IDENTIFYING AND OVERCOMING BARRIERS TO COMMUNITY POWER IN NOVA SCOTIA

by

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DEDICATION PAGE

To all those who strive for a world that nourishes life.

To Nova Scotian communities, the most inspiring I have found to date.

To treading lightly, living and letting live.

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ABSTRACT

Community power is an alternative to the fossil-fuelled, centralized approach to electricity generation. Typically, community power involves low-carbon or renewable forms of electricity generation developed in relatively small generation facilities distributed geographically, entirely or in part owned by the local community. Community power has been found to improve the efficiency of energy systems by decreasing transmission losses and making better use of the heat by-product. Other benefits include increased community acceptance of renewable energy technologies, expedited deployment of renewable technologies, and rural economic development. This study identified how the Canadian province of Nova Scotia could develop a viable community power sector by learning from leaders in the field, namely Denmark and Ontario. Case studies of these leading jurisdictions were developed through literature reviews and interviews with key informants. Next, the conditions for success for community management of common pool resources were compared to the case studies to draw parallels between conditions for success in community power sectors in Denmark and Ontario. It was found that many of the conditions for successful community management of common pool resources were similar to those that realized viable community power sectors with the exception of 'the relationship between the resource system and institutional arrangements.' The conditions fell under the themes of: 'resource system characteristics;' 'group characteristics;' 'the relationship between resource system and group characteristics;' 'institutional arrangements;' and 'the external environment.' At the time of study, Nova Scotia was taking the initial steps to creating a community power sector. By way of interviews with key informants in the province, barriers to a viable community power sector were identified. Next, drawing from the experiences of the Denmark and Ontario, methods to overcome the barriers were identified. Recommendations for the Nova Scotia Departments of Energy, the Department of Economic and Rural Development and Tourism, the Department of Natural Resources, CEDIF businesses, municipalities, renewable power proponents, and academic institutions were concluded from this study. The recommended path will enable a successful community power sector in Nova Scotia, which will in turn help achieve the provincial renewable electricity targets, enable a more stable and efficient energy system, and increase economic prosperity, particularly in rural communities. The recommendations are specific to Nova Scotia, although they may inform steps to successful community power sectors in similar jurisdictions.

LIST OF ABBREVIATIONS USED

CEDIF	Community Economic Development Investment Fund
CHP	combined heat and power
COMFIT	community feed-in tariff
FIT	feed-in tariff
kW	kilowatt
kWh	kilowatt-hour
MW	megawatt
MWh	megawatt hour
NSPI	Nova Scotia Power Incorporated
OSEA	Ontario Sustainable Energy Association
PV	photovoltaic
RFP	request for proposals

GLOSSARY

Combined Heat and Power projects are those that simultaneously produce both electricity and useful heat. Combined heat and power can be on any scale from very large applications in refineries to tiny machines in individual homes (World Association for Distributed Energy, 2008).

Community economic development is defined by the Canadian Economic Development Network (2008, para. 1-3) as:

> an action by people locally to create economic opportunities and better social conditions, particularly for those who are most disadvantaged. Community economic development is an approach that recognizes that economic, environmental and social challenges are interdependent, complex and ever changing. To be effective, solutions must be rooted in local knowledge and led by community members. Community economic development promotes holistic approaches, addressing individual, community and regional levels, recognizing that these levels are interconnected.

A **Community Economic Development Investment Fund** (CEDIF) is an opportunity instigated by the Nova Scotia Department of Economic Development in 1999 to attract venture capital into local businesses, which would in turn stimulate community economic development. Investments are eligible for significant provincial income tax credits totalling 65% of the initial investment over a 10-year time period. Investments are also registered retirement savings plan transferable. The goal of the program is to increase the capital reinvested in Nova Scotia to 5% by the end of the year 2010 (Nova Scotia Department of Economic Development, 2008).

Distributed Energy or **Decentralized Generation** refers to electricity production at or near the point of use, irrespective of size, technology, or fuel used - both off-grid and on-grid (World Association for Distributed Energy, 2008).

Net metering is a program for Nova Scotia Power customers to connect small renewable energy generating units (<1 MW) to the electrical grid to offset their own electrical consumption. The program will soon been expanded to include the option to net-bill (offset multiple meters on the same account by one generation facility within a limited region) and to sell excess energy credits to the utility for the retail rate (Nova Scotia Department of Energy, 2010b).

