

# **Power to the People: Assessing Renewable Energy Co-ops in Ontario**

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A Thesis submitted to

The Faculty of Graduate and Postdoctoral studies

In partial fulfillment of the requirements for the degree of

Master of Science in Environmental Sustainability

Institute of the Environment



uOttawa

The University of Ottawa

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## **Abstract**

There is need for increased production of electricity from renewable energy technologies. The transition to a low-carbon economy, whilst achieving energy security and meeting the Sustainable Development Goal 7 (SDG7) is an ongoing challenge for many countries. . Local communities instituting an energy co-operative model may be instrumental to reducing greenhouse gas emissions to attain the 2030 goal. Renewable energy co-operatives (RECs) are one approach that can contribute to environmentally and socially equitable energy transitions in order to meet the SDG7. This thesis examines the factors that affect the success of RECs within Ontario to better discern how RECs are set up and how government policy affects their development.

The main research question of this study is “How can Ontario’s renewable energy co-ops grow, experience long-term viability, be updated or expanded?” This thesis argues that the quest towards energy transition, a low-carbon economy and to achieve both the federal and provincial targets by 2030 should take on a multi-stakeholders approach. In theory, this should reflect community desires, goals and energy equity since a community should have its own supported role in energy generation towards the whole of Ontario. With the absence of provincial support from the removal of the Feed-In Tariff (FIT) program in 2017, it is now imperative that municipal governments become involved in REC developments within their community.

The methodological approach of this thesis uses a combination of the Strengths, Weaknesses, Opportunities and Threats (SWOT) and sustainability analyses in order to interpret the data collected from semi-structured interviews with co-ops and policymakers as well as their websites and reports. This study examines the support structures and barriers for the growth of RECs in Ontario and how their growth can contribute to the SDG7. Through document review

and interviews with representatives from the co-ops, I discovered that barriers include unstable government policy, inadequate funding, and a lack of support from financial institutions due to the smaller size of the projects developed by power co-ops. Comparisons with REC policy and progress in European countries show Ontario can do more to support RECs. This thesis concludes that one of the many available options for Ontario to contribute substantially to the transition to a low-carbon-economy is through applying the Pan-Canadian Framework on Clean Growth and Climate Change and the SDG7 by supporting citizen-led initiatives like RECs and to encourage large financial institutions to invest in their communities.

## Acknowledgements

I give profound thanks and gratitude to God Almighty who has been with me through this Master program at the University of Ottawa and made it possible for me to be alive to write this thesis. My humble appreciation goes to my supervisor Dr. Stewart Fast of the Institute for Science, Policy and Society at the University of Ottawa for his open-mindedness, skills and knowledge in the course of writing this thesis as well as his constructive and timely feedback. My appreciation will not be complete without acknowledging the effort of Mireille Leroux for her support and advice from application process to the commencement of this program when she was the Institute of the Environment program coordinator. I also want to acknowledge Jean Marc, Prof. Scott, Prof. Runnals and the other Professors at the Institute of Environment for imparting useful knowledge to me during the course of this program. I also want to express gratitude to Prof. Foibissi Kalame and Prof. Ryan Kartz-Rosene who took time out of their busy schedule to evaluate this thesis and provided constructive comments.

To my wonderful family members, particularly Barrister Julius Ogunleye, Mr. Gbolabo Ogunleye, Mr. Akinlolu Ogunleye, Mrs. R. Ogunleye, Mrs. Agbaje, Mrs. Omoregbe, Akintunde, for your unlimited love and understanding during this program. I want to appreciate the managing director of Environmental Laboratories Limited Dr. Femi Oyediran for giving me the required support during application, admission and after this program. My sincere appreciation goes to Professor Clement Adeofun, Dr. Olujimi Olanrewaju of the department of Environmental Management and Toxicology for the fatherly role they played during the application and after admission into this program. May God continue to increase your wisdom and bless you eternally.

A special thanks also goes to all Renewable Energy Power Co-ops in Ontario and the Independent Electricity System Operator (IESO) that gave me the needed support while I collected data. I also want to express gratitude to my bosom friends and colleagues Afolabi, Daniel Vervoort, Wilver Kemusa, Alexander Baker, Bukola Olaitan, Stewart Wiseman, Paige Crowell, Chrissy Chiasson, Cassie Rosenfeld, Chibueze Obiaefuna, Kayode Olaide, Opeyemi Adesina, Jeffery Hum, Andrew Kadykalo and Swetha Yegna. I am grateful I met you all.

## **Dedication**

To the blessed memory of my late parents, Mr. and Mrs. Samuel Ogunleye.

May your gentle souls continue to rest in peace.

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## **List of Acronyms**

Canada Co-operative Act - CCA

European Union - EU

Federation of Community Power Co-op - FCPC

Feed-In Tariff - FIT

Green Economy and Green Energy Act - GEA

International Co-operative Alliance - ICA

International Labour Organization - ILO

Independent Electricity System Operator - IESO

Intergovernmental Panel on Climate Change - IPCC

Long-Term Energy Plan - LTEP

Ontario Energy Board - OEB

Ottawa Renewable Energy Co-op - OREC

United Nations - UN

Sustainable Development Goal 7 - SDG7

Rural Electrification Administration - REA

Renewable Energy Power - REP

Renewable Energy Co-operations - RECs

Strengths, Weaknesses, Opportunities and Threats - SWOT

Toronto Renewable Energy Co-op - TREC

World Trade Organization – WTO

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## **1.0 Introduction**

### **1.1 Background Information**

Energy transition that is geared towards the generation of energy through a decentralized form of governance that empowers local actors is gaining momentum across the world, including in the province of Ontario (Thomas, 2015). This form of local actions is through Renewable Energy Cooperatives (RECs). RECs are a form of energy generation that are either wholly owned or managed by the members that contributed financially to its development or are organized in partnership with utility companies.

Increasing the production and consumption of energy from renewable energy sources is fundamental to sustainable development. The SDG7 clearly outlines the UN ambitions to ensure access to affordable and clean energy for all by 2030 (Munro et al., 2017). The continuous dependence on the use of unsustainable sources of energy and the adverse effects of greenhouse gas emission has made the switch to renewable energy absolutely essential.

The service provided by energy is vital to economic growth, progress, development, and eradication of poverty in any country aspiring to meet the SDG7 of the UN (Schlor et al., 2013). Reforming energy policy that takes into account the need for a transition to a low-carbon economy, energy security and the need for citizens to participate in democratizing the energy systems in Ontario contributes to social and environmental justice. Social and environmental justice is related to equitable distribution of wealth in the society (Schlor et al., 2013). Energy from RECs are one approach that can contribute to environmentally and socially just energy transitions, and to SDG7 (Jenkins et al, 2016). This thesis examines the factors that affect the success of RECs.

The Ontario Provincial Government's action towards transitioning to low-carbon energy provides the overall policy context for the REC case study in this thesis. The Government of Ontario announced its plan to phase-out the use of coal-fired plants and committed to the implementation of this plan in 2003. The commitment was enshrined in the Cessation of Coal Use Regulations (2007), which contained the end date of coal use to be December 31st, 2014. The Ending of Coal for Cleaner Air Act (2015) cemented

this commitment so that the province could no longer use coal to generate electricity in future. Coal, as of today, accounts for over 8000MW of the electricity generated in the province of Ontario. However, Ontario was the first to shut down the coal-fired power plant in North America due to its commitment to transition to a low-carbon economy.

The enactment of the Green Energy and Green Economy Act (GEA) in 2009 coupled with the Ontario's 2010 Long-Term Energy Plan (LTEP, 2010) which signified the commitment of Ontario to add renewable energy sources to the electricity system and encourage energy conservation (IESO, 2017). As of 2003, hydro was the only renewable energy source for electric generation in the province. However, due to the implementation of the GEA, non-hydro renewable energy such as wind, solar and bioenergy became 7% because of the Feed-In Tariff (FIT) that encourages various renewable energy technology generators including the RECs (LTEP, 2010).

There are currently 52 of these RECs in Ontario generating energy from the various renewable energy technologies such as wind, solar, bioenergy and biogas. The combined capacity of electricity from all renewable energy sources stands for more than 18,300MW. Approximately 3,000MW of renewable energy projects are still under development contracts, which includes big, small and community-level generators like the co-ops with FIT contracts (LTEP, 2017). However, 191MW has been generated by the RECs in Ontario by my calculations from the IESO document. In order to improve the energy security and transition to low-carbon energy in Ontario, the province proposed that by 2025, 20,000MW of renewable energy will be on the grid which will represent about half of Ontario's installed capacity (IESO, 2018). The province also forecasted the reduction of greenhouse gas emission from 32.9Mt in 2005 to 4.42Mt by 2018 (IESO, 2016) . The RECs will be instrumental in achieving this ambitious target.

Ontario is expanding electricity generation from renewable energy sources through utilizing RECs, which have contributed to supporting the region's various approaches towards energy security and transition to low-carbon energy to support the SDG7 (Orji and Weber 2017). As part of the rules of FIT, RECs must foster community participation and ownership as mandated by the Independent Electricity

System Operators (IESO). This means that least 50 members of the community must be involved in a project to qualify for FIT. The community-level energy initiatives are geared towards sustainable energy development which contributes to the sustainability (environment, social and economic) of the community where they exist and Ontario at large. The contribution of RECs and other renewable energy generators is evident in the IESO analysis of greenhouse gas (GHG) emissions over a 10 years period (2005-2015), which shows a decline in the GHG levels (IESO,2016). Renewable energy projects developed by RECs and other non-emitting sources have being attributed to the decline in GHG production in the provincial electricity system and have improved energy security. Other benefits of RECs includes promoting social cohesion in the communities where they operate, retaining money in the local economy and raising the awareness on environmental issues such as climate change through the different workshops organized by these RECs (Hoicka and Macarthur, 2018)

This potential shift in energy generation can align with the public's desire to contribute to sustainable development, energy security and the drive towards low-carbon economy that allows communities to be self-sustaining and very critical to human well-being, poverty alleviation and economic development (Genevieve & Parker, 2009 and Mundaca et al., 2018).

## **1.2 Research Problem**

RECs are spreading quickly in the province of Ontario. Co-operative ownership of renewable energy production provides public benefits in terms of social cohesion, local economic multiplier effects, increased electricity grid resilience through greater use of distributed energy, and greater public support for the adoption of new innovative technologies (Lipp & Dolter, 2016).

RECs are citizen-led energy generation initiatives as they enable citizens to collectively own and manage RE projects at local level. This represents a different form of ownership unlike conventional corporations, they are owned by members/users and they follow the seven principles of cooperatives (described below). Decentralized systems, like those offered by co-ops, tend to have a greater advantage

over a centralized system, as they reduce the costs of transmission and distribution systems, reduced grid power loss and are easier to manage at a local level (Thomas Bauwen, 2016). The implementation of decentralized RE systems and many energy efficiency needs to be steered by trustworthy individuals in local communities. RECs enhance the social acceptance of technologies at local level and encourages of more participation in decision making in the energy sector (Hoicka and MacArthur, 2018). Large RECs may be too capital intensive for small communities to handle, although RECs can partner with private organizations. This is demonstrated through a case study used in this thesis about the first REC project called the Toronto Renewable Energy Co-op with the Toronto Hydro. However, the RECs are interested in contributing their quota to the discussion around low-carbon economy along the line of social responsibility, environmental ethics and community development.

In an era where Canada has the opportunity to lead the world in the discussions around climate change and achieving energy transition, RECs offer a lot of opportunities towards transitioning to a low-carbon economy. The province of Ontario has been at the forefront at incentivizing the development of power co-ops, but these organizations face challenges and an uncertain policy environment.

While the quantity of renewable energy produced by co-ops in Ontario is currently low, the benefits provided by the model of co-operative ownership are substantial and the efforts to expand co-op generated renewable energy is worth studying. Ontario has a generation capacity of over 30,000MW of electricity out of which the capacity of the RECs is 190.83 MW based on calculations using the latest provincial data (IESO, 2017). It is unlikely that co-op's generated power could produce all the electricity needed in Ontario. However, Ontario needs to convert to a low-carbon economy in an equitable manner in order to meet the SDG7 by 2030 while supporting Canada's Nationally Determined Contribution (NDC) that aims to reduce greenhouse gas by 30% below the 2005 levels by 2030 (United Nations Framework Convention on Climate Change, 2017). The RECs mode of electricity production offers democratic and local economic development benefits that can contribute to sustainable development (Seyfang et. al, 2013) and fair energy transition.

It is important to assess how RECs are faring in terms of profitability and feasible sustainability as Ontario is taking on a leadership role in the development of RECs in Canada. This assessment will be based on the three pillars of sustainability (economic, social, and environmental) so as to know which of the pillars of sustainability contribute to their success and which of them act as barriers. Institutional support structures are vital to the development of co-ops and are expected to contribute significantly to their growth.

There are several barriers to the growth of RECs as found in empirical literatures such as lack of technical know-how, finances, institutional support, and local opposition to wind energy projects (Walker, 2008). There are several factors that support the development of RECs which may include institutional and community support. REC initiatives are increasingly becoming a key potential actor in the transition towards low-carbon energy systems and energy security especially in the absence of other policy tools like carbon pricing to drive this transition in Ontario (Thomas Bauwens 2016).

Through my research, I seek to analyze different aspects that are relevant to gaining an understanding of the operations of RECs. This thesis delves into stakeholders, supporting organizations, finances, policies, and technologies (sources of energy) that contribute to the success of these co-ops in Ontario. This thesis sets out to assess the current and future challenges that may hinder the RECs from contributing effectively to a just energy transition in line with SDG7. My findings will contribute to assessing favorable conditions for RECs in Ontario and, by extension, other jurisdictions considering the role of renewable energy co-ops in their energy systems.

### **1.3 Research Objectives / Research Questions**

Renewable energy co-ops are growing rapidly in the province of Ontario. Lipp, Tarhan and Dixon (2016) reported that in 2015, Canada had a total of 89 operational RECs. Ontario's leadership in RECs development within Canada is affirmed as Ontario operates 52 RECs.

Sustainable development is only possible if our society attempts to find and implement environmentally, socially and economically sound means to acquire its energy services (IPCC, 2012).

Support for RECs in Ontario is one of the tools and policy approaches to achieve sustainable development. According to IPCC (2012), combating climate change through transition to a low-carbon economy requires systemic and holistic innovations that include a sustainable supply of resources, the development of highly efficient technical solutions, and the adaptation of energy systems to the environmental, economic, and cultural context as well as the social and political framework to enable sustainable energy systems to be implemented for the welfare of mankind.

The broad objective of this research is to investigate factors affecting the long-term viability of renewable power co-ops in Ontario.

The research objectives are:

- 1 To assess the barriers and obstacles preventing the expansion of the existing RECs.
- 2 To evaluate the current support structure, incentives and policies for RECs in Ontario.
- 3 To make recommendations for policy action.

Research questions:

“How can Ontario’s RECs grow, experience long-term viability, be updated or expanded?”

Sub-question:

- a What are the barriers and obstacles preventing the expansion of RECs in Ontario?
- b What institutional support (policy and incentives) are present in Ontario for RECs? And what other support may be needed to ensure growth and long-term viability of RECs?

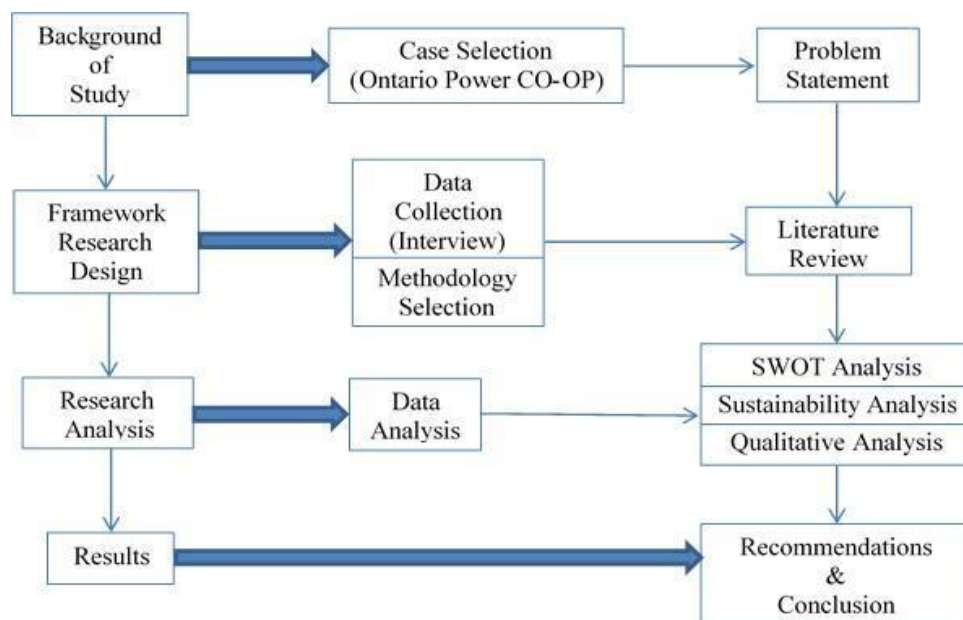
#### **1.4. Conceptual and Theoretical Research Framework**

I decided to develop a research framework for this study to provide cohesion to my research. It consists of four major steps along with each step having sub-steps. The first step is the background of this study where I described the problem statement and the objectives, which was to assess the support structure and barriers in the development of the different RECs in Ontario; the members of the Ontario Federation of Community Power Co-ops (FCPC) formed my case selection.

