FIT program, suggesting increases in electricity bills are due to the high costs of tariffs paid to electricity producers participating in the FIT program. However, the conclusions of a study into the components of Ontario residents' electricity bills showed that payments for electricity produced from non-renewable sources, in particular nuclear and gas-fired plants, comprise the largest portion of residents' electricity bills (Spears 2013).

Additionally, although the FIT program highlighted community participation as a core objective of the program, smaller renewable energy cooperatives with limited resources and low capacity to achieve economies of scale were, in some cases, unable to compete with larger REP developers, who were better established in terms of their track records with developing REPs and gaining access to capital. Essentially, some communities were unable to implement larger REPs, resulting in lower involvement in the FIT program. Other challenges renewable energy cooperatives face include competition with large-scale nuclear power generators, which have less flexibility in terms of their electricity-generating operations. Although fluctuations in electricity supply from solar and wind exist, electricity capacity obtained by generating electricity from these renewable sources can be scaled up, providing electricity planners with a high level of flexibility to manage supply. With nuclear, electricity is normally generated from large plants, which can create a problem of oversupply. Flexible hydro power capacity in Ontario can complement fluctuating supplies of electricity from REPs better than inflexible nuclear power plants. However, in order to manage the supply of electricity, arrangements can be made for excess electricity capacity to be transmitted to other provinces and states. In addition to these challenges, compared to FIT programs established in countries such as Germany and Switzerland, the Ontario FIT program requires greater administrative efforts, which can limit the pool of prospective participants in the program.

From FIT to Cap and Trade

On September 27, 2016, the Ontario Ministry of Energy suspended the planned second round of the Large Renewable Procurement (LRP II) process and the Energy-from-Waste Standard Offer Program. This decision halted the procurement of over 1,000 MW of electricity from solar, wind, hydroelectric, bioenergy and energy-from-waste projects. According to the Ministry of Energy (2016), the decision to suspend planned electricity procurement from renewable sources was informed by the IESO's Ontario Planning Outlook, an independent technical report on the electricity system in Ontario, requested by the minister of energy in June 2016. In the IESO's report, various planning scenarios for the future of Ontario's energy system over a 20-year period were outlined, presenting the Ministry of Energy with options for decision making. The IESO concluded in its report that Ontario had an adequate supply of electricity to meet demand over the coming years. This conclusion was based on an analysis of forecasted electricity production from contracts of supply currently operational and under development.

In efforts to fulfil the commitment to reduce GHG emissions, the Ministry of Energy embarked on a carbon-pricing scheme, with the objective to curb emissions and generate revenue in the process for the province. Its cap-and-trade policy was established in June 2016. Considering the conclusion reached by the IESO in its report and the suggestion there was not an immediate need for added electricity capacity in the province, the cap-and-trade policy, as a market-based mechanism, emerged as a preferred option for GHG reduction in Ontario. The Ontario cap-and-trade policy focuses on controlling GHG production by providing economic incentives to participants

of the program.[11] In the program, emissions of GHGs for businesses are capped and firms that exceed their limits are required to purchase permits or allowances through auctions run by the government or from other firms that do not exceed their emission limits (Leslie 2016).

In the Ontario cap-and-trade program, mandatory participation is required of electricity importers and facilities or natural gas distributors emitting 25,000 tonnes or more of GHGs per year, and fuel suppliers selling more than 200 litres of fuel per year. Facilities that generate more than 10,000 but less than 25,000 tonnes of GHG emissions per year may also participate voluntarily in the program. The Ontario cap-and-trade policy became effective on January 1, 2017, and is expected to be in force until December 31, 2020. The Ontario government held its first auction of GHG allowances on March 22, 2017, and sold a total of 25,296,367 current (2017) and 812,000 future (2020) allowances at settlement prices of $18.08 and $18.07 per unit, respectively (Ministry of the Environment and Climate Change 2017a). The Ontario government has committed to investing proceeds from the auction into programs to reduce GHG emissions in the province (Ministry of the Environment and Climate Change 2017b).

The change in policy — LRP suspension to cap and trade — has broad consequences for the renewable energy sector in Ontario, of which renewable energy cooperatives are a component. Although the Ontario government continues to implement the microFIT component of the FIT program, the policy change is largely viewed as a setback for the renewable energy industry in Ontario. However, the FIT contracts offered to renewable energy cooperatives by the IESO in the first phase of the renewable energy procurement process (LRP I) are valid and when REPs eventually become fully operational, they would be connected to the provincial electricity grid to supply generated electricity to the province. By 2016, the FIT program had helped to create 42,000 jobs (Ministry of Energy 2016), which Ontario's renewable energy cooperatives contributed to in developing their REPs. However, the decision by the Ministry of Energy to suspend the LRP II effectively eliminates the possibility of renewable energy cooperatives developing community-scale REPs to generate additional electricity capacity for the province in the near future.

11 See www.ontario.ca/page/cap-and-trade.

Conclusion

Renewable energy cooperatives in Ontario have contributed significantly to sustainable energy development in Ontario. Specifically, as a collective working to expand renewable energy generation in the province, renewable energy cooperatives have played an important role in boosting the supply of clean energy to accelerate the government's drive to reduce GHG emissions (International Labour Office 2013). Charting paths to a future with low carbon requires significant policy changes to increase energy supply while balancing the demand for energy needed for economic activities that can spur growth in the province (Conaty 2011). The Ontario government showed leadership in its commitment to implementing the FIT program and reducing GHG emissions by supporting electricity generation from REPs developed by businesses, including renewable energy cooperatives. According to the IESO's current 18-month outlook for the period April 2017 to September 2018, approximately 1,950 MW of new electricity supply would be connected to the provincial transmission grid. Solar and wind comprise 100 MW and 500 MW, respectively. This would bring the amount of grid-connected wind and solar capacity to 380 MW and 4,500 MW, respectively. Over this period, embedded solar capacity is expected to increase to 2,200 MW, while embedded wind capacity would increase to 2,200 MW (IESO 2017c). As a preferred channel for delivering solar and wind REPs, renewable energy cooperatives actively involved in the FIT program continue to contribute to sustainable energy development as a broad initiative to reduce GHG emissions in Ontario.

The FIT program in Ontario highlights several lessons that can be incorporated into initiatives to promote sustainable energy development in other countries. A critical lesson in developing other initiatives would be to establish a level of flexibility for eligible renewable energy cooperatives under contractual agreements to supply electricity, in their involvement in REPs. This would increase the capacity of renewable energy cooperatives to raise capital from lenders, providing these lenders with an increased amount of security. This can impact financing and ownership agreements, such that in the case of defaults in loan repayments, the agreement between lenders and the renewable energy cooperative can be restructured to reflect a different ownership structure, favourable to

lenders. Also, the Ontario FIT program highlights the importance of continuous longer-term energy planning for cohesive policy decision making, so as to avoid competition between parties generating electricity from differing sources. As the case between the nuclear and the renewable energy subsectors in generating electricity in Ontario shows, decisive policy making is paramount in implementing initiatives to foster sustainable energy generation from renewable sources. Finally, in the process of planning a FIT program, measures should be taken to control future electricity costs to prevent environmentally responsible and successful initiatives from becoming highly expensive. A tariff that takes into account the stages of development for RETs and the declining costs of technologies for more mature RETs, due to economies of scale, is an efficient tool that can be used to control electricity prices over the period of a FIT program.

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