The acronym, **NIMBY**, has been defined as an "abbreviated form of the principle 'Not-In-My-Back-Yard' underlying much environmental protest when confronted with proposed new but unwelcome development" (Archaeological Dictionary, 2003, para. 1). The reasons for the NIMBYism to renewable electricity include concerns about scale, noise, environmental impacts, property values, and aesthetics.

Peak demand occurs at the time when the most electricity is needed in Nova Scotia. This typically occurs from December to February between 7am to 12pm and 4pm to 11pm (Nova Scotia Power Incorporated [NSPI], 2010c).

Renewable energy can be defined as "energy obtained from natural and persistent flows of energy recurring in the immediate environment" (Twidell & Weir, 1986, p. 7). This would include heat and electric forms, of energy both of which are important for a holistic shift to energy sustainability. However, for the purposes of this study, **renewable electricity** will be the main area of focus. This is neither meant to dismiss opportunities for combined heat and power community systems, nor suggest that other renewable energy initiatives are not also beneficial, simply that they are not the focus of this study. In Nova Scotia regulations regarding renewable electricity, the term 'renewable low impact electricity' is used and is defined as:

> electric energy produced from any source of renewable energy that is able to be replenished by natural processes within a reasonable length of time, and within 80 years at the latest, and includes but is not limited to, all of the following:
> (i) solar energy,
> (ii) wind energy,
> (iii) biomass,
> (iv) run-of-the-river hydroelectric energy,
> (v) ocean-powered energy,
> (vi) tidal energy,
> (vii) wave energy,
> (viii) landfill gas,
> (ix) liquid biofuel and other biogas energy (Nova Scotia *Electricity Act*, c.25, s. 2, 2010).

Social acceptance can be understood by its components. '**Social'** refers to the whole society and its different groups while '**acceptance'** ranges from passive consent to active approval through direct involvement (Williams & Mills, 1986)

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CHAPTER 1 INTRODUCTION

1.1 Electricity System Challenges Globally

Energy is essential to all life; food nourishment is used to fuel all organisms but modern human society has come to depend on other forms of energy as well, such as electricity, space heating/cooling, and transport fuels. Because of its importance to the quality of life we currently strive towards for human beings worldwide, energy has been equated to a human right (Tully, 2006).

Electricity is one form of energy that can be easily converted and used for many different applications including heating, mechanics, communication, transportation, etc. New functions are continuously being developed for electricity; as such, it is an increasingly important form of energy in modern societies, especially in the industrialized world.

Early electricity systems were established in industrialized countries worldwide in the late 1800s and generation and distribution were dealt with locally (Marnay & Venkataramanan, 2006). In the first few decades of the 1900s, electric systems were rapidly expanded and consolidated, hence government regulation was introduced. Technology advances in generation and transmission; thus, centralization emerged as the most common model of energy generation (Marnay & Venkataramanan, 2006). Fossil fuels and the resulting technologies became more readily available, which altered the method with which electricity was generated. Economic-based decision-making resulted in large-scale, privately owned, fossil-fuelled electricity utilities (Hinshelwood, 2000).

Centralized electric grids provided electricity to a widely dispersed population; however, they faced some inherent challenges, one being efficiency. Generation facilities are often located a significant distance from the electricity demand; therefore, long distance transmission grids are necessary and line losses are inevitable. In the United States, and predicted to be similar in Canada, it was found that, on average, 7.2% of electricity was lost during transmission, with the highest line losses corresponding to times of high demand (United States Climate Technology Program, 2003). In the case of generating facilities that involve combustion, distance from the load also results in a limited market for the heat by-product and, consequently, electricity generation in which approximately half of the energy embodied by the fuel was lost as waste heat (Lovins, 1977).

Another challenge inherent in centralized energy systems is an increase in the vulnerability of customers to line damage. Damage to the transmission system affects more customers when large generation facilities are located far from consumption. This was demonstrated by both of North America's recent widespread blackouts in 1996 and 2003. The heat of summer resulted in an increased electricity demand (for air conditioning). The transmission system was over-loaded, which, coupled with the external heat, caused the lines to sag and be short-circuited on trees below (Oak Ridge National Laboratory, 2005). The costs of the blackout in 2003 were estimated at $4 to $10 billion (ICF Consulting, 2003; Parks, 2003).