The second step is the research design in which I conceptualized the method of collecting data. This was done through an analysis of different kinds of literature in this research domain and interviews with power co-ops and the (IESO) and grid operators.

The third step is the research analysis which is where my literature and interview data are subjected to a qualitative analysis. I chose to perform a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis on the co-ops and conduct a basic sustainability analysis to delineate the key objectives and research questions.

The last step is the results which is the end goal of this research. Here, I made some recommendations for further development of power co-ops in Ontario and present a conclusion (see figure 1). The conceptual and theoretical framework used in this thesis is based on energy transition as found in most of the literatures in this research domain.



**Figure 1. Schematic Diagram of the Research Framework**

### 1.5 Organization of Study

This thesis has a research, fieldwork and assessment component in order achieve the objectives of this study's the research questions. It consists of five chapters: Chapter 1 presents the research questions,

research framework, objectives, and key concepts of the thesis; Chapter 2, presents an extensive literature review on RECs in Canada; Chapter 3 contains the research process and method of data collection and analysis; Chapter 4, summarizes the major findings from the Ontario RECs, the IESO and a concise document review; Chapter 5 draws together my final conclusions, proposed recommendations, suggested limitations and areas for further research. At the end, the Appendixes and References show additional material used during the work, data gathering and analysis, as well as the references and literature consulted throughout the duration of my research.

## 2.0 Literature Review

### **2.1 The Concept of Renewable Energy Power Co-Ops**

RECs are bottom-up energy initiatives that are generally associated with community-level ownership and operations through financial investment and managerial control by or on behalf of groups of the “members of co-ops”. They may be wholly owned by the co-op members or may be developed under co-ownership arrangements with private energy developers (Walker, 2008). Allen et al. (2012) suggested that top-down policies and initiatives promote a quick fix and ignore the institutional and social barriers that inhibit the local actions needed to identify, plan and deliver small alternatives such as RECs.

Lipp, Tarhan and Dixon (2016) have defined renewable energy co-ops or community power as a concept used in referring to community ownership of and participation in renewable energy projects. According to their definition, for a community project to be labeled a community power or energy project, it must satisfy the condition that the local community members have a direct financial stake in the project other than land-lease payments, tax revenues or any other payments in lieu of taxes. Prior to the modern usage of RECs, co-operative societies called “energy co-operatives” were established during the period covering the end and the beginning of the nineteenth and twentieth century. These “energy co-operatives” were involved mainly in the development and distribution of affordably priced electricity in the rural areas. Different studies (Haanyika, 2006; Reiche, 2000; Yadoo & Cruickshank, 2000) have documented the activities of these “energy co-operatives” in the U.S., Austria, and Argentina.

#### **2.1.1 Context for the Emergence of Renewable Energy Co-ops**

Power in the form of electricity is an important contributor to the quality of life globally. Toman and Jemelkova (2003) have asserted that electricity has stimulated the development of various aspects of the society including: employment, health, education, and culture. Commercially, electricity has been generated from either renewable or non-renewable resources and these two types of energy are known as renewable and non-renewable sources of energy, respectively.

In recent years, there has been a shift towards the use of new forms of renewable energy generation such as wind and solar. The shift was due to the increasing concerns about the environment and energy transition to a low-carbon form. According to Twidell and Weir (1986), renewable energy refers to energy obtained from the continuous or repetitive currents of energy recurring in the natural environment. Examples of resources employed in the generation of renewable energy include the sun, wind, plant materials, running water, and geothermal structures. Natural Resources Canada also defined renewable energy as an energy derived by a natural processes that are replaceable, not depleted at a rate equal to or faster than the rate at which they were taken (Natural Resources Canada, 2017). I will like to agree more with their definition of renewable energy since it can be easily replenished when depleted unlike conventional energy sources.

The Ontario electricity system is the focus of this thesis. Ontario's system is typical of industrialized economies and is comprised mainly of electricity generated in large central stations and transmission of the generated electricity to load centers where demand is concentrated. Electricity generation in Ontario is controlled by several companies. Oji and Weber (2017) stated that companies such as Bruce Power, TransAlta Corporation, Atlantic Power Corporation, and Ontario Power Generation are engaged in the centralized generation of power in the region. The activities of these companies include the operation of different electricity generating assets and the distribution of electricity to the residents of Ontario. The generation and distribution of energy have been the major factors that contribute to the style of living and where we live. Yet, constraints on the use of centralized energy generation and transmission systems have led to the emergence of various local alternatives. According to Hatziaargyriou, et al. (2007), the model of centralized electricity production can be substituted to some degree by the operation of energy storage devices and various types of distributed generators such as diesel generators, micro-turbines, photovoltaic units, and wind turbines to optimally serve a designated local area or "microgrids". RECs align more with this kind of model.

### **2.1.2 Renewable Energy Power Co-ops in Ontario**

RECs are examples of the micro grid or distributed generation approach in energy generation and transmission. The REC is a local power initiative consisting of a generation site that operates either connected to a grid or alone and provides power to a single dedicated user. However, RECs in Ontario typically run projects that are connected to the local distribution networks of the provincial grid operated by the IESO. According to Driesen and Katiraei (2008), the stand-alone mode is considered as a potential solution for the electrification of off-grid remote communities; however, this is not the focus of the current research.

The central concept of RECs can be described as the communal ownership of renewable energy sources. Such projects include plants based on solar photovoltaic, wind energy, bioenergy, hydroelectric energy, and tidal facilities that feed energy into a local grid. Lafond, et al. (2013) have added that RECs provide a way for local citizens to invest directly in the infrastructure that benefits them, which reduces the economic leakage of profits leaving a local area. To corroborate, Lipp and Dolter (2016) assert that RECs are examples of community power concepts. Their report emphasizes that community power refers to the direct participation in, ownership of and sharing of collective benefits from renewable energy projects in a local community. These projects may be owned in part or in full by co-operatives. RECs are a widely adopted concept in European countries such as Germany and the Netherlands. In Canada, the concept has gained decent traction in Ontario and Nova Scotia.

A survey conducted by the umbrella body of all the RECs in Ontario—the Federation of Ontario Community Power Co-ops— between 2014–2015 had responses from 23 co-ops. The co-ops develop different projects using either wind, solar, bioenergy, or a combination of two of these technologies, with solar projects being the most common among the co-ops. The results show that there are 20 RECs using solar PV, five co-ops developing bioenergy, two developing energy through wind, while four out of the 23 respondents use more than one technology. In terms of the number of co-op members across Ontario,

the results of the survey show that there were 6,899 (Lipp et al., 2016) Ontarians who were members of one co-op or the other as of May 2015.

RECs are a sustainable solution in providing energy especially in the remote areas of the world. It is a viable alternative to the conventional centralized energy generating geographical points. Although this is not the focus of the current research, some RECs concentrate their projects in the rural areas in Ontario by partnering with First Nations communities to build renewable energy projects to reduce the reliance on unsustainable sources of energy among First Nations communities. Mizani and Yadzani (2009) posited that Northern Ontario has more than 30 remote communities dependent mainly on diesel generators for electric power. In these areas, the downside of relying on diesel is the cost and complications for utility companies. The cost components consist mainly of diesel transportation either through road or through air. Mizani and Yadzani (2009) have put the fuel delivery costs to the remote areas of Ontario to be \$1.5/liter. The Government of Canada has been exploring and financing renewable energy projects in Northern Canada as part of the ongoing effort to reduce the over reliance on diesel in the North and to promote a clean growth economy, transition to low-carbon energy and to meet the SDG7 through the implementation of the federal actions on clean growth economy as part of the Pan-Canadian Framework on Clean Growth and Climate Change (Government of Canada, 2018)

According to Tucker, et al. (2014), the institutional history of RECs can be traced to the need of providing affordable and reliable electricity to the regions of the country forced to go without it, while also benefiting the local community economically simultaneously. In the U.S.A., electricity co-ops provide electricity to 12% of the country's customers in 47 states and account for 11% of all electric power sold (Tucker et al., 2014). Electricity power co-ops are different from RECs in that the former builds and maintains power lines of other utilities at lower rates, while RECs operate mainly in the renewable energy sector. Shaffer, et al. (2004) has opined that co-operatives still operate with the traditional paradigm of helping communities with business attraction, retention, and expansion strategies.

The concept of community-operated RECs has gained traction in Ontario even though there is still potential for development. Lipp, et al. (2016) affirms that Ontario is home to 58% of the total co-ops utilizing renewable energy in Canada. This means that 52 co-ops are involved in the production of energy from RECs out of a total of 89 co-ops in Canada. Although with much potential for new projects, Ontario still trails Germany where close to 50% of all renewable energy capacities are community owned (ClientEarth, 2014). Murphy (2008) has pointed out that although the renewable energy sector is in most developed countries, it is dominated by large corporations; the participation of communities is an emerging phenomenon. Oji and Weber (2017) reported that RECs have been instrumental in expanding electricity generated from renewable sources in Ontario.

The Government of Ontario has a multifaceted approach towards reducing greenhouse emissions, energy security and transition to a low-carbon economy. Over the years, these approaches have included the work of RECs in developing solar, wind, and bioenergy projects. RECs operate under the aegis of the Ontario Feed-In Tariff program (FIT) (discussed in detail in section 2.5). Principally, the co-operatives generate electricity and feed into the provincial grid. A major policy change occurred in 2018 with the end of the FIT program in Ontario and since then, RECs are scrambling for survival.

However, the implementation of net-metering and virtual metering is a program that allows individuals and communities to generate and use their own energy. They also earn credits for whatever amount that is sent to the local grid and pay for the differential should they use more than what they generate from their solar PV, which may prove beneficial to RECs and is outlined in the recently released Ontario's LTEP. Lipp and Dolter (2016) asserted that RECs may also be involved in other ancillary processes along the electricity supply chain, such as: distribution of electricity, distribution of fuels, provision of technical advice, completing energy retrofits, and installation of solar panels. The distinctive character of the RECs concept in which local citizens and communities can participate in energy generation is important because it empowers the citizens to participate in the democratization of energy system.

Community power projects drive the transition towards the use of sustainable energy by giving local individuals a direct financial stake and decision-making power in the energy sector. Lipp et al. (2016) assert that community power, or RECs, contribute to the transition to low-carbon economy and energy security by democratizing the ownership and control of clean energy projects, which also creates wealth for the local people. In other developed countries such as U.S.A., Germany, and the Netherlands, the concept of RECs is well established due to the energy and climate change policies and economic incentives like FIT and grants that encourages community participation

According to an International Labour Organization (ILO, 2013) report, RECs serve as alternatives to traditional energy providers and they provide better prices, provide sustainable local investment, promote adoption of renewable energies and local development, and bring energy production to the local level. RECs have also been shown to be sources of technological innovation and contribute to regional energy security. Schreuer (2010) states that technologies developed from innovative pioneer communities can produce more design variants and forms of implementation than those developed in the context of large government programs and business investments.

This diversity in forms of implementation can be seen in Ontario's RECs. For example, the Agris Solar Co-operative located in Oakville, Ontario is mainly involved in the development of land-based solar systems and farm-yard installed solar systems called SolarShare, which operate on rooftops and ground mounted solar systems; however, Ottawa Renewable Energy Co-operative partner with schools to install solar systems on the rooftops. Lipp and Dolter (2016) reported that as of 2016, 24 power co-ops have secured 212 Feed-In Tariff (FIT) contracts, 1000 MicroFIT contracts, raised more than \$84 million in the community capital in the form of bonds and shares, have more than \$100 million in assets as of 2015, and a pay out of more than \$9 million to investors.

Primarily RECs are involved in the generation of renewable energy, however, they perform a host of other functions too. The functions performed by a REC relates to the operational model adopted by the

co-op. The models and the range of functions performed by co-ops operating them are detailed in section 2.2 below. Besides power generation and transmission related functions, community co-ops are often involved in training and awareness creation programs by acting as information hubs. ILO (2013) asserts that the information and education service provided by co-ops are intended to increase people's knowledge on issues such as energy safety and the different energy supply options.

## **2.2 Models of Power Co-ops**

A way of categorizing the various models of RECs is by focusing on ownership. Ownerships go a long way in determining the success or failure of community projects. According to Walker and Devine-Wright (2008), “the ownership model is usually a defining characteristic of community energy and impacts a project's processes and outcomes”. A project's processes are the details of who will manage the project and how it will be managed. A project's outcome details the distribution among stakeholders of a project's economic and social costs, benefits, and risks. Various models have been identified for the implementation of community energy or community power projects, which include: community investment funds, charities, co-operatives, the MUSH (Municipalities, Universities, Schools and Hospitals) sector, and varying arrangements or partnerships between the aforementioned. The widespread use of co-operative models in Ontario is because the FIT program preferentially purchases power produced by co-operatives. Co-operatives offer a number of competitive advantages in producing, providing and distributing energy. They are often community-based, foster democratic control over local energy issues and offer a viable and sustainable model because of its capability to effectively harness locally available decentralized renewable energy.

RECs are business structures that are wholly owned by their members who invariably are always members of the local residents of Ontario, although the size and boundaries of “communities” can vary from co-ops in the city or county level to broader regions. RECs foster community participation and ownership in renewable energy project development as mandated by the IESO as a part of the Ontario Feed-In Tariff (FIT) program (Oji & Weber, 2017). RECs strive to ensure sustainable community energy

production and generation by presenting a path for sustainable energy development through local community engagement. The operational models deployed by RECs enhance the economic, social and environmental aspects of sustainability. Lipp, et al. (2016) assert that while most 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 the project development, and the size of the project they implement.

Zeuli and Cropp (2004) state that the co-operative model is inseparable from the principles that it makes up. The co-operative model basically has three main principles: user ownership, user control and distribution of net income based on patronage. Unlike other forms of business, co-operatives are guided by a set of business principles and values that are peculiar to the co-operative model. According to the International Co-operative Alliance (ICA, 2017), there are seven international principles for co-operatives, which include the following:

- 1 Voluntary and open membership
- 2 Democratic member control
- 3 Member economic participation
- 4 Autonomy and Independence
- 5 Education, training and information
- 6 Co-operation among co-operatives
- 7 Concern for community

The seventh principle, “concern for community”, has established the link between co-operatives and sustainable development (Wilkinson & Quarter, 1996).

### **2.2.1 Categorization of Power Co-ops Based on Business Functions**

The table below outlines various co-operative types:

**Table 1. Types of Co-operatives in the Renewable Energy Sector.**

Type of Co-operative	Business Activities Engaged in
Renewable Energy Generation Co-ops	Generating electricity, heat, and/or fuels from renewable energy sources.
Renewable Fuels Co-ops	Mobility and/or heating fuels generation and supply, usually from biofuels.
Distribution or Utility Co-ops	Distributing electricity generated from renewable energy and possibly other sources.
District Heating Co-ops	Heat generation and distribution from renewable energy sources.
Renewable Energy Service Co-ops	Service provision related to renewable energy and energy conservation.
Education Co-ops	Providing education in regard to renewable energy.
Financing and Investment Co-ops	Focusing on financing REC projects.
Project Development Co-ops	Instead of owning shares, some co-ops help with development support as well as promotion and community outreach activities.

Source: Lipp et al. (2016)

The contributions of the various stakeholders determine the financial structure of a co-op. RECs can also be categorized based on the type of partnership as outlined below:

- A partnership between project developers and farmers
- A partnership between a project developer and a local community group
- A partnership between project developers and the local community
- A partnership between project developers and investors

Another classification of the RECs model is the one provided by the ILO. Within this categorization, RECs are organized according to the type of co-operative model they employ, energy source, activities and position in the value chain, and actors, owners and services provided (ILO, 2013). See the table below for the categorizations and examples.

**Table 2. Categorizations of Co-operatives according to ILO**

Classification Categorization	Example
According to the Co-operative Model	Energy consumer co-operatives, energy producer co-operatives, energy producer and consumer co-operatives, energy service co-operatives.
According to the Energy Source	Solar co-operatives, wind co-operatives, wood-fired power stations, and co-operative bioenergy villages.
According to the Activities and Position in the Value Chain	Workers' co-operatives, innovation co-operatives, purchasing co-operatives, and virtual networks.
According to the Actors, Owners, and Services Provided	Electricity co-operatives, rural electric co-operatives, community-led investments, and consumer-owned utilities.

*Source: ILO, 2013*

In the results section of this thesis, I will classify Ontario RECCs according to these categories based on document analysis and interviews.

### **2.3 Drivers of Power Co-ops**

A report by Lipp and Dolter (2016) states that between 2010 and 2015, there were more RECs established in the province than all other types of co-ops combined. The emergence of RECs as a viable and sustainable solution to energy needs have been driven by different factors. According to Mizani and Yadzani (2009), the environmental setbacks such as: nuclear waste as in the case of nuclear energy, carbon dioxide emission as in the case of coal-fired power plants, water withdrawal as in the case of thermal power plants associated with central energy generation systems, technological advancements in small-scale power generators, price volatility of fuels, and inadequate transmission capacities, are the major factors in the emergence of local power co-ops. The idea of RECs has gained traction in different parts of Canada such as Manitoba, Nova Scotia and Ontario, because of its capability to empower local communities (Lipp and Dolter, 2016).

The realization that maximizing the economic benefits and public support for clean energy sources, such as wind and solar, requires community participation and ownership in order to remain one of the main driving forces behind RECs. Lipp et al. (2012) reported that the multiple positive impacts of community-owned renewable energy projects in comparison to commercially developed projects include higher job creation, stronger economic impacts, better social license to develop projects, and reduced cost of transmission and distribution. RECs are an appealing concept not only because of its environmental benefits, but due to its ability to unleash innovation, spur community development, utilize social finance, create wealth, and assure energy security (Seyfang and Alex, 2012).

The challenges associated with the drive towards a low-carbon economy and energy security while maintaining communal wealth makes the utilization of RECs a sustainable policy. The drive behind the emergence of RECs goes beyond just the creation of jobs and income. There is the communal focus on innovation and entrepreneurship and the belief that communities need to develop their own self-development models. Wilkinson and Quarter (1996) assert that co-operatives serve as important vehicles for community development because they mobilize community resources into a critical mass and their structure allows them to be more community oriented.

For a community to successfully create an operational atmosphere that favours the establishment of RECs, the conditions of innovation incentives and low-entry barriers should be met. According to Hufen and Koppenjan (2015), a strong rise in the use of renewable energy in a facility area as a result of RECs occurs in certain circumstances:

- 1 An increase in the use of renewable energy in an area generates a drive towards the establishment of more renewable energy projects and potentially more energy through RECs.
- 2 When a significant proportion of the energy needs of small-scale users in an area can be supplied by renewable energy projects operated by RECs.

- 3 When many small-scale users start producing renewable energy for their own needs and can sell under the influence of local power co-operatives.

From the above, RECs are mainly driven by the interaction of the forces of demand and supply. However, we also know that demand for cooperatively generated power rests on favorable policy support and incentives. Also, the motivating factor for the development of RECs is not limited to increasing energy from renewable sources to keep the power on (energy security), but also to drive energy transition towards a low-carbon economy that supports the SDG7. The rapid increase in the number of RECs in Ontario was driven by a purposeful choice to dedicate a portion of government procured power to RECs. Hufen and Koppenjan (2015) further posited that RECs have higher emergence when particular conditions in the relationship between the RECs and their clients are fulfilled. Basically, the energy source being proposed by a RECs should have a comparative advantage over other sources. The processing and ease-of-use of the energy source proposed by a RECs should not be complex or difficult to adopt. Lastly, the transportation and distribution of the energy source should be compatible with existing systems.

## **2.4 Benefits of Power Co-ops**

Several benefits of RECs are mentioned in the literature and these are discussed below.

### **2.4.1 Economic Benefits of Power Co-ops**

The RECs have continued to play important roles in fostering the local economic development of communities. Deller, et al. (2009) have demonstrated that local RECs have the potential of generating tremendous revenue and value-added income while employing people at the same time. The direct impact on the local economy in terms of the recirculation of revenue and income paid to local workers has induced more economic development and employment in local communities. For instance, the Ottawa Renewable Energy Co-op (OREC) has invested \$7 million in projects, given \$60,500 as lease to landlords

with \$2.5 million paid to local laborers, and has provided an estimated \$35,000 in the local economy per average investment (OREC, 2017).

Local RECs also represent a source of revenue to the government. Tucker et al. (2014) posited that power co-ops pay sales and property taxes to local and state governments. The Institute for Local Self-Reliance, a U.S. think tank study, posited that that local ownership increased the economic benefits of renewable energy projects by 50% – 240% by keeping money and jobs in local communities (Farrell, 2014). The economic benefits are evident in other advanced countries where local co-ops operate. The rate of community value reinvested by local co-ops has been found to be 12 – 13 times more than that of private corporations. A review conducted by the Ontario Ministry of Energy shows that the Feed-In Tariff (FIT) program, which is the operational framework in which power co-ops operate, has attracted a lot of investment into Ontario (Ministry of Energy, 2012). According to the Ministry of Energy’s report, “the FIT program had attracted over \$27 billion in the private sector investment” (2012); co-ops represent only a portion of those investment dollars.

Lafond et al. (2013) further stress that such projects help stimulates local economic development. Kildegaard (2010) supports this view by asserting that locally owned projects lead to a three-fold increase in the local economic development when compared with projects owned by outside entities. RECs as local initiatives provide the important benefit of keeping financial resources in the immediate community it is creating wealth within. Kenkel, et al. (2003) highlight that co-ops return excess revenues that are not used to run or expand the co-ops. The fact that most of these members reside in the local community helps to keep such economic resources in the local area.

Based on the available statistics, Lipp and Dolter (2016) compute that the development of 210MW of local community and co-op owned power in Ontario can be valued as generating approximately \$4.1 billion in total economic impacts and \$1.6 billion in induced economic impacts for an economy-wide impact of \$5.2 billion.

### **2.4.2 Building Public Support**

The operations of local co-ops also help generate local support. With a focus on Ontario, a study done for the FCPC by the Ekos Research Group exhibits that respondents are more likely to support wind energy or solar project if the project is community owned (Lipp and Dolter 2016).

RECs through the process of local energy production support the local economy and prevent the flight of capital that would have been used to purchase energy from outside concerns. A review of the literature suggests that there is a marked communal hostility towards projects perceived by the community members as being brought in by outsiders (Fast et al. 2016). Such projects do not receive the necessary local support and they have a high probability of failing. In some regions, the difference in the project outcomes is predicated on the amount of local support the project receives. Musall and Kuik (2011) have noted that community participation has been shown to address and alleviate the social friction that arises around new infrastructure projects.

### **2.4.3 Improved Services**

RECs can offer solutions to the drawbacks of the sole use of centralized power systems. Mizani and Yadzani (2009) argue that RECs, as examples of distributed generation, have the benefit of bringing about improved power quality, energy security, removing transmission line congestion, reducing emission and energy losses, and have the possibility of improving the utilization of renewable energy resources. Furthermore, Mizani and Yadzani (2009) posit that the majority of community-owned energy projects are connected to local power distribution systems, which means that the power they generate is consumed locally thereby reducing power losses that come with transporting electricity over long distances.

Secondly, local energy generators serve as emergency back-up when centralized power plants encounter either internal or external problems. IESO (2018) reports that Ontario still relies on natural gas-fired electricity for about 6.7% of its annual electricity supply; this statistic has important greenhouse emission ramifications. The renewable energy projects implemented by RECs that are solar based are

useful for replacing the natural gas-fired sources during the summer when air conditioning drives up electricity demands.

#### **2.4.4 Platform for Community Development**

RECs also provide a platform for community empowerment. The collaboration among community members that lead to the establishment of RECs provides a sense of responsibility that helps deal with other environmental projects. Community ownership of renewable energy projects has been shown to be a gateway for a wide array of emission reduction actions and an important motivator for increasing the uptake of energy conservation programs such as home retrofits (IESO, 2016).

Environmental problems are best solved when there is a sense of communal ownership and responsibility. The establishment of RECs provides a platform through which community stakeholders think more deeply about a transition to low-carbon energy, energy conservation, climate impact and develop collective capacity and expertise through the co-operative development process. Oji and Weber (2017) report that social cohesion is promoted by the activities of RECs. The operation of RECs brings people with similar aspirations together and forges deep social bonds between them. ILO (2013) report that the competitive edge energy co-operatives have over other providers in the United States is mostly related to financial considerations, ethical issues and client orientation.

Tucker et al (2014) have identified “concern for the community” as a major benefit of RECs. The International Co-operative Alliance has identified “concern for the community” as the seventh cooperative principle (International Co-operative Alliance, 2011). This benefit plays out in the fact that RECs are active in promoting community development, improved welfare and improved quality of life in the communities they serve. The remote areas where RECs are more important have average incomes that do not match those of the urban areas which proves that RECs help foster economic growth. Stufen (2011) has asserts that RECs in the U.S. routinely engage in voluntary work and charitable contributions, all in a bid to improve the quality of life.

## **2.5 Elements of a Support Structure for Renewable Energy Co-ops**

### **2.5.1 Legal and Organizational Structure**

An important element needed for the successful functioning of a REC is the adoption of an organizing structure consistent with the principles of co-operatives. The Canada Co-operatives Act (CCA) passed in 1998 was an important element needed for the success of RECs. The CCA was established for self-governing entities made up of members who share the same economic, social, or cultural needs and who operate through jointly owned and democratically controlled institutions. A distinguishing character of power co-ops is that unlike conventional co-ops, they have one client that is not a member of the co-operative, such as the utility company. According to Oji and Weber (2017), the focus of the GEA to expand the green energy industry in Ontario through capacity building in renewable energy and successful policy implementation depends on the investments from financial institutions and practical knowledge of generation projects from the developers.

The passing of the GEA led to the promotion of RECs and the clustering together of people with shared interests in community participation, renewable energy and greenhouse gas emissions to form renewable energy co-operatives in the province of Ontario. The fusing of the co-operative model and the GEA has important ramifications that are explored in this thesis.

The Elton Energy Co-operative in Winnipeg has outlined (Lafond et al, 2010) the basic characteristics of a co-op model upon which successful operations can be built, and these include:

- The adoption of a “one member, one vote structure”.
- Co-operatives issuing investment shares based on offering statements rather than having to issue shares based on a much more expensive prospectus.
- Co-operatives being allowed to sell investment shares through a person-person marketing campaign rather than the use of a stock-broker, which increases transaction costs.

## 2.5.2 Favorable Legislative Support

The widespread emergence of RECs requires favorable legislature as a support structure. Feed-In Tariffs are one of the most widely used incentive rate structures for stimulating the development of renewable electricity and for creating conditions that reduce risk and improve investment security. In this context, a Feed-In Tariff is an agreement to pay a guaranteed amount for every kWh over a set period of time for certain types of renewable electricity (Cory et al., 2009), which encourages investment from both small and large-scale generators. According to the United States Department of Energy, a Feed-In Tariff is defined as a publicly available legal document, promulgated by a state utility regulatory commission or through a legislation that obligates an electric distribution utility to purchase electricity from an eligible renewable energy seller at specified prices for a specific duration (Hempling et al., 2010). A review of the available literature shows that FIT is an incentive mechanism that is widely put in place by the government to encourage investment in and development of renewable energy projects in order to eliminate risks and improve the security of the investment. It is a guaranteed contract that assures the investors that the government will pay a certain amount for every kWh over a set period of time for electricity generated through renewable energy sources (Mabee, et al. 2012). Successful operations of Feed-In Tariffs necessitate that prices be set sufficiently high to attract the desired types and quantities of renewable energy and that sellers are entitled to the utility at the pre-agreed price without obtaining additional permissions.

The establishment of co-ops has been encouraged by the GEA and the adoption of the Feed -in-Tariff program, which has paved the way for community participation in the Ontario power sector. When the FIT program launched in 2009, it birthed the development of RECs as part of the provincial government's GEA. The IESO is the overarching government agency in charge of the administration of the FIT program. All projects eligible for FIT contracts are those that use renewable energy with a majority of the contracts being solar projects. There are particular incentives in the FIT program for cooperative owned power. These are explored in the results section.

Generally, legal frameworks help to lay the foundations for the smooth running of RECs. The government's stance on the use of renewable energy has an important bearing on the success or failure of the co-ops whose activities are mostly built around renewable energy.

### **2.5.3 Public Acceptance**

Public acceptance is an important element in the functioning of RECs. Utility companies have long established solar plants and wind farms but such initiatives have been met with local resistance because community members feel they are deprived of the benefits of their own local resources. A report by the Institute for Local Self-Reliance (2016) states that local citizens are often hostile to energy projects in their area if the projects are not communally owned. An FCPC study shows that Ontarians overwhelmingly support the community ownership model because it guarantees the projects acceptability and success (Lipp, 2016).

### **2.5.4 Direct Promotional Support**

ILO (2013) has stressed the importance of direct promotional measures such as loans or guarantee schemes as important structures needed for the effective functioning of RECs. Historically, direct promotional supports trace their roots to the United States' experience with the Rural Electrification Administration (REA). By the 1930s, 90% of the rural homes in the U.S. were without electricity, which could be attributed to the fact that the utility companies found it uneconomical to invest in the rural areas as the structures are far apart, leading to higher infrastructural costs and lower demands (Malone, 2008).

In 1935, the REA was established to provide subsidized loans to cooperatives, private companies and public agencies. The loans had low-interest rates, flexible repayment schedules, and were guaranteed by the Federal Government. The direct promotional support offered through the REA had positive impacts. By the end of 1938, 350 co-operative projects had delivered electricity to 1.5 million farm families. The direct promotional support thus proves to be an important supporting structure for the operation of co-operatives. Another aspect of direct promotional support is the provision and maintenance

of public infrastructure which has generally hampered the development of the renewable energy sector in many developing countries. Niez (2010) states that a prerequisite for the effective functioning of the renewable energy sector is a good transport and infrastructure network that is absent in many developing countries. The use of biomass, for example, requires the transport of materials from one geographical point to another, which is very dependent on a good transport infrastructure system.

Another potential support structure for community co-ops is the promotion by international organizations. The recognition of community co-ops as potential tools in the fight against poverty and underdevelopment has been an undertone of certain UN programs. International organizations such as the UNIDO and USAID have also helped to create awareness about the use of renewable energy and have in many ways contributed to the success of community co-ops (ILO, 2013).

## **2.6 Barriers to the Success of RECs**

While RECs have demonstrated their capability to yield positive gains for society by showing that they can develop projects in a cost-effective manner while offering competitive investment returns, there are still barriers to be overcome. The trend among researchers is to categorize barriers into both internal and external ones (Walker, 2008).

### **2.6.1 Financial Constraints (Both Internal and External)**

Boon and Dieperink (2014) argue that the main barriers that RECs face are financial and bureaucratic constraints. Walker (2008) posits that funding and competition for funds, high maintenance costs, lack of market incentives, the dearth of unqualified employees, internal technical inabilities, and the lack of support policies are the various barriers to the development of RECs in developed countries.

According to a study done by Oji and Weber (2017), “despite evidence that renewable energy co-operatives have played an important role in expanding renewable energy generation in Ontario, as a collective, renewable energy co-operatives have faced severe challenges and setbacks”. The challenges

range from financing to dependence on IESO contracts. The finance difficulties sometimes stem from the inability of co-operatives to access corporate funding. The sole dependence on IESO for contracts is also for challenging the effective functioning of co-operatives.

RECs are limited by the conditions of their FIT contract, which run for a stipulated 20 years. This limited time frame can be a constraint in getting access to finance and making long-term business plans. There is also the perception that the increase in the electricity bills in Ontario is a fall out of the high tariffs paid by the community co-ops to ensure continuous inclusion in the FIT program. However, a study done by Spears (2013) has shown that the non-renewable electricity component of a customer's bill is responsible for a larger portion of the increase. Lipp and Dolter (2016) confirm that co-ops have higher financing costs than large multinationals and that long project application and development lead times present a significant challenge to raising the community capital.

### **2.6.2 Legislative and Policy Concerns (Primarily External)**

The quality of project management obtainable and the financial resilience have also been identified as the determinant factors in the success or failure of RECs. According to a study done by Seyfang et al. (2013), changes in the government's renewable energy incentive structures in the U.K. caught several groups off guard and undermined their efforts. Seyfang, et al. (2013) further argue that planning hurdles and bureaucracies are also barriers to the effective functioning of RECs. The irregularities in the government's support of initiatives such as RECs coupled with the monetary risk related to such ventures might tip the scale towards failure. Bomberg et al. (2012) emphasizes that the national and international fluctuation on fuel bills, high monetary risk costs, and administrative status quo policies are the disincentives for RECs. Sinclair (2013) notes a particular barrier faced by the Government of Ontario when the GEA legislation was ruled as partially illegal by the World Trade Organization (WTO). In 2012, Japan and the European Union (EU) filed complaints with regards to the local content requirements of the GEA. The WTO ruled that the GEA requirements violated the international free trade rules. Sinclair (2013) opines that even though the Government of Ontario agreed to make changes in the

requirements, the scenario has provided a glimpse into the barriers that might be faced by local power initiatives in the future. The view is that there will be conflicts between local or national governments pursuing sustainable energy initiatives while at the same time adhering to the WTO guidelines.