A third challenge resulted from electric generation being located a long distance from population centres; significant psychological distance emerged between electricity generation and its end users (Pasqualetti, 1999; Walker, 1995). Consumers of electricity became less aware of how electricity was generated.

More recently, there has been increasing focus on renewable electricity generation. This has been instigated due to recognition that fossil fuels are finite in supply and that carbon emissions are linked to climate change. Because it is often modular in nature, renewable electricity generation can be developed in a more decentralized, or distributed, manner, which can overcome some of the challenges stated above.

1.2 Distributed Generation

An alternative path to the centralized model is distributed generation, which refers to electric generation that is produced proximate to where it is consumed. This inherently means that the generation units have smaller output capacities. These systems can be either renewable or not, although this study has focused on the renewable forms of distributed generation.

The primary advantage of distributed generation is its ability to increase the efficiency of moving electricity from the point of generation to consumption (World Association for Distributed Energy, 2006). Another opportunity for increased efficiency, hence cost savings, found with distributed generation is the opportunity for combined heat and power (CHP). When electricity generation creates excess heat, as in any combustion system, there is an opportunity for that heat to be used. This increases the overall efficiency of the fuel conversion by 40% to 50% (Marnay & Venkataramanan, 2006). Locating generation units closer to consumers can make the transportation of heat to consumers also possible. Although distributed generation has higher operation and maintenance costs as well as installation costs per unit installed, the benefits can sum to a net savings overall because of the efficiencies achieved and the offset costs of transmission infrastructure (World Association for Distributed Energy, 2006).

Distributed generation can contribute to a more stable supply of electricity. When generation is closer to supply, customers' vulnerability to grid outages is reduced. Marnay and Venkataramanan (2006) suggested that this also reduced a region's vulnerability to malicious attack and that a distributed electric system would be able to provide a higher quality of electric service at lower cost to society than a system based on centralized generation. Distributed systems tend to be smaller and, as such, face reduced exposure to interest, escalation, and mistimed demand forecasts during construction (Doukas, 2006; Lovins, 1977). Lower financial risk results in lower debt interest rates, thus a lower cost for electricity.

The proximity of distributed generation to load centres helps to bridge the spatial and psychological distance described by Pasqualetti (1999) and Walker (1995). As such, distributed generation may provide increased opportunities for the local community to benefit educationally and economically.

1.3 Community Ownership

Although often associated with distributed generation, community ownership is a distinct characteristic that offers a way to overcome some of the challenges of centralized electricity systems. Community ownership involves participation by the local community in the electricity generation system, which can include investment and/or decision-making authority. Although community ownership is possible for many types of electricity generation, this study has focused on renewable forms of electricity generation. 'Community renewable energy', 'community power', 'community-based power', and 'community-owned power' are all terms applied to this alternative path. This study employs the term community power. Community power has taken the form of either distributed generation or large-scale generation, but it typically is distributed.

The benefits of community power include its ability to increase social acceptance in the immediate community, the inclusion of that community in the decision-making process, economic benefit to the local community, a diversification of income often for rural residents, and a more rapid deployment of renewable electricity. The most common challenges are financial and technical capabilities.

Community ownership in renewable electricity can help increase local support for a renewable electricity project (Gross, 2007; Warren & McFadyen, 2010). Another potential benefit of community power is rural revitalization. Renewable resources are most often accessible in rural areas. As such, community power developments have been employed as a mechanism to diversify incomes and employment in rural communities dependent on natural resource extraction or facing declining populations (Walker et al., 2007).

The community power concept has been found by two studies to increase the speed at which renewable electricity generation capacity can be developed. Walker et al. (2007) found that community power was a way to stimulate capital investment in renewable electricity and expand the small-scale technologies market. Hain, Ault, Galloway, Cruden, and McDonald (2005) found that renewable electricity could be developed more quickly in a region when community owned renewable electricity was built into the development strategy.

1.4 Community Power in Nova Scotia to Date

Currently, the Canadian province of Nova Scotia generates its electricity with 75% coal, 13% natural gas, and 12% renewable sources (NSPI, 2009a). The government of Nova Scotia has stated that:

> This over-reliance on a single fuel source weakens our energy security, binds us to the volatile and upward trend of international prices, and drains wealth away from the province. Equally important, it has a negative impact on both our health and our environment (Nova Scotia Department of Energy, 2010b, p. 2).