### **2.6.3 Ambiguity of Benefits that Might Erode Public Support (Internal)**

Another identified barrier to the effectiveness of RECs is the ambiguity of benefits. A study by Rogers, et al. (2012) outlines a wood energy co-op in the U.K. and argues that the main barrier to the success of that initiative lies in the socio-demographic structure of the initiatives. Seen in this context, power co-ops are perceived as not garnering enough collective public support that is important for local community mobilization, organization and lobbying efforts. Rogers et al. (2008) opine that ‘low-level analysis on public identity and unawareness on community desires has given rise to misconceptions between the RECs and public groups. Therefore, the lack of local support is a major barrier that must be surmounted if RECs are to succeed. The lack of local awareness and support and the low degree of social cohesion are the major barriers that must be overcome (Boon & Dieperink, 2014).

### **2.6.4 Hostile Competitive Environment (External)**

Another barrier to the success of RECs is the fact that the market is more conducive for big renewable energy power operators than smaller ones due to the advantages conferred by the scale of the economy. Oji and Weber (2017) stress that this particular challenge might put the community participation goal of RECs in jeopardy. In reality, accumulating economies of scale makes it uneconomical for the smaller, newly-established co-operatives to compete against the larger, well-established ones. This particular challenge makes the establishment of RECs an unattractive proposition in some communities.

Lanford et al. (2015) have also identified other barriers including inadequate capacity, contract uncertainties, development costs, and flawed perceptions about prospective economic development. According to the study securing funding for the various stages of implementing community power

projects has been a challenge since most initiatives are spearheaded or initiated by non-profit organizations Lanford et al. (2015). It is a difficult task to convince the members of a community to invest in a project given the uncertainty of success. The development of RECs is predicated on many pre-development costs and communities often seek assurance that such costs will be recouped. In the end, only projects with high probabilities of success attract high investments.

To summarize, it is important to note that RECs operate in a complex space of administrative, political, and economic factors. These factors impact the effectiveness of power co-ops considerably which makes them more difficult to establish. This, in turn, also determines whether a power initiative will be a success or a failure. This study will help to promote the success of RECs within Ontario and to offer policy suggestions in order to increase their overall success rate.

### **3.0 Research Methodology**

#### **3.1 Study design**

I adopted qualitative designs to collect data from the RECs in Ontario. Data was collected through document analysis and a semi-structured interview with co-ops and policymakers. This allowed me to analyze and estimate the performance of the community's energy co-op and relate these findings to the overall objective of the study, which is to identify the barriers and obstacles to the expansion of energy co-ops in Ontario.

- i The first step was to conduct a document and academic literature review on the energy co-ops in Canada and other jurisdictions from published academic journal articles and the energy policy and program documents related to RECs. The literature review was used to identify existing academic knowledge of theoretical drivers and barriers to RECs. The review of policy and co-op documents allowed me to begin to identify the actual barriers and obstacles and begin to substantiate the answer to the research questions.
- ii Interviews were held with the major stakeholders (n=9) in the RECs space including energy co-ops and public sector actors to see if and how the theoretical drivers and barriers were experienced in practice. My analysis was performed based on the responses.
- iii Based on the findings from the interviews with stakeholders, the conclusion and recommendations were formulated.

#### **3.2 Scope of study**

##### **3.2.1 Geographical Scope**

The study was conducted in the province of Ontario in Canada. A total of seven RECs from across the province were interviewed. They are located in Ottawa, Sudbury, Cobourg, and Toronto.

### **3.2.2 Conceptual Scope**

I conceptualized this study to cover the following certain thematic areas that I hypothesized (based on the reviewed literature) to be critical to the development and success of the RECs. The survey questions for the RECs surround these thematic areas which includes awareness regarding: energy, environment, social cohesion and commitment, community support, funding, policy support, collaboration, composition in terms of the social profile of members and other variables, management issues and satisfaction levels with regards to the performance and the outlook of the community co-op, and so on. From the literature reviews, these areas form some of the barriers and success factors for the development of RECs and they can help in identifying the support structures required for the success of community power initiatives.

### **3.2.3 Case Selection**

In Ontario, the FCPC is an umbrella term for the body of all the existing power co-ops in the province. The members of the federation are the main focus and the major source of information for this study. A total of seven out of 14 members of this federation responded and showed an interest in this study, in addition to one organization that specializes in developing and operating projects in partnership with First Nations communities in Ontario. These co-ops are as follows: SolarShare, Toronto Renewable Energy Co-operative (TREC), ZooShare, OREC, Petawawa Renewable Power Corporation, Community Power Northumberland, SUN Co-operative, and The Beach Community Energy Co-op.

### **3.2.4 Study Overview**

The idea of the study was to analyze the activities of RECs through survey interviews. My analysis was focused on the support structures or drivers that aid in the development of co-ops and the barriers that have impeded their growth and expansion. I chose to only interview the existing RECs and the independent grid operator in Ontario, IESO, as they are central to the research question.

### **3.3 Data Collection**

The primary interview data for this study was collected by me through semi-structured interviews with an executive of each co-op and a member of the staff of IESO during the months of November and December 2017, and January 2018. All the primary data was collected by phone interview and conducted according to procedures approved by the University of Ottawa's Research Ethics Board. For my secondary document data, I consulted scholarly journal articles, reports provided by co-ops and the co-ops' websites. The secondary data was subjected to content analysis for extracting all the relevant data needed for this study, while the interviews were recorded on paper and saved on Google Docs.

### **3.4 Qualitative Data Analysis**

The interview questions asked revolved around the thematic areas that were derived from various types of literature relevant to this research domain such as awareness regarding energy and environment, social cohesion and commitment, community support, collaboration, management issues, and satisfaction and sustainability plans. Responses from the various stakeholders were documented, compared to each other, analyzed manually, and then this report was compiled. There are many kinds of analyzes at the disposal of a social researcher to describe, explain or interpret. In practice, the options tend to gravitate around the notions of "quantitative" and "qualitative" research (Denscombe, 2014).

For the qualitative analysis, the data collected from the RECs in Ontario and other stakeholders was subjected to the transcription of interview responses and content analysis. The term "content analysis" refers to a range of methods to analyze text; in this study, content analysis means responses from the various stakeholders were documented and compared with each other by listing the various responses of the interviewees and a report was compiled.

To delineate the research, there are several methods of analyzing the result. The methods include governance assessment, SWOT analysis and Stakeholders mapping.

Governance Assessment Tools (GAT): Governance analysis can be used to rate certain governance dimension (Bressers et al., 2013). GAT was developed in the Netherlands and was first used for water governance assessment. It can be used to understand the governance context in which a community's renewable energy operates as well as their interaction between government, RECs and different stakeholders. Based on the governance assessment tools, the quality of interactions among key stakeholders in the governance context can be analyzed in terms of extent, coherence, flexibility, and intensity. To use this method, multiple administrative levels from the federal, provincial and municipal levels will be involved in the governance context of RECs; however, this is not the case in Ontario and this is why GAT method is not appropriate for this thesis.

Stakeholders Analysis/Mapping: Stakeholders analysis could also be used to delineate the result of this thesis which will allow an understanding relationship to form between each stakeholder, their positions, influence, and the resources they bring to the RECs. It can also be used to assess the power, interest, urgency and attitude (Vietor, et al., 2015). It has been used to identify the challenges that hinder the uptake or growth of decentralization of electricity market.

I could have used this in this thesis along with the SWOT (Strengths, Weaknesses, Threats, Opportunities) and sustainability and analyzes, but I felt that a SWOT (described below) and a sustainability analyzes were more appropriate in the context of this research because they are more in tune with the research objectives and questions of this thesis.

### **3.4.1 Ethics Approval**

Approval for conducting research with human subjects was sought and received from the University of Ottawa's Research Ethics Board. Informed consent to participate was obtained from all interview participants (See Appendix D).

### 3.4.2 SWOT Analysis

To identify the key drivers that contributed to the success or failure of Ontario's power co-ops, the SWOT analysis was conducted on each of the co-ops.

Many environmental management literatures have used SWOT analysis to diagnose the influencing factors that led to the success or failure of an organization's projects. For instance, Hovardas (2015) states that in SWOT analysis, the potential of organizations to accomplish their overall goal is judged against both inner (internal operation) and outer (the environment/surroundings where they exist) factors. The inner aspects are called "strengths" while the outer aspects are described as "opportunities". In a similar manner, there can be barriers limiting an organization through the internal barriers are called "weaknesses" and the external barriers are referred to as "threats".

A SWOT analysis caters to the internal and external strengths, opportunities, weaknesses, and threats to the growth of an organization. In line with the objective of this research, my aim is to know the support structures (strengths and opportunities) and the barriers (weaknesses and strengths) to the growth of co-ops in Ontario. This method has been applied in different research in other fields including in this research domain (Renewable energy co-ops) to diagnose the current state and future growth/actions towards sustainable energy development as outlined by Markovska, et al. (2009). It can also be used to examine and outline the SWOT to national, regional, or municipal plans to advance for the development of renewable energy and expanding domestic renewable energy installations (Chen, et al., 2014; Fertel, et al., 2015; Shi, 2016). SWOT and sustainability analyzes were employed to delineate my point around the main research question which are barriers and support structures while predicting how RECs can experience further growth and development.

To perform a SWOT analysis in this study, I identified the potentials that may promote or create barriers that may hinder the success of RECs as described by the factors that are internal and external to each co-op. The analysis covers all the thematic areas as described in the conceptual scope of this study. The result of the SWOT analysis helps allows insight into the factors acting as strengths, opportunities

and prospects for the future, while identifying the weaknesses which they must address internally and the external threats that need to be removed. The details of this analysis will be presented in the next chapter of this study and in the Appendix.

### **3.4.3 Sustainability Analysis**

I completed a preliminary analysis of the sustainable performances of the selected co-ops. This was based on the three pillars of sustainability: economic, social and environmental. The details of the individual sustainability analysis can be found in the Appendix.

### **3.4.4 Snapshot of the Co-ops Examined in this Study**

**The Beach Community Power Co-op:** This power co-op generates sells and promotes green energy in the community. They also promote sustainable living via community investments in sustainable energy that protect the environment and the future of the children in the community. The mission of the co-op is to provide an opportunity for the community members to channel funds into renewable energy projects in the east end of Toronto. The Beach community co-op was incorporated as a non-profit co-op in 2012 as a result of the desire of Kew Beach School Council to become sustainable. The first project built on the rooftop of the Kew Beach School had a capacity of 72kW and it helped the school to reduce its carbon footprint. The co-op pays a portion of the profit made to the Toronto School Board to promote eco-initiatives that benefit the community and school. The Beach Community obtained a FIT contract for 34.2cents/kW from the IESO. As of January 2018, the co-op has about 150 members across Ontario and six board members running the affairs of the co-ops.

**Community Power Co-op Northumberland:** This co-op was formed by a group of people who were passionate about a cleaner future for their children. It was the outcome of a workshop on renewable energy organized by the Go Green Together and the Ontario Sustainable Energy Association in Cobourg. The co-op was formed in 2012 by the residents of Cobourg. It was conceived, developed, owned, and controlled by the residents of the community and was incorporated under the Co-operative Corporation

Act as a non-profit renewable energy co-operative. The funds used to kick-start the co-op were obtained from donations from members, federal and provincial start-up grants, loans over \$100,000 from members, and development partners. Afterwards, the co-op secured approval for three FIT rooftop solar contracts from the Ontario Power Authority. The construction of the first three projects began in fall 2014 at a cost of \$3.8 million and by March 2015, the three projects had been successfully connected to the grid. In three years, the co-ops expanded from the initial 19 members in 2012 to 89 members in 2015. To date, Community Power Co-op Northumberland has an installation capacity of 1075kW capable of powering 78 homes with a total greenhouse reduction of 234 tons and annual revenue of \$663,000.

**Petawawa Renewable Power Corporation:** This is the only private corporation (i.e., not a true co-operative corporation) among the nine stakeholders that were interviewed. They were included in this study because they have experience running co-ops, over 25 years of experience in renewable energy projects development and are a member of the FCPC. The company is a developer of clean and green energy projects and particularly focuses on developing, building and operating renewable energy projects in First Nations communities in Ontario. The company prides itself on partnering with landowners and local communities while working in co-operation with community officials, First Nations and other stakeholder groups in order success and maximizes benefits for all. They have three ongoing projects in Ullswater, Rousseau and Port Carling.

**Ottawa Renewable Energy Co-operative (OREC):** This co-op was founded in 2012 with the aim of empowering Eastern Ontario communities to take ownership of their energy through investment opportunities in local energy projects. On 25th of February 2018, OREC closed the first half of their sixth series local solar investment opportunity. This sixth series was on for seven weeks and was reported to have seen just 94 members investing \$859,500. During this offer, the membership of OREC grew from 704 to 736. If this amount is invested in a solar project, it is capable to offset 111 tons of greenhouse gas emissions per year. OREC posits that this financial commitment by the residents of Eastern Ontario shows their desire for social impact investment opportunities, which will not only benefit the portfolio of

individual investors, but will also bring social, environmental and economic benefits to their communities.

In terms of installed and uninstalled capacity, it was reported that OREC is in the process of completing financial portfolios for a total of 19 projects of which some have been installed while some are still under financial processing. When installed, the 19 projects will have a total capacity of 2.5 megawatts of renewable energy generation. OREC has a range of projects with different size arrays (10kW to 383kW) on industrial rooftops. The co-op has completed 13 projects since 2012 and all generate clean energy. Members are paid a return on their investment and the total installed capacity is 1MW valued at \$5 million.

**SolarShare** : This is a leading renewable energy co-op in Canada. SolarShare is one of the most successful RECs in Ontario. SolarShare develops commercial-scale solar projects for Ontario residents to invest in. They have over 1500 passionate members who have invested over \$35 million and earned \$3.3 million returns on their investments. SolarShare has completed and installed 14MW valued at \$55 million.

**SUN Renewable Energy Co-op:** The co-op is a community-owned non-profit REC that was founded by some local residents in July 2013 with the help of Rethink Green, a local environmental network located in the greater Sudbury area. The reason they set up the co-op was to promote community investment in renewable energy and to support the local environmental volunteer organizations with the proceeds from the co-op. The source of funds for starting the co-ops was from individual members, grants from Bullfrog Power, interest-free loans from Sudbury Credit Union, and provincial funds. The co-op has a higher rate of return to individual investors. For instance, every \$500 and \$1000 invested attracts 7% and 9% rate of return to members who invested in the bonds. The co-op has project partners who help in the construction of the projects and cover any shortfall in finances in the course of the construction. Through the FIT contract, the co-op has conceived several projects and they are in the process of completing a 500 kW

ground mounted solar project. The co-op has 95 members and voluntary board members running their affairs.

**TREC:** This is Canada's leading community RECs project developer. TREC supports co-ops, indigenous communities and inform policy through research and advocacy in Ontario. TREC is an umbrella organization for several renewable energy projects and has founded some renewable energy initiatives such as SolarShare, WindShare, Relay Education, and People.Power.Planet. SolarShare is one of the leading RECs in Ontario, while WindShare is the first RECs in Ontario and specializes in developing wind projects. Relay Education specializes in bringing education about renewable energy to the public, especially the youths across the province, while People.Power.Planet. is a pan-Canadian research partnership with the aim of fostering a broad range of dialogue about the importance of community/citizen-led sustainable energy future. TREC has helped many social entrepreneurs to turn their social capital into a financial capital through investments in community bonds.

Finally, TREC is the first renewable energy co-op from the development of the WindShare wind turbine project and has been instrumental in the success of RECs in Ontario through policy advocacy, project development and renewable energy education.

**ZooShare Power Co-op:** ZooShare is the first North American zoo-based biogas plant located in the Toronto Zoo. It is strategically located there to convert the Zoo's animal waste and local food waste into biogas for energy generation. ZooShare does not only produce energy but the digestates are also used to produce fertilizers for farmers. ZooShare is not part of the Toronto Zoo, but is incorporated as a non-profit co-operative with the Zoo as a permanent board member of ZooShare. The biogas digester has a capacity of 500kW and can generate 4.1 million kWh of electricity per annum which is enough to power 250 homes. The ZooShare biogas power plant is capable of reducing 10,000 tons of greenhouse gas emission from the atmosphere and returns some amount of the nutrients to the soil through the production

of fertilizers annually. The ZooShare co-op has 692 members and has collectively invested \$4 million in the project.

## **4.0 Result and Discussion**

This chapter presents a report of the results of the documents reviewed and summarizes the results of the interviews that were conducted with the seven co-ops in Ontario, one co-op partner and one government agency. To assess the barriers, I collated and transcribed the responses from the interviews with the co-ops. Also, to gain an understanding of the support structures, in addition to the interview I had with the co-ops, I also had an interview with the IESO. My attempt to have an interview with the Ontario Ministry of Energy was refused; however, the Ministry sent some links that contained information surrounding my survey questions and referred me to the Energy Partnership Program (EPP) office of the IESO.

### **4.1 Findings from Document Reviews**

TREC was the first established REC in Ontario that jointly built a wind turbine in downtown Toronto with Toronto Hydro which was completed in 2002. The project was financed by the community with about 450 investors that raised almost \$2 million (TREC, 2016). After this, a few other RECs were founded such as Lakewind, Pukwis, LIFE, and positive power co-ops. Up until 2009, there were no REC policy frameworks required to drive the development of RECs in Ontario. The early co-ops then pushed for an Ontario RECs policy framework since none of the other co-ops that came after TREC had a utility partner as a power purchaser.

The rapid growth of RECs in Ontario has been attributed to the enactment of the Green Energy and Economy Act (2009) which has led to the construction of more renewable energy projects and incorporated more RECs through the FIT program that was included in the Green Economy Act (GEA). Many Ontario RECs that have been able to go through the FIT contract application process get contracts to generate grid-tied energy using various kind of renewable energy technologies such as biogas, wind and solar with massive support from their teaming members. However, the price per kWh in each round of the Ontario FIT programs varies and also depends on the type of renewable energy technology used.

For instance, the FIT contracts in 2009 were 80.2cent/kWh, 13.5cent/kWh, 13.1cent/kWh, and 16.0cent/kWh for solar PV, windpower, hydropower, and biogas respectively. These contract prices have decreased significantly as the costs of solar PV technology has dropped. The table below shows the prices used in the last FIT 5.0 contracts in 2017:

**Table 3. Prices used in FIT 5.0**

Renewable Fuels	Project Size Tranches	January 1, 2017 (cents/kWh)	Percentage Change
Solar PV Rooftop	6kWh and below	31.1	0.5%
	6kWh and 10kW	28.8	2%
	10 – 100kW	22.3	8%
	100 – 500kW	20.7	8%
Solar PV Non-Rooftop	0 – 10kW	21.0	2%
	10 – 500kW	19.5	8%
On Farm Biogas	0 – 100kW	25.8	2%
	100 – 250kW	20.0	2%
Biogas	250 – 500kW	16.5	2%
Wind Power	0 – 500kW	12.5	2%
Hydropower	0 – 500kW	24.1	2%
Landfill Gas	0 – 500kW	16.8	2%

Source IESO: <http://www.ieso.ca/en/sector-participants/feed-in-tariff-program/news-and-updates/contract-offers-for-fit-5---september-20-2017>

The Ontario FIT program is the key structural foundation upon which the emergence and effective functioning of renewable power companies rest. The overarching Ontario FIT program comprises different microFIT programs each with a focus on developing generation projects with capacities of a maximum of 10 Kilowatts (kW) as well as the main FIT program for larger projects. A 2017 report by the IESO (2017a) maintained that the microFIT program has as its core target the generation of electricity at the residential level by homeowners. These homeowners are then expected to supply electricity generated

from their own installations to the Ontario electricity grid and will receive payments accordingly. Another category of producers in the Ontario FIT program are larger renewable energy generators that have the capacity of producing more than 10kW, but less than 500kW of energy. The reason for including these larger renewable power companies into the FIT program is to encourage the commercial generation of renewable energy.

The role of these larger renewable power companies was mainly taken up by RECs. Rodger (2014) has described the selection processes potential RECs undergo. The selection process occurs in stages called “rounds”, and in these rounds, potential co-ops are rated based on different criteria to prove community participation. Success is dependent on the number of points accumulated during the “rounds”. In the selection process, the IESO allocates points to different renewable energy producers based on the proponent’s experience, financial capability, and site due diligence (Rodger, 2014). Between 2011 and 2017, five bidding rounds were reported by the IESO. The implementation of the GEA legislation through the Ontario FIT program helped position Ontario as the clear leader in non-hydro renewable energy generation and procurement across North America (Oji & Weber, 2017). For RECs to be offered as a FIT contract, they must have a 50% community participation level in order to be offered a contract from the portion set aside for community participation. The table below summarizes the capacity, number of contracts in each of the FIT rounds and the community’s capacity set-aside in each round.

**Table 4. Summary of the Capacity Set-aside for Community Participation**

Rounds	Number of Contracts	Capacity MW	Total Contract Offers for Community Set-Aside	Total Capacity for Community Set-Aside (MW)
1		159	58	56
2	951	146.5	109	23.3
3	832	223.5	125	37.4

4	936	241.43	118	40.8
5	390	150	79	33.33

*Source (IESO, 2017): A Progress Report on Contracted Electricity Supply*

#### **4.1.1 Ontario’s FIT Program**

The existence of policy support structures in the form of a FIT program is thought to be essential in the creation of renewable power companies (recall section 2.5). The Ontario FIT program with its systems of price adders and capacity set-asides for community projects has played a central role in the power co-ops movement. Price adder is an additional price component that is added to an initial cost estimate by a fixed amount or percentage. For instance, the price adder for Aboriginal projects is 1.5cent/kWh and for community projects with a community participation of 15% – 50% ownership is 1 cent/kWh (IESO, 2015). There are also parts of the FIT contracts that are set-aside for community projects based on capacity. For instance, projects whose level of community participation is greater than 50% can enjoy the FIT contract capacity side-aside. The total capacity set-aside for community power projects was typically 500MW in each round of FIT contracts. The FIT contract is available for projects whose generating capacity is no more than 500kW.

The GEA was introduced into the Ontario legislature in February 2009 with the aim to accelerate Canada’s progress towards the reduction of greenhouse gas emissions, transition to low-carbon energy and energy security. The legislature sought to achieve this key aim through the development of a clean renewable energy sector. The GEA is a portion of the policy stance of the Ontario government and its multifaceted strategy to reduce greenhouse emissions (Oji & Weber, 2017). The GEA strategy comprises actions such as the development of renewable energy technologies, stimulating the creation of clean energy industries, increasing local economic activity by creating energy-related jobs, while gradually phasing out of fossil fuel powered energy generating plants in order to improve air quality.

The structural framework adopted in Ontario for the implementation of GEA was the penetration of renewable energy into the province's electricity system and the FIT program was brought in as an incentive to encourage interested RECs. It is important to note that a FIT has three important components which include: guaranteed grid access, long-term contracts for electricity produced, and purchase prices that not only take into account the cost of renewable energy generation, but also tends towards grid parity (Mendonca, 2007).

According to a report by TREC in March 2016, 175MW has been approved for the development by proponents since 2010 with community participation. My calculations are based on the most recent data from IESO which now put the total figure at 190.83 MW. The section below gives an overview of the RECs studied in this research. I have provided a piece of each of the co-ops and REC partners that were interviewed for this study. Firstly, I will provide an analysis of where RECs place in Ontario's most overarching policy, the LTEP.

#### **4.1.2 The Ontario Long-Term Energy Plan (LTEP 2017 as Related to RECs)**

Hydroelectricity dominated the Ontario electricity market for a while but has been overtaken by nuclear energy, which produces the largest share of electricity in the grid. As of 2016, the share of the nuclear power capacity in the grid was estimated to be 53.5%, while renewable energy sources contribute 30% to the electricity system, they are hydro (21%), natural gas (7.5%), Wind (6.2%), Solar (2.0%), and biomass (0.4) (Ontario LTEP, 2017, 34). The LTEP notes that the province expected a shortfall in the capacity of the electricity supply in Ontario by mid-2020 due to the end of life of the Pickering nuclear generating unit. The government plans to meet the new capacity target through initiatives under the renewable market. The plan also forecasts the growth of wind and solar to assist the province in meeting the demand of electricity for consumers.

The recent reduction in the cost of solar PV and wind technologies could offer a great opportunity for Ontario to systematically increase the share of renewable energy in the grid The REC is a good

platform to drive the energy transition to renewable energy in the province, as it supports the Pan-Canadian Framework on Clean Growth and Climate Change and efforts of the Government of Canada to meet the SDG7 by 2030.

The LTEP 2017 contains a net-metering regulation that allows customers to offset their electricity bill when they install renewable energy systems such as solar panels on their rooftop. It is a billing system that is arranged with the local electricity distribution company. Household or businesses that are net-metered can also receive credits on their electricity bill when they send part of the electricity generated to the grid, and consequently, their total bill electricity will reduce significantly (LTEP, 2017). This may offers an opportunity for RECs in the post-FIT era to change their business model in order to get utility partners who can buy back electricity from them.

To enhance and expand the net-metering arrangement, the government promised to propose a net-metering legislative and regulatory amendment. When passed, this regulation will allow for third-party providers to own and operate net-metered renewable energy production systems and will also protect consumers (LTEP, 2017). Recently, the Government of Ontario took a significant step forward by removing the restriction on the size of generating systems that are eligible under the net-metering arrangement while allowing them to be used along with energy storage technologies. The overall aim of this arrangement is that electricity consumers in Ontario will now have a reduced energy bill through the offset of electricity purchases with clean energy generated on-site. According to interview participants, this looks like a great opportunity for Ontario's RECs to explore and it can serve as the only regulatory live-wire for the co-ops survival after the expiration of the 20-years FIT contract, especially as they hope to develop a new business model in the first post-FIT years.

Recent events indicate that even though the FIT system has aided the emergence of RECs, a shift is being noticed from the FIT regime to a competitive bidding system for large projects following the end of the FIT program altogether in 2018. Lipp and Dolter (2016) mention that RECs cannot survive in a

competitive bidding environment because the bidding process raises transaction costs, which, in turn, lowers the probability that a REC will succeed. The structure of the bidding processes raises risks and creates uncertainty which further limits the ability of RECs to raise affordable financing especially in cases where financing might involve going to the equity markets. The higher risks caused by the bidding systems raise the return expectations expected by the investors, thus raising the cost of capital. In connection with this constraint, Grau (2014) asserts that infrequent and tightly constrained bidding rounds can weaken local supply chains by severely limiting opportunities for ongoing businesses. The competitive bidding system also weakens the community development of power co-ops because it tilts the business field to favor large-scale companies at the expense of small local ones.

In most cases, community-based concerns do not have the huge financial reserves necessitated by the competitive bidding process. According to Lipp and Dolter (2016), under the competitive bidding process, municipalities and other community interests will have to play subordinate partners to the large financially endowed companies earning a smaller share of the benefits or ceasing the development of renewable energy projects and forgoing revenues and emission reduction opportunities as well as direct economic and social benefits.

A typical net-metered home in Ontario would have rooftop solar PV generating electricity which powers the house. The extra electricity would be sent to the grid, after which, the net-metered customer receives a credit on the amount of electricity sent to the local grid. However, when the electricity generated from the home is less, the home will draw electricity from the local grid and get charged for its usage. The net-metered customers are charged based on the calculated difference between the amount of electricity they take from the grid and the credit they receive from the amount sent to the grid (OEB, 2018).

As stated in the LTEP, the province believed that the decline in the price of these technologies will make renewables sources competitive with other conventional sources (LTEP, 2017).

## 4.2 Major Findings from Interviews of Ontario Energy Co-ops

### 4.2.1 Major Findings from Energy Co-ops

This section is organized based on the thematic areas suggested by the literature review and what was asked in the interviews with the power co-ops and IESO. The thematic areas include but are not limited to the following: legal formation, main drivers and benefits, asset and ownership, external factors, coexistence among the co-ops, future aspiration and continuity, skills required by co-ops, community support, awareness and social cohesion, finance, management, and support structure and barriers. These thematic areas will be broken down in the following section.

**Legal Formation:** Ontario co-ops choose different legal forms to operate. Six out of the eight organizations assessed have adopted the co-operative model to operate. This means that the co-operative model is owned by co-op members and that it adheres to the seven principles for co-ops (see section 2.2). Members invest in the co-op's power projects, share any profits and elect a Board of Directors annually to oversee the co-op. Of the remaining organizations interviewed, one is a corporation who is a member of the FCPC is the Petawawa Renewable Power Corporation which develops, builds and operates clean energy projects with a focus on First Nations communities in Ontario and is currently developing projects for its First Nations partners. The other, TREC, is a hybrid of the co-operative model with several power producing projects and a separate corporation that provides support to other co-ops, indigenous communities, and social enterprises through research and advocacy efforts. The co-operative model that is used in Ontario is common in many community energy initiatives in Europe. Walker (2008) has stated the various models and legal formation of RECs and the co-operative model used in Ontario is one of the legal formations he highlights in which the local community becomes members of a co-operative and buys shares to finance the energy project.

**Main Drivers and Benefits:** There are several drivers and benefits derived from RECs in literatures as highlighted in Chapter 2. For instance, Hoicka and MacArthur (2018) identify social learning and facilitating economic benefit local community engagement in energy policy implementation, which

conforms to some of the responses I got in the course of my interview with the co-ops. All eight co-ops pay returns on investments to all their members from the revenue generated through the projects. The co-ops also provide education to the members and to the community where they operate. Most of the co-ops believe they function in order to contribute to the local economy through job creation.

In terms of drivers, all the co-ops acknowledged that sustainability and passion for the environment was the main reason for starting the co-op. The main driver for co-op development in Ontario is not energy security since the province has enough energy. The people have begun to be cautious about the environment they live in and they want to add their voice to the climate change debate through the generation of clean energy. Although most of the co-ops also indicated that while they are investing in clean energy, they are also motivated by the financial benefits that come with it through revenue generation.

In terms of cost savings, it is important to point out that there is no reduction in energy prices for co-op members. The way the FIT program is organized ensures that all the power that is produced is sold to the province via the local utility. In terms of other direct cost savings, only one of the co-ops offer a 10% discount on grocery shopping to its members while the co-op whose target group is the First Nations in Northern Ontario indicated that the FIT program gives an extra \$15/MWh to the First Nations group.

**Co-existence among Co-ops:** All the RECs indicated that they know other co-ops. As stated earlier, I only assessed the power co-ops who are members of the FCPC. There are regular meetings among the co-ops under the umbrella of FCPC. However, one co-op pointed out that they provide support to other co-ops and have been involved in some projects.

**External Factors and Stakeholders:** All the co-ops indicated that the FIT program is the critical external factor on which they rely. It is highly important to note that the FIT program initiated by the provincial government has been the major incentive for influencing the development of RECs in Ontario. One of the eight organizations stated that they depend on First Nations; the other seven co-ops believe that the price

of solar panels is a critical external factor for them. The only biogas co-op indicated that they heavily depend on the market for waste, organic waste policy and renewable energy policy.

In terms of stakeholders, other biogas co-ops clarified that waste haulers and the Toronto Zoo are their important stakeholders, and of course, their members. One co-op indicated that they have regular meetings with solar developers; two of the eight co-ops posit that they meet regularly with their business partners, some of who helped build projects and provided financial support during the construction stages of their projects. The IESO in Ontario is an important stakeholder to all the co-ops; one co-op mentioned that they meet regularly with Hydro One and Lakefront utility and those are important stakeholders for them. Other important stakeholders to most of the co-ops are the landowners and building owners who agree to lease their rooftops and lands for the building of all the projects by the co-op.

**Asset and Ownership:** There are several forms of ownership for RECs assets found in literature and highlighted in Chapter 2. Walker (2008) identifies that RECs could develop projects independently at a community level or projects could be developed in collaboration with partners. Both of this form of ownership was found while assessing the RECs in Ontario. The ownership of the co-ops' assets was assessed during the course of the survey. Four out of the eight co-ops indicated that all the assets are 100% owned by the co-op. One out of the eight co-ops stated that the first three projects were done with the financial assistance from a partner and the revenue was agreed to be shared in a 60:40 proportion slated in favor of the co-op and that the other projects are fully owned by the co-op. A co-op with 19 projects indicated that 15 of the projects are 100% owned by the co-op while four of their other projects are only 50% owned by them. The co-op with a total number of 45 projects posited that only two of those are shared with a partner while the other 43 projects are 100% owned by the co-op. However, only one corporation among them builds, owns and operates the projects while paying interest to the First Nations and landowners. The rooftop and ground mounted solar projects are a major kind of project embarked upon by the co-ops. In both cases, the co-ops entered into lease agreements with the landowners or building owners to build projects on their roof or land. Depending on the leasing agreement between the

parties, the RECs pay the landowner monthly or yearly rental fees; in most cases, the lease agreement is for 20 years, which is the life expectancy of the projects as covered by the FIT contract.

**Skills Required by Co-ops:** Co-ops require certain specialized skills to be successful. Energy co-ops cannot function well without possessing these skills, which include technical skills and management skills (project, finance, fundraising, risk development capital, and stakeholder management) (Ogunleye, 2015). From my findings, the co-ops mentioned a wide variety of skills, some of which are consistent across all of the co-ops while some differ. The major skills that are required by all co-ops are technical skills as seven of the co-ops hire technical contractors/consultants for the construction of their projects. Management skills are also very important for the sustainable development of the co-op as the survivability of the co-op is highly dependent on the quality of its management. Three out of the eight co-ops believed they require people with financial skills, two of the co-ops stated that they require marketing skills and one of the co-ops indicated that an expert in risk and development capital is highly required by the co-op. One of the co-ops required fundraising and fund management skills to mobilize funds for the construction of projects. One other co-op posited that waste management skills for understanding the waste market and stakeholder management skills are the most important skills needed in addition to technical skills.