To elicit input into the renewable energy future of Nova Scotia, NSPI hosted a series of public consultations in 2005. They found that the public generally preferred home-grown solutions, which suggested support for community power in Nova Scotia (Tedesco, 2006). In the fall of

2009, another consultation process focused on renewable electricity was undertaken. This process identified widespread support for community power in Nova Scotia (Adams & Wheeler, 2009). The concluding suggestions of the consultation recommended that 100 MW of electricity (of a system total of 2,293 MW) should be generated through community enterprises (Adams & Wheeler, 2009). This same target was later stated in the Province's Renewable Electricity Plan through the creation of the community feed-in tariff (COMFIT) program (Nova Scotia Department of Energy, 2010b).

Under the COMFIT, feed-in tariff (FIT) rates were required for wind projects, run-of-the-river hydro, in-stream tidal, and biomass CHP. Projects had to be connected to the distribution grid and ownership of the projects had to be at least 50% community equity ownership with an exception for biomass CHP (definition explained in section 2.1.1.1) (Nova Scotia *Electricity Act*, c. 25, s. 20, 2010).

The Community Windfields, which are regionally defined investment groups with a mandate to generate equity for community power projects, have been pooling finances since 2002 (Scotian Windfields, 2012). There are eight such investment groups across the province that have been raising equity under the Community Economic Development Initiative Fund (CEDIF) program of the Nova Scotia Department of Economic Development, which was created to encourage investment in local businesses.

Steps have been taken in Nova Scotia with regards to community power but the sector is still young. Lessons from leaders in the field can provide guidance to policy-makers and other stakeholders to ensure a viable community power sector that benefits Nova Scotia. This study aims to determine, based on local experience, the remaining barriers to community power and to recommend solutions by learning from leaders in the field.

1.5 Research Questions

The questions guiding this study were:

- How was a viable community power sector realized in Denmark and Ontario?
- What are the barriers to greater community power development in Nova Scotia, Canada?

- Drawing from both Nova Scotia experience and the experiences of Denmark and Ontario, what are potential solutions to these barriers?

This study focuses on electricity because it is the form of energy that requires a coordinated approach from the province as a whole and because the technologies are deployment-ready. Denmark was selected as an area of focus because it is an international leader in community power with over 2100 wind co-operatives contributing to electricity generation (Gipe, 1996). Ontario was selected because it has become the leading province in Canada in community power. It should be recognized that, had other jurisdictions been the focus of this study, different recommendations may have been concluded.

1.6 Significance of the Study

Nova Scotia is the specific jurisdiction analysed by this study. Related research in Nova Scotia has looked at policies to support community power (Lipp, 2008). This study extends that research by including an examination of other contributing factors in addition to policy that contribute to the realization of a viable community power sector. This study also extends that study by including primary data collected in Denmark and Ontario. Although the specific area of focus is Nova Scotia, the findings of this study in relation to conditions that support a community power sector have relevance elsewhere. Also, the recommendations made specifically for Nova Scotia may be pertinent in other jurisdictions in which the centralized electricity model dominates.

This study took place at a time when the community power sector in Nova Scotia was undergoing significant changes, new renewable electricity targets and the introduction of the COMFIT being the most notable. Consequently, this study is also significant to current discussions and efforts in the realm of community power in Nova Scotia. The findings of the study may be immediately applicable to shaping the community power direction in the province.

CHAPTER 2 BACKGROUND

2.1 Background of Distributed Generation

European countries such as Denmark (Daugaard, 1997) and Austria (Rakos, 1998) were the first in the industrialized world to put into practice the ideas of distributed generation (Schweizer-Ries, Casper, Djuwita, Ramirez, & Hidalgo de Avila, 2001). The World Association for Distributed Energy (2006) found that in 2002, 13% of new electricity generation worldwide was considered distributed; in 2005 this number increased to 24%. Currently, most applications of the distributed CHP systems are fuelled by natural gas; however, fuels such as biomass or biogas are the renewable options. In Denmark, 60% of the electricity is generated in CHP units, many of which are fuelled at least in part by biomass, providing 80% of the country's heating needs (Maegaard, 2009a).

The International Energy Agency (2002) found that costs for electricity generation could be reduced by 30% if the generation facilities were built close to consumption load. Savings would be found in decreased line losses and a reduced need for expensive infrastructure to transport electricity (International Energy Agency, 2002). This would translate to tens of billions of dollars in Canada (Doukas, 2006). Distributed generation does not achieve economies of scale in installation and operation and maintenance costs. A study comparing electricity costs from distributed wind generation to large-scale wind projects found that the transmission costs saved with distributed generation can almost offset the diseconomies of small scale (Farrell, 2007). The study also found that the most significant factors in achieving economies of scale for wind developments were higher towers and larger swept area; savings found in increasing the numbers of turbines in one installation were modest (Farrell, 2007).

2.2 Background on Community Power

In the United Kingdom, it was found that, although surveys of public opinion consistently showed general support for the principles of renewable electricity (EDF Energy, 2005), opposition to individual projects remained frequent and resulted in the delay of many projects (British Wind Energy Association, 2009; Upreti & Van Der Horst, 2004). It has been noticed that wind projects in particular have faced local opposition for reasons including: insufficient public consultation (Devine-Wright, McAlpine, & Bately-White, 2001), aesthetic impacts of wind farms located in valued landscapes, and a lack of benefits to the local community while large utility companies were perceived to be profiting (Hinshelwood, 2001). A study on public response to wind energy in England, Wales, and Denmark noticed that "opposition groups were started due to anger that an outside company or single individual proposed a project that locals would not benefit from" (Loring, 2007, p. 2659). Advocacy groups pushed for a community approach to energy generation to help overcome the mounting opposition in a democratic manner (Walker, Hunter, Devine-Wright, Evans, & Fay, 2007). Experiences from Scotland found that community ownership of wind turbines increased local acceptance of wind power (Warren & McFadyen, 2010). An Australian study found that when the community's financial benefit and representation in the decision-making process are deemed fair by the community, the likelihood for community acceptance was increased (Gross, 2007). Community engagement literature supports this finding, stating that individuals who are engaged in the decision-making process are more accepting of the outcomes, whether or not the decision is their preference (Pinkerton & John, 2008).

Three distinct economic models applied to the state of Iowa found that local ownership of wind projects resulted in more economic benefits to the local community than a comparable wind project not locally owned or financed (Galluzzo, 2005). The U.S. National Renewable Energy Laboratory performed the first economic modelling of locally-owned renewable energy generation. It found that local ownership of wind projects would create five times more economic benefit and create twice as many jobs in the local community. Minnesota's Southwest Regional Development Commission conducted the second study, comparing external facility ownership to ownership amongst local landowners. It found that local ownership would produce significantly more jobs and local economic benefit in the area. The third model found the local economic activity to be ten times higher when wind ownership was local as compared to external (Galluzzo, 2005).

2.2.1 Definitions

The meaning of the terms, 'community' and 'community power' must be clearly understood before a further discussion of benefits and applicability of community power.

2.2.1.1 Community

Communities of locality and communities of interest have been suggested in academic literature as the two main ways to identify a community (Mitchell & Lynch, 1994). In an energy context, Denmark has demonstrated the variability of the community of locality definition. Prior to 1999 in Denmark, investors in a renewable energy project defined as a community project (and thus eligible for the financial incentives) were required to be from within one municipality. Next, the boundaries of community became nation-wide, demonstrating that the spatial extent of a community is variable (Sørensen, Hansen, & Larsen, 2002).

In Nova Scotia, a locality approach to community has been established. Those groups eligible for the community title as it pertains to energy projects in the COMFIT program has been limited to one or a combination of:

- a university;
- a municipality or a wholly owned subsidiary of a municipality;
- a Mi'kmaw band council;
- a co-operative or not-for-profit of which a majority of members reside in the Province and at least 25 members reside in the municipality where the generation facility is located; or
- a community economic-development corporation of which at least 25 shareholders or members reside in the municipality where the generation facility is located (Nova Scotia *Electricity Act*, c. 25, s. 20, 2010).

2.2.1.2 Community Power

Community power employs the definition of community but extends it for energy applications. It is a broad term that is variable in definition in both the literature and practice. The two perspectives on community power, and in particular what distinguishes it from conventional renewable electricity generation, emphasize either the economic or governance aspects of project control. The economic perspective focuses on the community economic benefit that occurs as a result of local financial investments (Mazza, 2008; Minnesota Project, 2009). In this case, project control is calculated as the percentage of equity invested by community members.

The alternative focus is on governance aspects of community power development that value local democratic control over resources (Christianson, 2007; Gsanger, 2009). In this case, authority over decision-making determines project control. Aspects of decision-making include initiating the idea, planning, selecting the site, managerial framework, infrastructure decisions, revenue allocation, and decommissioning. The two perspectives are neither mutually inclusive nor exclusive; they can be decoupled.