**Community Support - Awareness and Social Cohesion:** I examined the awareness of renewable energy and existence of the co-op members' feelings as well as the social profile of members and their sense of belonging. Respondents indicated that community and members of the co-ops are generally aware of the existence of the co-ops and are supportive of its continuity. One out of the eight co-ops believe that awareness about renewable energy is still low while the other seven indicated that people are well aware of RE but do not have information about the advantages of investing renewable energy projects. Therefore, there is still more to be done about educating people on the activities and advantages of investing in community energy initiatives. One co-op indicated that people are supportive of the continuity of co-op, however, rural communities are against ground mounted solar projects as they take

up farmland and wind energy projects due to the height and noise of the wind turbine. Rural dwellers generally support rooftop solar projects. One of the co-ops stated that people are aware of renewable energy but lack an understanding of how zoo waste is converted to energy.

In terms of sense of belonging, co-ops generally agreed that all their members have a sense of belonging and are excited to have invested in the projects that contribute to the sustainability of the planet. On the other hand, the social profile of older members is seemingly the same amongst the co-ops, except for one that indicated that they have kids, youth, and elderly members. Four of the co-ops indicated that the age of their members range between 45 – 65. The only co-op partner that does not have members is a corporation that builds and operates projects for First Nations communities, while one co-op posited that the co-op consists of retired and old people who are 50 years or older. In terms of gender, five of the co-ops believe that they have an evenly mixed gender (Male 50%: Female 50%), while one co-op stated that their male: female ratio is 57%: 43%. Several empirical literatures expressed the need for community to support renewable energy projects in their community. The local support for RECs spur the social acceptance for technologies at local level which subsequently leads to community development and reduces opposition for green infrastructures. RECs also increase the chances of community members to discuss other community development agenda which is an element of social cohesion (Hoicka & MacArthur., 2018).

**Finance:** The sources of funds used to start the co-ops include private investments, loans from private individuals/partners, federal grants and provincial grants. The study found out that the most important source of funds and incentives common among the co-ops was the Feed-In Tariff offered by Ontario's provincial government and private investments from members of the co-ops. In addition to these two important sources, two of the co-ops stated that they received grants from the federal government, one co-op indicated they got support from the Northern Heritage foundation, grants, and donations from Credit Union, partners, and the city government. Only one co-op indicated that they got commercial loan and grant as the start-up capital for the co-op.

**Management:** Overall this study found out that seven out of the eight co-ops have a board that is responsible for the management of the co-ops. These seven co-ops also indicated that the board members meet on monthly basis and there is an annual general meeting with all the members of the co-ops. One of the co-ops stated that they do have one or two special meetings with members when the co-ops need money for project construction. Some of the co-ops indicated that they have staff that assists the board to run the day-to-day activities of the co-op while some co-ops mentioned that they are looking to hire staff in the future. To understand if the members are always informed about the activities of the co-ops, seven of the co-ops indicated that the report of the board meetings and the progress of the co-op is shared with all members by mail and made available on the co-op's website for the members to see. Two of the co-ops stated that they issue monthly newsletters to members to update them on the activities of the co-ops.

**Support Structure and Success Factor:** I examined the support structure from the provincial government to the co-ops, and I found that all the seven co-ops get support from the government through the 20-year power purchase agreement included in the FIT program. The FIT program is seen as the major enabler of co-ops in Ontario together with the membership support that all the co-ops enjoy.

When asked what the provincial government can do to support further development of the co-ops, three of the co-ops indicated that the monopoly of the IESO needs to be changed to allow co-ops to sell energy directly to individual households, businesses, and offices. Also, the government should allow co-ops to do something additional, such as produce energy for space heating and not just for electricity. One of the co-ops suggested that the government should ban organic wastes from going to the landfill and mandate that all the organic wastes must be processed in a biogas plant.

However, seven of the co-ops believed that since the FIT program is ending, the government needs to initiate another incentive program to encourage the existing co-ops and for further development of new co-ops, otherwise, when the current 20-years power purchase agreement enjoyed by all co-ops expires, RE power co-ops may cease to exist in the province. Most of the co-ops have seen the net-

metering program in the newly released Ontario’s LTEP as an opportunity for the existing co-ops when implemented. Net-metering is a system that allows a household to generate electricity for their own consumption and any excess energy can be sent to the local grid to get credits that reduce their energy cost. Overall, the overwhelming support from communities, members, and the government policy (FIT program) are the foundational support structures that have helped in the development of Ontario’s co-ops.

Source of Energy: In terms of the source of energy, seven RECs are into the development of solar energy projects while only one produces energy via biogas. The solar projects are either rooftop or ground mounted installations. The table below shows the capacity of rooftop solar projects vs. ground mounted projects of five co-ops. The only biogas co-op converts the waste products in the Toronto zoo and other wastes to biogas.

**Table 5. Rooftop Solar Project vs. Ground Mounted Solar Project of Five Co-ops**

Name of Co-op	Capacity of Rooftop Solar Project (kW)	Capacity of Ground Mounted Solar Project (kW)
Ottawa Renewable Energy Co-op	1300.7	500
SolarShare/TREC	5299	1500
SUN Power Co-op	-	500
Beach Community Power Co-op	72	-
Northumberland Community Co-op	1,075	-
ZooShare	500	Not applicable

**Barriers:** This study has revealed several barriers and the factors that may serve as threats and weaknesses for the further spreading and development of co-ops in the province of Ontario. The barriers as indicated by the co-ops include finance in terms of availability of funds to invest in projects, lack of a clear understanding of how the net-metering affects new projects, cultural and political barriers with regards to the monopoly of IESO, technical barriers, economic barriers, the needs for new regulations to open up more options for co-ops to sell energy to third parties and produce energy for heating and electricity, lack of skilled staffs as most of the co-ops over rely on volunteers to run the co-ops, lack of

access to loan facilities from financial institutions, lack of stable government policies, and bureaucratic bottlenecks in the government. All the co-ops indicated that funding and lack of policy support are two of the biggest barriers, as they feel the government policies mostly support the big players in the hydropower and nuclear energy sub-sectors.

In terms of threats and weaknesses, one of the co-ops mentioned competition with other biogas plants, location and transportation of wastes, cost of disposing digestates because of excess water, odor, power contracts, unstable government policies and programs, and lack of public understanding of the benefits of investing in community power as the threats they face. All the co-ops expressed concern about the end of the FIT program and the government's unwillingness to replace it with another program, as no source of incentive from the government for encouraging the survival of co-ops is a big threat to the co-ops. Most of the co-ops also indicated that the energy politics in the province and the monopoly of IESO are threats to the further development of co-ops in the province. One of the co-ops stated that business risk in terms of lack of guarantee/warranty from equipment suppliers and inverter suppliers not providing good services to the co-op are the major threats it faces. Also, all the co-ops posited that the need to modify the business model each time the government regulation changes is a huge threat to the existence of co-ops in Ontario.

**Future Aspiration & Continuity:** I examined the opinion of the co-ops on the overall provincial energy policy as reflected in the newly released Ontario's Long-Term Energy (LTE) plan. Four of the co-ops do not see the LTEP supporting the development of co-op as it is oriented towards nuclear energy, with over \$12 billion committed to nuclear power. Since it does not have any incentives or programs like the FIT program, co-ops do not see it as a tool that can promote RECs. However, three of the co-ops indicated that it looks promising but are looking forward to the implementation of the net-metering and virtual net-metering regulation promised in the plan.

When asked about the future of RECs in Ontario, three of the co-ops indicated that the government through IESO is not interested in RECs, and thus, co-ops have no future in the province unless regulations that support them are put in place, especially now that the FIT program has ended and there are no policies or incentives for the development of new projects.

Some co-ops added that after the expiration of the existing 20 years power purchase agreement, power co-ops may have no future beyond it unless there is a policy change. However, five of the co-ops believe that there is a future for RECs in Ontario at least for the next 20 years and are very hopeful that in the future the regulations might change and the new regulations will be in favor of the development of new projects through the RECs. All the co-ops posited that in the post-FIT era, they are in the process of developing new business models that will keep them in business for the next 20 years. Furthermore, the majority of the co-ops are of the opinion that the net-metering and virtual net-metering regulation is a legitimate lifeline for co-ops in the post-FIT era, but the system needs to be matched with other government funding sources when implemented.

I also asked the opinions of the co-ops on what they think the government can do to further assist RECs in their development. All the co-ops indicated that the government's energy policy should support both big and small energy producers. They felt the current Ontario energy plan is written in such a way that it only favors the big nuclear energy corporations; one of the co-ops mentioned that the government must stop refurbishing the Pickering nuclear power plant. The government should also help to educate the people on the advantages of investing in renewable energy co-operatives. One of the co-ops suggested an insurance program for the co-ops, while three of the co-ops posited that future policy changes that allow co-ops to sell power to individual businesses and households will go a long way in developing power co-ops in the province of Ontario.

Overall, the biggest concern of RECs in Ontario is the end of the FIT program. It should be noted that the last round, FIT 5, ended in December 2017, and as of 2018, the co-ops will have to change their

business model without any government incentives, which may affect the growth and further development of the RECs co-ops in the province. The FIT 5 contracts were recently wind down by the new conservative government. It is a challenging period for the clean energy sector in Ontario with the new government. The government is poised to wind down every gains that has being recorded in the process of limiting greenhouse emission, transition to low-carbon economy by revoking the carbon pricing act of the past government and cancellation of all FIT 5 contracts which might limit the ability of the Ontario government to contribute effectively to the Government of Canada’s commitment to reaching the SDG7 that has to do affordable clean energy. This study argues that this abrupt change in the government’s incentive structure translates to a lack of policy support and is the most important external barrier to the success of RECs such as the recently abolished FIT program.

To advance knowledge in this research domain and drawing inference from the co-operative categorization done by the ILO as shown in table 2 above, the RECs studied in this research can be categorized below:

**Table 6. Categorization of the Renewable Energy Co-ops under Study according to ILO**

Classification categorization	Co-ops Examined in this Study
According to the co-operative model	Energy producer co-operatives, (7 of 7)
According to the energy source	Solar co-operatives (6 of 7), Biogas co-operative (1 of 7)
According to the Activities and Position in the Value Chain	Innovation co-operatives (7of 7)
According to the Actors, Owners, and Services Provided	Community-led investments (7 of 7)

#### **4.2.2 Findings from Regulators:**

**Policy:** On whether RE co-ops align with the energy policy of Ontario, the IESO stated that they do not make policies but only serve as the province energy policy implementer, and thus, they were not ready to speak about it and I was referred to the Ontario Ministry of Energy. However, the Ministry of Energy did not seem interested in discussing anything related to the RECs and only sent me some links to the IESO's website in relation to energy co-ops.

**Support for RE Co-ops:** The IESO is of the opinion that they are in support of the operation of RE co-ops in the province, especially with the way the FIT program is being implemented. The FIT program is a testimony to the support of the co-ops and has encouraged the development of power co-ops in the province. The interviewee added that there is nothing restricting anyone from generating electricity in the province and receive a market rate for it, but the RE co-ops are not interested in developing a market base facility due to the existence of the FIT program. The IESO is also supportive of the increase in the renewable energy system and currently has 30% of them in the grid electricity share, although hydroelectricity makes up the bulk of this 30%.

The interest and the mandate of IESO is to ensure that the light stays on in the province, and if the power stays on, IESO will go for the facility that can provide the best technology on the basis of the needs. The interviewee was of the opinion that the FIT program was a place to kick-start the renewable energy industry, and obviously, the industry has developed through these incentives to a level where such incentives are no longer required. The renewable energy industry can now compete on its own without incentives from the government.

**Future Outlook for Renewable Energy:** The interviewee believed that the share of RE energy in the grid is going to increase in the future, say 20 years from now. However, it depends on a number of factors such as how the provinces energy policies evolve and on the continuous evolution of technology. For instance,

the intermittent nature of the current renewable energy has to be addressed and discovery of storage systems will serve as a great deal in the future.

Another issue faced by the RE co-ops is accessing financial support from financial institutions. The interviewee posited that the financing community does not seem to be interested in investing and it has been challenging for the RE co-ops to get support from them due to the lack of a robust financing structure. On the part of the co-ops, it is also difficult to get the volume of projects they envisioned, and maybe they will find a solution to this by redesigning their business model such that it will attract the financing community.

It is also a challenge for the regulators because when looking for generators only those that do their job well will be considered. Their job is to provide electricity and ensure the operating facility is working optimally to keep the light on for the consumers. On increasing the volume of distributed energy in the grid, the interviewee stated that he is unsure if this is going to increase in the future due to the dynamic nature of the grid, and this depends on how the software evolves in the future; Ontarians want electricity to stay on and as such IESO is conservative on this.

Net-metering and Virtual Net-metering: Although one of the interviewee could not comment on the newly released 2017 Ontario Long-Term Energy Plan because he believes such questions should be directed to the Ministry of Energy, he gave a brief insight into the net-metering and virtual net-metering regulations of the Ontario government. He concluded that virtual net-metering is a potential opportunity for RE power co-ops and it would help them in their continuity plan if they can operate the virtual net-metering systems.

Support for Similar Programs like the FIT: This depends on the Ontario government. IESO only implements the government policies and programs in the power sector. However, this does not mean that IESO will not support similar programs if directed by the government. At the moment, its focus is on market renewal, which is basically looking at the current sources of energy in the electricity market that

have been used for a couple of decades, re-invent them, and better position them for the future. IESO is looking at a future with more distributed generation and not the traditional coal, nuclear, and hydropower plants. The aim is to position the electricity market in a way that is stronger for the future of the province, allowing all generators like the RE co-ops to compete in the market and helping to drag down the cost of electricity for Ontario’s consumers in the next six years.

#### 4.3 Result of SWOT Analysis

The interview and document findings reported above provide the basis for a SWOT analysis of the current situation for RECs in Ontario. The table below develops themes and patterns from findings into a format of “Strengths, Weaknesses, Opportunities and Threats. This analysis therefore includes the notion of “internal and external” barriers facing community power identified by Walker (2008) (section 2.6) and extends to include drivers.

**Table 7. Result of the SWOT Analysis**

	Helpful	Harmful
	Strengths	Weaknesses
Internal	Co-ops are environmentally, economically, and socially driven. High level of motivation and commitment amongst board members. Willingness amongst the members to do voluntary work for the co-op. Strong leadership skills. Members share a sense of belonging to the local community.	Lack of technical-know how Lack of self-sufficiency within co-ops in terms of expertise. Co-ops’ lack of business mindsets. Limited revenues for new investments. High degree of reliance on volunteers (lack of funds to hire staff). Lack of youth involvement which may hamper succession.
	Opportunities	Threats

External	<p>Co-ops were able to form a federation where important issues affecting each co-op is discussed (Networking among co-ops).</p> <p>There is a potential for members to grow through the knowledge sharing platform embarked upon by co-ops.</p> <p>Use of social media and the local newspaper to get more people to support co-ops.</p> <p>Support from some municipalities.</p>	<p>Lack of policy support and incentives, especially now that the FIT program is over.</p> <p>Political and cultural barrier</p> <p>Lack of access to loan from financial institutions.</p> <p>Social opposition to wind turbine and ground mounted solar projects.</p> <p>High centralized grid system (IESO).</p>
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### 4.3 European RECs vs Ontario RECs: A Comparative Analysis

Using the SWOT table above to compare the Ontario RECs experience with that of the European Union (EU). The concept of community RECs has gained a decent traction in Europe and has been used as a tool to meeting the EU vision 20-20-20. The climate and energy policy of the EU which is generally referred to as the EU-20-20-20 means that by the year 2020, the EU plans to have 20% reduction in greenhouse gas emission as well as 20% increase in the share of renewable energy consumption. The implementation of this target that was set in March 2007 is underway in the majority of EU member states (Bohringer et.al, 2009). European countries, such as the Netherlands and Germany, have used the transition to sustainable energy to implement this target in their domains. Small scale renewable energy generation by local communities is one of the strategies adopted by these countries to decarbonize their economy (Rick et al, 2014).

For instance, the fact sheet published by a German-based energy newspaper *Clean Energy Wires* shows that there has been an increase in the share of renewable energy in the final power consumption in Germany. As of 2017, renewable energy consumption in Germany account for 36.1% (Appunn, 2018) with most of this coming from wind, solar and biogas. This has placed Germany ahead of other EU member states and poised to meet the 20% renewable energy target in power consumption in 2020 having had 14.9% (Appunn, 2018) renewable energy power consumption as of 2016.

In European countries like Germany, Denmark, United Kingdom and the Netherlands where renewable energy has been successfully employed as part of the tools used to promote energy transition and security, the UK alone there are over 500 community renewable energy (Bauwens et al., 2016). Co-ops by the assessment in this research has not being be highly success in Ontario when compared to the European experience due to certain challenges hindering their growth listed in table 4.7. Unlike in Ontario where the FIT program was only opened for few number of years, the FIT program, Feed-in premium(Fip) has been used by most the European countries to stimulate the use of RE technologies which makes RE projects to be economically feasible. This policy mechanisms has encouraged individuals and communities to generate electricity from RE sources because it lowers the transaction cost of operating and installing RE projects (Bauwens et al., 2016).