In policy, community power is most often defined using the economic perspective, likely because of its relative ease of measurement. Motivations for a jurisdictions' renewable energy policy appear to affect the definition of community power and the incentives offered. For example, jurisdictions wishing to rapidly increase renewable electricity tend to have more broad geographic boundaries for community and require lower percentages of community financial investment. For example, Ontario legislated a phase-out of coal power by 2014 (Ontario Ministry of Energy and Infrastructure, 2010); consequently, RE is being developed as quickly as possible. There, community is defined as:

> one or more individuals resident in Ontario; a registered charity with its head office in Ontario; a not-for-profit Organization with its head office in Ontario; or a "co-operative corporation", as defined in the Co-operative Corporations Act (Ontario), all of whose members are resident in Ontario (Ontario Power Authority, 2010c, para. 2).

Projects with as low as 10% community investments are eligible for a portion of the community price-adder (Ontario Power Authority, 2010b). Also, there is a specific incentive in place for Aboriginal investment, which demonstrates another of Ontario's motivation for community power, i.e., First Nations' economic opportunity (Ontario Power Authority, 2010a).

Nova Scotia's eligibility criteria for the COMFIT require that one of the community groups identified above provide a majority (>50%) of the equity for the renewable electricity project. The eligibility criteria also require the following:

- all biomass projects must be CHP;
- the electricity must connect to the distribution grid;
- the generation facility must be located in the province;
- if the generation facility is owned by a municipality or a wholly owned subsidiary of a municipality, it must be located within the boundaries of that municipality or the boundaries of an immediately adjacent municipality;
- if it is owned by a Mi'kmaw band council, it must be located on reserve lands or lands leased or owned by a band-controlled entity; and
- the project must have been issued a feed-in tariff approval (Nova Scotia *Electricity Act*, c. 25, s. 20, 2010).

It should be noted that the community requirements listed above do not all apply to a biomass CHP generation facility. In this case, all entities that have a use for the heat produced by the generation facility are eligible for the COMFIT rate. This includes industrial entities that have a need for steam in their processes.

The eligibility criteria for community power in Nova Scotia are a relatively restrictive list of requirements for community power compared to similar policies internationally. The most restrictive elements are the municipal boundary criteria, the minimum 25-member requirement, which excludes individual ownership, and the distribution-connection requirement. Nova Scotia's COMFIT rates are available to fewer participants than in other jurisdictions; thus, Nova Scotia appears to prioritize local decision-making. Nova Scotia's definition of community power will be employed for this study.

2.3 Relevant Background on Nova Scotia

2.3.1 Nova Scotia in General

Nova Scotia is a Maritime province on the east coast of Canada. It has three major water bodies surrounding it: the Bay of Fundy, the Atlantic Ocean, and the Gulf of Saint Lawrence. In terms of land connection, it borders only New Brunswick. The human population is just under one million and the population density is approximately 17 people per square kilometre (Nova Scotia Department of Finance, 2010). Many of the rural communities are experiencing population decline (Province of Nova Scotia, 2010). The largest city is Halifax with 398,000 residents in 2009 (Statistics Canada, 2010).

The economy has historically been based on natural resource industries, namely fishing, forestry, mining, and agriculture (Beck, 2010; Stedman, Parkins, & Beckley, 2004). Natural resources including forests and fish have been found to be in noticeable decline (Charles, Boyd, Lavers, & Benjamin, 2002; Glube, Marshall, & Shaw, 2010); consequently, economic activity has been shifting towards the service sector (Nova Scotia Business Inc., 2010). Nova Scotia's reliance on natural resource extraction has resulted in boom and bust economies (Haley & Sodero, 2007); hence, stable sources of income and strengthened communities have become of particular priority in Nova Scotia (New Democratic Party of Nova Scotia, 2009). The Province has recognized that renewable energy development is one way to create jobs for Nova Scotians (Nova Scotia Department of Energy, 2010b).

2.3.2 Electrical Situation in Nova Scotia

From the late 1800s into the mid-1900s, over 200 electric utilities, both privately- and publicly-owned, generated electricity in Nova Scotia (Smith, 2010). Currently, six of these companies remain and the rest were amalgamated into the publicly owned utility, Nova Scotia Power. In 1992, the Province sold the utility for $192 million (Smith, 2010) as well as $31 million each year (indexed to Canadian Price Index) (*Nova Scotia Power Privatization Act*, c.8, s. 18, 1992); thus the utility is now known as Nova Scotia Power Incorporated (NSPI). The generation and distribution of electricity in Nova Scotia is now handled by NSPI, a fully integrated company. In 1999, NSPI was bought by a holding company, now Emera (Nova Scotia Utility and Review Board, 2008). That same year, NSPI common shares were approved for listing on the Toronto and Montreal stock exchanges (Smith, 2010). Legislation in Nova Scotia limits shareholder returns to between 9.1% and 9.6% (NSPI, 2011). In 2009, NSPI served approximately 486,000 customers and had a generating capacity of 2,293 megawatts (MW), representing 97% of the electricity used in Nova Scotia (NSPI, 2009a). The company has 1,900 employees on staff (NSPI, 2010a). Because of the location of local coal resources when the centralized electricity generation facilities were built, current electric generation capacity is concentrated in the northeastern part of the province. However, the highest consumption area is Halifax (southwest of the generation).

The Nova Scotia Utility and Review Board oversees the activities and electricity rate-setting of NSPI. The Board is a quasi-judicial body that reports to the Ministry of Finance. It has regulatory and adjudicative authority as defined in the *Utility and Review Board Act* (c.11, 1992). The Board has authority over issues including "setting rates, tolls and charges; regulations for provision of service; approval of capital expenditures in excess of $250,000, and any other matter the Board feels is necessary to properly exercise its mandate" (Nova Scotia Utility and Review Board, 2008, para.1).

Due to its geography, Nova Scotia's electric grid operates much like an island with only one 345-kilovolt transmission line and two much smaller lines connecting to New Brunswick. For comparison, this is one fifth of the interconnection capacity that New Brunswick has to New

England and Quebec. As such, intermittent electricity (such as wind energy that is produced only when the wind blows) generation poses a challenge for power load balancing in Nova Scotia.

Electricity makes up almost half of the total energy used in the province (Statistics Canada, 2007). A demand-side management program has been underway since 2008 and now has a goal of improving overall energy efficiency by 20% by 2020 based on 2008 levels (Nova Scotia Department of Environment, 2009). This means that the ratio of energy consumed to fuel input will improve in the coming decade. The demand-side management efforts are focused on all energy types but electricity is a main focus because it makes up a significant portion of the energy consumed in the province.

The Department of Energy has legislated that renewable electricity must make up 25% of electricity by 2015 (Nova Scotia Department of Energy, 2010b) and 40% by 2025 (Nova Scotia *Electricity Act*, c. 15, s. 2, 2011). As such, Nova Scotia faces an inevitable technology transition. Of this new renewable electricity generation capacity, a target of 100 MW of community power was set by the Department of Energy (2010b), which was the capacity suggested by Adams and Wheeler (2009) in the recommendations from recent stakeholder consultations.

In Nova Scotia, there are six options for how a generator of renewable electricity can sell the product. First, any entity may generate and consume its own electricity through either an off-grid system with electric storage or through the net-metering program (for systems up to 100 kW). Second, the six municipal utilities managing their own communities' grids may sell renewable electricity directly to their ratepayers. The opportunity to sell electricity directly to ratepayers is not available to any other generators of renewable electricity in Nova Scotia. Third, renewable electricity from equipment owned by community groups and meeting other criteria are eligible for the COMFIT (Nova Scotia Department of Energy, 2010b). Fourth, in the near future tidal turbines above 0.5 MW in capacity may generate power and earn a specific tidal FIT. Fifth, transmission-connected projects have been and will continue to be tendered by NSPI. Independent power producers compete for contracts to produce power through a competitive bidding process, which is required to total at least 300 GWh by 2015 (Nova Scotia *Electricity Act*, c. 25, s. 6, 2010). Sixth, NSPI has been granted the right to 300 GWh of transmission-connected renewable electricity by 2015 (Nova Scotia Department of Energy, 2010b).