In order to understand the potential of the community renewable energy initiative to contribute to the environmental and energy goals of the UK, the Department of Energy and Climate partnered the UK research councils to fund a research program to investigate how the community energy initiatives could help the UK to reduce energy demand and to meet the policy goals (Seyfang et.al, 2013). This is an indication of the support for the REC sector. The distribution of wealth through community renewable energy projects seems to be a key element of the government support for the RECs sector in the UK judging by the quote below:

*We will encourage community-owned renewable energy schemes where local people benefit from power produced. We will also allow communities that host renewable energy projects to keep the additional business rate they generate. UK Department of Energy and Climate Change (Department of Energy and Climate, 2011).*

The Department of Energy and Climate also launched a community energy strategy, a move which is aimed at promoting community-led initiatives to grow, produce, manage and purchase energy. In addition to this, the Department of Energy and Climate and the UK Department of Food and Rural Affairs jointly

established a 15 million pound Rural Community Energy Fund to support rural communities to develop renewable energy projects and another 10 million pounds for the development of renewable energy projects in the urban areas through the Urban Community Energy Fund (Bauwens et al., 2016). This kind of support is however lacking in the case of RECs in Ontario, apart from the FIT program, there is no evidence that the Ontario province is supporting the RECs to growth. This could be attributed to the dominance of the nuclear energy in the electricity market in Ontario.

In Denmark, the development of wind power has been attributed to RECs. The ownership of wind power in Denmark was promoted by local citizens, companies and cooperatives through the country's energy planning schemes and specific regulations. As of 2000, 80% of all wind turbines were owned by cooperatives, individuals and farmers due to the fact that the ownership of wind turbines was restricted to local actors or communities where they are funded by government (Seyfang et. al., 2013). However, this is not the case in Ontario as most as RECs currently do not have any regulations, grant scheme or any other policy tools that encourage them in the long term.

In Denmark, there have been report of social opposition to wind turbines and obtaining social licenses for wind power project became increasingly difficult if the project does not have community input or stake in it. Wind power project that is wholly owned by professional developers or large energy companies suffered setback in the early 2000s (Bauwens et al., 2016). In other to solve this social opposition to new wind power projects, the Danish government enacted a regulation that allows citizen to own wind power projects. The regulation also compelled developers of new wind turbines to offer at least 20% of the ownership to the members of the community living within a radius of 4.5km from the turbine. In order to support local wind power cooperative, the Danish government also open up a public guarantee fund to support the preliminary investigation and energy planning by co-operatives (Bauwens et. al 2016). In Contrast, Ontario RECs facing this type of opposition to wind turbine and ground mounted solar projects are left to find solution all by themselves, it is a threat to the development of co-ops in the province and the provincial government does not really care if they survive or not.

In the Netherlands, where local “energy cooperatives,” as they are fondly called, has been promoted as one of the tools used to meet the EU-20-20-20, SDG7 and transition to low-carbon economy. According to a report by the Dutch National Council in 2014, the first wind power co-operatives were founded in the late 1980s, early 1990s (Triarii B. V., et al.). This form of energy cooperatives have since grown in the Netherlands over the years. Currently there are over 300 active local energy co-operatives and they have being driven by a combination of regional, National, Provincial and municipal policy (Triarii B. V., et al., 2014).

However different factors have been attributed to the spread of RECs in the Netherlands, one of which is the subsidy scheme called Stimuleren Duurzame Energieproductie and its successor SDE+. SDE+ was the regulation used by the Dutch government to promote sustainable energy energy production from decentralized systems for both large generators and small scale generators like that of RECs with a commitment of 3.5 billion euros towards electricity, heat and green energy. From our interviews this form of subsidy scheme is currently not enjoyed by the Ontario RECs (ibid).

Another factor is the presence of enthusiastic, interested and devoted volunteers who are not only willing to invest their money in the co-ops but also dedicate their time, ideas and experiences to develop the co-ops. RECs in the Netherlands and most other places started with volunteers who like to share their time, knowledge and expertise in order to contribute to the sustainability within their domains (ibid). In the Ontario context, the involvement of volunteers is clearly a strength to the the development of RECs, this agrees with most literatures on RECs.

One other factor is public engagement. The involvement of people in the RECs in the Netherland was spurred by the various engagement platform created by the co-ops that informs people on how they can be directly involved in renewable energy generation. It started with the founder’s recruitment of members in the neighborhood and streets. The desire to ensure that these members and volunteers are involved in decision making in the co-ops created more and better support for projects to be implemented

and could support the long time viability of the cooperatives (ibid)). In Ontario, the engagement platforms created by co-ops is an opportunity for them to convince the public to join them and would contribute to the growth of RECs in the province.

Other factors attributed to the growth of the Dutch local energy co-operatives are the role of government in creating policy with financial incentive like the SDE+ which provide subsidy to communities willing to take this initiatives which is not present in the Ontario context and it's a huge threat to the long time viability of the RECs.

Germany with the most successful story of transition to low-carbon energy with over 50% of its energy coming from renewable energy sources. The success of RECs and adoption of renewable energy in the country has been attributed to the EU climate change and energy policy 20-20-20 Renewable Energy Act and the Feed-in tariff system. (Nolden.C., 2013). Climate Community Saerbeck (Klimakommune Saerbeck) is one of the most successful and studied community renewable energy initiatives in the Europe if not the world and provide a template on how to organize energy transitions at local level (Hoppe et al., 2015). The reasons for the establishment of this initiative were to be independent and switch the energy supply of the whole municipality to clean energy by 2030.

The success story gained traction when the federal state of North Rhine-Westphalia organized a regional competition for municipality and the Seabeck community won. As a result of winning the competition, Saerbeck community got funded and this marked the beginning of their ambitious plan to achieve climate neutrality and be energy autonomous by 2030. This project was promoted by the municipality coupled with the Renewable Energy act of the German government and FIT, equity, loans and grant as financial instrument (Hoppe et al., 2015).

In contrast, Ontario RECs are not enjoying any support from municipal government nor any financial incentive from the Government of Canada at least none of the co-op mentioned this in the course of my interview with them. However, one co-ops mentioned that a municipality allows them to use the

rooftop to install projects free of charge and this save the cost of leasing rooftop from building owners, this is the only support from any municipality i heard during the interviews.

It is should also be stated that many financial institutions in Europe are always ready to offer loans to support energy transition through the local energy initiatives. Banks like Triodos commit a larger part of their investment on development of renewable energy projects Cooperative banks and Triodos has being instrumental to energy transition in the UK and most part of the European Union investing in both large and small scale renewable energy projects (TriodosBank, 2018; Nolden, 2013 ). This is one of the missing link in the Ontario context of RECs. Funding and access to loans from financial institutions has contributed to the stunted growth of the RECs in Ontario and this is largely due to the size of projects embarked upon by the RECs; the lack of support from financial institution can also be attributed to the unstable government policy. For the Ontario co-ops to experience growth, they must develop a bankable business model and the financial institutions must be flexible with their terms of loan and repayment. This will not only benefit the RECs but also the banks in the sense that it will promote the banks as having green image and contributing to energy transition and sustainable development.

This thesis argues that RECs play a part in the quest towards a just energy transition, low-carbon economy and to achieve both the Federal and provincial target by 2030 as part of a multi stakeholders and multifaceted approach. There is a need for the municipal government to be interested in the activities of the RECs especially in the absence of the any provincial support. The RECs on their part, since they operate at community level needs to lobby the city governments to see reason why they can be instrumental to achieving transition to low-carbon economy while creating wealth at the same time. The support of municipal government for RECs in Ontario will not only contribute to the long time viability of RECs but also support to the Pan-Canadian Framework on Clean Growth and Climate Change which will subsequently contribute to the Federal government commitment to the SDG7 which focus on affordable and clean energy.

Based on the range of support structures in other jurisdiction, this thesis suggests Ontario can further realize the role that RECs have to play in energy security, wealth creation, and transition to low carbon-economy and for the province to contribute substantially to the Pan-Canadian Framework on Clean Growth and Climate Change and the SDG7. Supporting citizens-led initiatives like RECs is one of the many options available. Since most RECs are localized in a communities and communities being the microcosm of the society their role in the democratization of energy system can be pivotal to meeting the SDG7 by 2030.

#### 4.4 Sustainability Analysis

**Table 8. Results of the Sustainability Analysis**

Environmental Aspect
<p>From the eight initiatives the source of energy is:          Solar energy (7)          Biogas (1)</p> <p>All the eight co-ops stated that the environment is their major driver.</p>
Economic Aspect
<ul style="list-style-type: none"> <li>* All co-ops received FIT contracts to startup.</li> <li>* Only one of the eight co-ops provided cost savings to its members by giving up to 10% discount on grocery shopping.</li> <li>* All co-ops pay financial benefits to members from its revenue.</li> <li>* Two co-ops mentioned that they received a federal grant.</li> <li>* One co-op stated that they received a grant from a foundation.</li> <li>* The co-ops also exist to create local jobs and keep energy dollars in the community.</li> </ul>
Social Aspect
<ol style="list-style-type: none"> <li>1 All eight co-ops mentioned that the community and the members are in support of the continuity of the co-ops and they share a sense of belonging.</li> <li>2 All co-ops stated that they have a knowledge sharing platform where they educate Ontarians on the renewable energy investment opportunities.</li> <li>3 Seven of the co-ops also mentioned social cum environmental (Climate change) reason as one of the drivers.</li> </ol>

#### 4.5 Summary Table for Barriers, Success Factors, and Drivers to the Development of Renewable Energy Co-ops in Ontario

**Table 9. Summary Table of the Barriers and Success Factors/Drivers of RECs in Ontario**

Barriers	Success Factors/Drivers
Technical	Ontario Green Energy and Economy Act
Finance	Feed-In Tariff
Lack of Skilled Staff (Dependence on Volunteers)	Climate Change
Lack of Access to Loan from Financial Institutions	Massive Support from Communities and Members
Political and Cultural Barriers (Monopoly of IESO)	Social Cohesion
Unstable Government Policies	
Bureaucratic Bottlenecks	

Table 9 summarizes the barriers and drivers of RECs in Ontario. Some of these were expected and could have been predicted based on the academic literature others were more of a surprise. The barriers and drivers faced by Ontario co-ops generally align with those predicted by the literature, however, the political and cultural barrier is not expected, it is surprising to know that the electricity market in Ontario is still highly centralized and controlled by the monopoly of the IESO. One would expect that the electricity market should have been liberalized. There should be a level playing ground for all energy generators irrespective of how small they are or the source of their energy. It should be a free market that encourages all players to freely come in and go out.

Although the financial barrier is expected, the lack of support from financial institution came as a surprise. For instance, the RECs stated that financial institutions were not supportive of their activities due to the size of the power co-ops. Financial institutions are only interested in financing big energy projects. One would expect that financial institutions should be one of the drivers of Canada's ambition in

reducing greenhouse gas emission and RECs is a good platform for financial institutions to explore their sustainability portfolio and demonstrate support combating climate change mitigation.

By supporting RECs through provision of soft loans, banks will not only benefit from the interest rate on the loan repayment but will be promoting a green image to their customers which may help bring more investment opportunities and customer's confidence.

From the perspective of the IESO, it is believed that the business model on which Ontario power co-ops operates is hinged on the FIT program. Now that the FIT has ended, the co-ops need to redesign their business model that takes into account of the economics of electricity generation. One barrier that may hinder this is the fact that most co-ops are still being run on a day to day basis by a volunteer Board of Directors. Most of the co-ops are unable to hire skilled labour especially people with management expertise (project, finance and stakeholders management) that could help manage the day to day activities of the co-ops. Another skill that is important for the success of the co-op is technical skills lacking in most of the co-ops. They depend fully on external contractors to do most the installations. IESO personnel stated that when the regulators are looking for electricity generators, it is only those that can manage the electricity system well that are considered. Currently, most of the co-ops does not have internal technical staff to install and manage their systems, they largely depends on external contractors.

The awareness about renewable energy technologies is high in the province; however, many people are not aware of the opportunities that exist in investing in renewable energy power co-ops in the province. This is largely due to a low level of awareness done by the co-ops. It is unexpected to find that there is no common platform established by the co-ops for sensitizing and educating the people about renewable energy power co-ops, this is done by individual co-ops in their locality. In addition, there is no evidence that the umbrella platform of all co-ops in Ontario, FCPC is doing enough to facilitate proper knowledge transfer and co-ordination among co-ops. Such an umbrella organization is expected to be a solid platform that could drive the co-op governance landscape.

I also expected to see a partnership between dealers of equipment and some co-ops. In the course of this thesis, none of the co-ops mentioned that they developed any project in partnership with neither solar manufacturers nor equipment providers. I expect to see a synergy or partnership that involves co-ops and equipment dealers that will include project development, installation and after sales services with a profit sharing agreement. The advantage of this to the co-op is that it could allow co-ops to develop many projects while on the part of the equipment dealers, it would help drive sales and thus it will be a mutually beneficial situation.

#### **4.6 Contribution of Renewable Energy Co-ops to the Ontario Sustainability Goals**

From an environmental point of view, the twin sustainability challenges of climate change and energy security warranted the need for energy transition to low carbon alternatives. The Pan-Canadian Framework on Clean Growth and Climate Change, the Green Economy Act and the 2017 Ontario Long Term Energy Plans included generation of energy from distributed sources through renewable energy technologies like wind and solar PV, energy conservation and efficiency measures and carbon pricing mechanism.

REC is a form of distributed energy with community-level participation where the energy generated is sent to a nearby grid-system thereby reducing transmission losses. It is more efficient and sustainable than large centralized electricity generation. In the absence of carbon pricing, REC has been instrumental in the implementation of the Ontario government's Long-term Energy plan since 2010 through active promotion of embedded electricity generation produced by big renewable energy generators and small ones like RECs which has been contributing to fostering energy security in the province. In addition, with a proper policy and financial support RECs can further play a vital role in Canada's effort to meet the SDG7 through a just transition to low-carbon economy.

Broadly, RECs have also played a key role to advancing the Ontario government's strategy for environmental sustainability in the absence of carbon trading and other mechanism that can be used in mitigating climate change and contribute to the SDG7 that Canada committed to reaching by 2030. RECs

have also contributed to the development feasible low-carbon energy from clean renewable energy across Ontario. The complete shutdown of the Ontario coal-fired power plants have helped RECs to thrive in the province and they have helped in stabilizing electricity supply across the province and reducing GHG emissions produced from the then coal plants

The development of REPs, RECs 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, RECs have helped to stabilize electricity supply across the province, while displacing GHG emissions produced from coal. As mentioned earlier, the carbon emission profile of Ontario from 2005-2015, as released by IESO, indicates that there is a downward trend in carbon emission; it decreases from 14.9MTCO<sub>2</sub>e in 2009 when GEA was first enacted to 7.1MTCO<sub>2</sub> e in 2015 which is about 80% GHG reduction in the 10-year period of review which is largely due to the closure of the coal-fired generation and increased generation of electricity from renewable energy sources contributed by both renewable energy generators which includes RECs (IESO, 2016).

From an economic perspective, RECs in Ontario have helped in boosting the local economy in the communities in which they operate by providing investment opportunities to community members like buying bonds and investing in RE projects which yields financial returns to them (McMurtry and Lipp 2015). This happen particularly in the communities seeking to contribute to advancing the province sustainability goals. Also, REC has helped in creation of local jobs opportunities in the community where they exist thereby retaining money within the community. It has also opening a new frontier for the locals to diversify their resources by helping to raise capital for other development projects within the community

RECs is a community-led energy generation initiatives that allow community members irrespective of the amount invested to have a sense of ownership in the energy project within their community. RECs have promoted social cohesion within the communities where they are located. One example of this is the citizen engagement fora of OREC which has served as a platform for community

members to discuss broadly on community development agenda in relation to proposed or developed RECs in their locality. OREC have developed a culture of engaging with their members regularly before, during and after project development.

In addition, TREC has taking it up upon itself to educate and impact energy knowledge in the elementary and secondary schools and indigenous communities in Ontario. This has increased the awareness level in some communities around the several options available to reducing GHG emission at individual level and community level in other to contribute toward the Ontario long term energy plans (Orji and Weber 2017), this kind of awareness and citizen engagement will reduce opposition to new green infrastructure at the community-level (Hoicka and MacArthur 2018).

## 5.0 Conclusion and Recommendations

### 5.1 Conclusion

This thesis set out to investigate the factors affecting the long term viability of RECs in the province of Ontario. The first step was to carry out a content analysis of scholarly literatures, documents from the websites of the co-ops and that of the government agencies within the literature review section.

In order to delve further into the research objectives and research questions that revolve around the obstacles to RECs development and the support structures they have in Ontario, I conducted interviews with seven RECs, one co-op partner and IESO,.

The outcome of this research indicates that the single most important government policy incentive (FIT) that supports the development of RECs in Ontario was removed at the end of 2017. This means that from January 2018, it will be much more difficult for RECs to be formed in Ontario and the existing co-ops can no longer build projects except those that have a guaranteed purchase agreement through FIT contracts. This will definitely slow down the expansion of RECs in Ontario and serves as a difficult policy obstacle to the development of RECs in the province.

Notwithstanding this recent development, I found a number of patterns and similarities facing RECs in Ontario. These includes the policy and regulatory barrier due to the end of the FIT program, bureaucratic bottleneck, technical know-how within each co-ops, and management issues which are largely due to the fact that many of the co-ops are still been managed by volunteer board members without permanent staff. The analysis has provided a case study of a jurisdiction that is highly relevant to the literature surrounding community based energy initiatives. This thesis will hopefully provide a useful summary and analysis to practitioners in the community power coop sector in Ontario and Canada at large.

## 5.2 Recommendations

If one recalls the objectives of this thesis, it was to find out how Ontario's RECs can grow, experience long-term viability, be updated or expanded, while finding out the role of drivers and barriers. I have put together three recommendations that cover the research questions and objectives of this thesis.

**Recommendation 1:** The major incentive that encourages the development of power co-ops has been removed at the end of last year without any replacement. The study found that most of the co-ops have power purchase contracts that guarantee the purchase of any energy generated for the next 20-year period. This means the existing RECs will continue to function during this period, however, new co-ops based on the FIT dependent business model cannot be developed, and the existing co-ops cannot be expanded in the way they have for past nine years. For long-term viability of co-ops in Ontario, there is a need for a renewable energy policy that includes policy incentives that encourage the continuous development of RECs and their expansions. The Government of Ontario needs to find another way of supporting the growth of RECs in the province by replacing the FIT program with another incentive program. In the light of this, my recommendation would be that co-ops should lobby the Ontario's parliament for a new renewable energy policy that includes incentives similar to the FIT program. This may not be as easy as stated but a consistent collective voice from all co-ops could make the government see the reasons to support the co-ops initiative, such as changing the language of the cooperative act to expand the activities that the co-ops can offer.

**Recommendation 2:** Without the power purchase contract in the post FIT years, the RECs in Ontario need to develop a new business model if they want to remain in business. One of the strategies to include in this new business model is to explore the possibility of partnering with utility companies. Co-ops can form partnerships with utility companies in their location to build new projects that can be connected to the local grid owned by the utility company. This was how the first co-ops, TREC and WindShare, started in 1998 when they partnered with Toronto Hydro to build a wind turbine. This partnership will ensure that co-ops continue to exist without any government incentives. It is imperative for the co-ops to find out

what made Toronto Hydro's partner TREC build the first co-op project in Ontario which will help them engage with their own local utility companies in a mutually beneficial partnership.

The LTEP also forecasted the growth of wind and solar to assist the province to meet the demand of electricity consumers. This offers a great opportunity for RECs in the post-FIT era to change their business model and get utility partners who can buy back electricity from them. The recent reduction in the cost of solar PV and wind technologies could offer a great opportunity for Ontario to systematically increase the shares of the renewable energy grid and the REC as a good platform for driving the energy transition towards renewable energy in the province.

**Recommendation 3:** Financial constraint is one of the barriers identified by the co-ops and can prohibit the development of RECs in Ontario. The major financial support structure of the co-ops has been the FIT contracts and the bonds or shares sold to members. As a matter of fact, some of the co-ops posit that it is not easy to convince people to buy bonds. It is important that the co-ops look elsewhere for financial support, as the government continues to take away incentives. One option for RECs could be to seek out financial support from financial institutions.

One of the major findings noted in this research is the fact that financial institutions are not participating in the funding of co-ops. In fact, one of the co-ops posits that the financial institutions in Ontario are only interested in financing big energy projects and not small-scale projects embarked upon by the RECs. During the interviews with the co-ops, none of the co-ops mentioned collecting loan facility from any financial institutions. It is imperative to note that combating climate change needs a collective effort from both private and public institutions. The role of financial institutions in the transition to a low-carbon economy cannot be overemphasized.

In the new business model that will be developed by the co-ops, it is highly recommended that they should include the role of financial institutions to further develop RECs. The financial sectors in Ontario really needs to assist the co-ops with soft loans to build projects or should enter into a partnership with them. For instance, banks can support the co-ops through a low-interest rate loan facility, equity

investment, microfinancing, and guarantee. Financial institutions can also contribute through administrative and project management roles to facilitate investment.

### **5.3 Limitations and Opportunities for Further Research**

The research only seeks to find out the support structure for RECs in Ontario as well as the barriers affecting their growth and development within the province. I was able to survey only seven co-ops and one REC partner that are listed on the website of the Federation of Ontario Community Power Co-ops. Although I was able to interview one person in IESO, the refusal of the Ontario Ministry of Energy to have an interview with me to get their perspective on the RECs initiative could be viewed as one of the most important limitations of this research.

Further research is needed to do a comparative analysis of the barriers and institutional support structure of the RECs across all of Canada. This would enable researchers to see the gaps in renewable energy policy as well as the commonalities and areas that need to be addressed by each province/territory. Further research is also needed to find out the experiences of RECs without FIT programs in the next 5–10 years. It is my hope that this research will be used to empower the development of RECs and REC policy within Canada as well the rest of the world

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## Appendix A – Research Analysis

### SWOT Analysis for All the Co-ops

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· They are a capitalist corporation and has money enough money to do project</li> <li>· Decision can be easily made because there is no board</li> <li>· Focus is mainly economic than environment</li> </ul>	<ul style="list-style-type: none"> <li>· Complex regulation</li> <li>· Co-op need management skills with expertise in risk and development capital</li> </ul>
	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· First Nations is the priority of this co-op and are easy to convince because they only need to meet the chiefs and elders</li> <li>· First nations are in need of clean energy instead of the current dependence on diesel and other unclean fuel</li> </ul>	<ul style="list-style-type: none"> <li>· No members</li> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> </ul>

### Zooshare SWOT Analysis

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· Toronto zoo are fully in support</li> <li>· Enjoys community support</li> <li>· Managed by dedicated board members</li> <li>· Apart from FIT and contribution from member, Zooshare had access to commercial loan</li> <li>· The focus is on environment and economic and social benefit</li> </ul>	<ul style="list-style-type: none"> <li>· Cost of disposing digestives because it contains lots of water</li> <li>· Cost of transporting waste to the zoo due to the location of the zoo</li> <li>· Lack of capacity, Zooshare needs skills in engineering, stakeholder management and organic and biogas marketing.</li> <li>· Lack of external funding source</li> </ul>

	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· It is headed by a practical environmentalist who understands the science behind biogas plant</li> <li>· Opportunity to refine the digestate for fertilizer</li> <li>· Many visitation by the public and the children and youths education</li> </ul>	<ul style="list-style-type: none"> <li>· Competition with other biogas plants</li> <li>· Inability to curtail the Odour</li> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Political factor</li> <li>· Lack of waste policy that prevents waste from going to the landfill</li> </ul>

### TREC SWOT Analysis

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· The focus is economic , environmental benefits and social enterprise</li> <li>· It's the leading co-op and organizes workshop to educate other co-ops and provide supports</li> <li>· Overwhelming community support</li> <li>· FIT contract</li> </ul>	<ul style="list-style-type: none"> <li>· Monopoly of IESO</li> <li>· Co-op not being able to do both heating and electricity</li> <li>· Fund mobilization skills</li> <li>· End of FIT program</li> </ul>
	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· Net-metering regulation in the Ontario long term energy plan</li> <li>· Provision of platform on knowledge sharing and information about rapid energy sector development within province</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Lack of access to loan facility from financial institution</li> </ul>

Solar share SWOT Analysis

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· Perhaps the most successful co-op with over \$350m invested and over 1500 members</li> <li>· Economic and environmental benefits</li> <li>· Has construction investors that help build projects and get 10% in return during construction phase and 6% when project is running</li> <li>· Dedicated board members and staffs</li> <li>· Educating Ontarians on the benefit of investing in co-ops</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of finances</li> </ul>
	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· Combination of construction investors and bond holders</li> <li>· Having an intelligent Board of Directors with a wide array of talents who are willing to put in the time needed (for free!) to make it work.</li> <li>· Building a long-term economic model and budget that takes all risk factors into consideration.</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Unstable government program/policy (policy change)</li> <li>· modification of business model each time government policy changes</li> <li>· The public needs to be educated on the benefit of solar energy</li> </ul>

Northumberland Community Co-ops

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· Members passion for promoting local community investment and RE</li> <li>· Sustainability is the hallmark of this co-op</li> <li>· Local municipal government that allows for the use of their rooftop, currently there are 3 projects on the rooftop</li> <li>· Partnership with investors in the first three projects</li> </ul>	<ul style="list-style-type: none"> <li>· Private building owners are difficult to discuss with in terms of rooftop solar</li> <li>· Project Management skills needed</li> <li>· Technical ability, co-op hire engineers to build projects. Marketing and financial skills</li> <li>· Most members are over 50-60 years (Succession plan)</li> <li>· Needs for skilled staffs and not over reliance on volunteers, the board currently run the co-op</li> <li>· Finance, raising fund is difficult because of size</li> <li>· Lack of access to loan from banks</li> </ul>
	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· Present of partners to support co-op</li> <li>· Federal Grants (community future cooperation)</li> <li>· NET metering will be supportive in future</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Rural people do not favor ground mounted solar projects because it takes farm land, also they do not like wind energy because of noise and how it looks.</li> <li>· Government Bureaucracy</li> <li>· Business risk in terms of lack of guarantee/warranty from equipment suppliers, if the business of the supplier fold up then it becomes a problem for co-op who gets these equipment from the co-op, inverter suppliers not giving good service.</li> </ul>

SUN Power Co-op

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· Environment and climate change</li> <li>· Founders are majorly engineers</li> <li>· Supportive members</li> <li>· They got project partners</li> <li>· Supportive board members</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of financial management and technical skills</li> <li>· Funding</li> </ul>
	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· Project partners</li> <li>· Co-op enjoys both community and municipal support</li> <li>· support came from Northern Heritage foundation, grants from Bullfrog power, donations from credit union and the city, partner</li> <li>· Net-metering offers a good opportunity to co-ops</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Restricted to generating power and selling them to the grids</li> </ul>

The Beach Community Power Co-op

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· Community members are fully in support</li> <li>· Sustainability resilient, future of children. Most people are against nuclear power</li> <li>· In partnership with Kew Beach School</li> <li>· Dedicated board</li> </ul>	<ul style="list-style-type: none"> <li>· Regulatory weakness, cultural barriers, economic,</li> <li>· Technical and political barriers</li> </ul>
	Opportunities	Threats

External	<ul style="list-style-type: none"> <li>· Kew beach schools allows the co-op to use their roof</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Regulatory weakness, developing consensus</li> </ul>
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Ottawa Renewable energy co-op SWOT Analysis

	Helpful	Harmful
	Strengths	Weaknesses
Internal	<ul style="list-style-type: none"> <li>· Economic, making RE a new normal and environmental benefit</li> <li>· External grant from federal government</li> <li>· Members overwhelming support</li> <li>· FIT program(the 20 year power purchase agreement)</li> <li>· Dedicated volunteers that wants to get involved in the business</li> </ul>	<ul style="list-style-type: none"> <li>· Co-op is in need of Engineering skills, technical skills, financial planning skills, and marketing skills</li> <li>· FIT contract is over, co-ops has to develop new business model to stay alive.</li> <li>· Finance</li> <li>· Lack of clear understanding of how the new net metering regulations affects new projects low electricity rate, the price was lowered</li> </ul>
	Opportunities	Threats
External	<ul style="list-style-type: none"> <li>· Knowledge sharing and information about rapid energy sector developments within province</li> <li>· Net-metering is an opportunity</li> <li>· Free event speakership</li> <li>· Co-op offer 10% in-store grocery shopping</li> <li>· There is a strong demand in Eastern Ontario to have a local green investment options as there are no many of them, OREC is leading this</li> </ul>	<ul style="list-style-type: none"> <li>· Lack of policy support and incentive especially now that the FIT program is over</li> <li>· Changing of business model is a threat</li> </ul>

## Appendix B – Research Interview Questions

### Question to the Market Regulator - IESO

- 1 Do you think the development of renewable energy power co-ops align with your energy policy?  
If yes, how? If not, why?
- 2 To what extent would you say Ontario energy co-ops are dependent on your support?
- 3 What kind of supports do you give to the Ontario energy co-op?
  - a. What kind of financial support you provide for the co-ops? (ie. Grants, Subsidies, Loans, Tax Exemptions, etc.)
  - b. What kind of technical support you provide for co-ops? (ie. Technical Training, Maintenance, Spare Parts, etc.)
  - c. What kind of advisory support do you give to the co-ops? There are several advisory supports, e.g.: business consultancy.
- 6 Do you have regular meetings where you can have a feedback session with the energy co-op sector? If so, are these minutes public? Are there any reports of public information you can share for this study?
- 7 What is the view of your organization on renewable energy?
- 8 What is the current percent of renewable energy on grid in Ontario?
- 9 In 20 years, where do you see the future of energy generation in Ontario? Do you see a greater penetration for alternative sources of energy other than nuclear such as wind, solar and/or bioenergy?
- 10 In the future, do you see the unbundling of the power sector in Ontario to accommodate distributed power (power co-ops)?
- 11 What do you think the future has in store for co-ops?
- 12 What are the success factors for the continuity of co-op in (location of public officer)?

- 13 In relation to your long term energy plan, could you please tell explain the shortcoming plan that needs to be improved upon in relation your co-op?
- 14 Can you give us an insight into this yet to be released plan?
- 15 Can you tell us how the net-metering would favor Ontario power co-ops?
- 16 The FIT program is ending, would your organization support a similar program that will keep power co-ops running?
- 17 What is your ideal vision of a co-op's performance? (this is more for a win-win situation where you can help meet municipalities' targets if they provide support to power co-op)
- 18 Which avenues would you like this study to investigate?
- 19 Is there any extra information you would like to share?

#### Interview Questions for the Renewable Energy Power Co-op

- 1 Would you kindly tell us about yourself and your work? What is your co-op's target group?
- 2 Do you think the local community knows about your co-op? If yes, do you know what their feelings are about your co-op? (If possible, obtain external data)
- 3 Do you think the community favors the continuity of your co-op? How is local populous' awareness of renewable energy?
- 4 Do you think people in the co-op share a sense of belonging to their community? How many members do you have?
- 5 Could you tell us about the social profile (age, gender, etc.) of members (interested community members)?
  - a Can you please explain who is benefitting from your co-op and how?
  - b How: What type? Finance? Technical? Consultancy? All three: Are you satisfied with the benefits you are providing? Or do you think you have more to do? Please explain.

- 6 What of the following sources of energy do you focus on? Wind power generation, solar, hydro, bioenergy, and/or biogas?
- 7 How much energy have you generated since you started? (kWh)
- 8 If there are any installations (e.g. solar/windmill): How is the ownership of the assets divided?
- 9 Do your members enjoy any cost savings due to your co-op service?
- 10 What are the sources of your funds used to start your co-ops?
- 11 Are there any external factors you depend on?
- 12 Which do you think play the biggest roles in the success of your co-op? Local community?  
Government policy?
- 13 Are you aware of other RE co-ops in different locations?
- 14 Do you have a board for your co-op? Do you have regular meetings with your members? If so, how often?
- 15 After these meetings, do you prepare reports? Are these reports readily available to members and to public? Would you mind sharing a report for this study?
- 16 Are there meetings with external "stakeholders"? If yes, who and how often? If not, why?
- 17 Would you continue with this initiative from now on? Why or why not?
- 18 Have you identified any threats/weaknesses towards your co-op?
- 19 Do you think your co-op requires any special skills? Explain your vision for future.
- 20 What kind of supports do you give?
- 21 What kind of support does the provincial government provide your co-op?
- 22 What more could the government do to support your co-op?
- 23 What do you think about Ontario's long term energy plan? Does it support the development of your co-op?

- 24 Do you think the FIT and micro FIT program of Ontario's government will promote the spread of power co-ops in the province?
- 25 What are the success factors for developing a co-op?
- 26 What are the barriers for the development of co-op?
- 27 What are the next steps for co-ops? What do you think the future is for energy co-ops?
- 28 What information would you expect to receive from my study on your initiative?

### **Appendix C - Research Ethics Approval and Consent Forms**

The research went through the social science ethics board at the University of Ottawa (02-17-09) and it was approved to proceed after every ethics concern was addressed. In our ethic application, we assessed the risk that may be faced by participants. The participants may experience inconveniences such as time consumption, disruption of a work day commitment and potential discomfort from criticizing government policies and programs. To mitigate these risks, we located convenient time slots for the interviews, provided confidentiality and the participants had the option anonymity. The benefit this research will have to participants is that this study will be shared with policy makers, energy co-ops and provided to other interested parties with the intent of recommending improvements to co-op policies. In terms of identity, the participants will only be identified with the position occupied in the organization. We hope to ask them if they want their names to be mentioned in the research. We do not intend to inconvenience any participants. The participants will be given an option to remain anonymous in both name and organization which has been noted in the consent form.