2.3.3 Challenges Facing Renewable Electricity Development in Nova Scotia

Those interested in generating electricity in Nova Scotia, either community groups or private business, face a number of challenges due to the process by which renewable electricity is developed. First, the current retail price for all forms of electricity is not calculated based on a full-cost accounting approach; therefore, externalities are overlooked. These externalities include the costs borne by society associated with carbon and other emissions from fuel combustion, among others. Fossil-fuel-generated electricity has generally larger externalities than most forms of renewable power; therefore, if full-cost accounting were required, fossil-fuel power would be less competitive and renewable power production would be stimulated. A study found that “the current system inappropriately advantages power generated from fossil fuel resources” and that “clean and efficient generation technologies are the most attractive when all options are examined using a full cost, levelized approach” (Roth & Ambs, 2004, p. 2125). An initial evaluation specific to Nova Scotia’s electricity system performed by the Genuine Progress Index Atlantic, a non-profit organization studying full-cost accounting, found that the external cost of damages from air pollutants and greenhouse gases alone summed in the range of $617 million to $4 billion per year (Lipp & Cain, 2005).

Second, Nova Scotia has missed targets for renewable electricity generation due to high rates of contract failure in renewable electricity procurement (Haley & Sodero, 2007). Since 2002, the contract success rate in Nova Scotia is 52%; the rest of the projects have failed, are pending approval, or were bought out by NSPI (Chernick, 2011). Contract failure under a competitive bidding process is common, averaging around 50% across North America when a competitive bidding process is used (KEMA Inc., 2006). A FIT process has been found to be a more effective contracting mechanism and will be discussed more below.

Local opposition is a third challenge facing renewable electricity development in Nova Scotia (Cole, 2007; Goodwin, 2008). Opposition is not unique to Nova Scotia; most jurisdictions and technologies face some level of opposition (Walker, 1995; West, Bailey, & Winter, 2010). For electricity generation in Nova Scotia, municipalities are responsible for setting by-laws, creating land-use plans, and issuing permits to developers. Many municipalities do not have the expertise or capacity to perform extensive community consultation to ensure their constituents have a voice in the creation of the by-laws or land-use plans. The Government of Nova Scotia has recognized the need for the community voices in wind energy decision-making. Consequently, in 2009, it created a Wind Energy Development Plan pilot project, which sponsored two pilot municipalities to conduct community consultations and generate wind energy plans (Nova Scotia Department of Energy, 2010a). Tidal and biomass electricity technologies have also faced some opposition, although these technologies are less established in Nova Scotia to date.

2.4 Community Management Theory

Community power, namely the community management of renewable electricity generation, draws parallels to community management of other types of resources. Notably, the disciplines are similar in so far as community members who are affected by the development or the use of a resource are directly involved in the decision-making about its use. There exists a significant body of research regarding the necessary elements for success of community management of common pool resources. Common pool resources are finite in nature and the depletion of them by one user subtracts from the ability of another user to benefit from the same resource (Agrawal, 2001).

At first glance, there is a notable difference between community power and community management of common pool resources. In community power, the focus is not often on regulating access to the resource (except sometimes in the case of biomass projects). Success is achieved in community power with the development of a community-owned, economically viable, and socially accepted renewable energy project. Alternatively, success for communities managing common pool resources is, as stated by Ostrom (1990, p. 90) but echoed in common pool literature, in the achievement of "sustaining the common pool resources and gaining the compliance of generation after generation of appropriators to the rules in use." This distinct difference in objectives results in variations in the necessary conditions for success. The differences are more thoroughly analysed using the community power case studies of Denmark and Ontario but the body of knowledge regarding community management of common pool resources provides an initial framework through which the case studies can be examined.

Studies by Robert Wade (1988 and 1994), Elinor Ostrom (1990), and Jean-Marie Baland and Jean-Philippe Platteau (1996 and 2000) are the seminal studies of community management.

Each study defined conditions that facilitated success for a community managing a common pool resource. The findings of these four authors were then analysed by Agrawal (2001) and a synthesized list of conditions facilitating success was the result.

Wade looked primarily at communally managed irrigation institutions in South Indian villages (1988). In a subsequent publication, Wade (1994) synthesized his 14 necessary elements for success into six categories: resources, technology, user group, notice-ability, relationship between resources and user group, and relationship between users and the state.

Ostrom (1990) analysed 14 case studies collected by other scholars including studies of communally managed meadows, forests, irrigation systems, water rights, and fisheries. She defined eight conditions for success, not all of which were present in each case depending on the complexity of the managing institution and resource. By splitting her eight conditions into their component parts, Agrawal (2001) found Ostrom to have 10 conditions supportive of success.

Bland and Platteau (1996) analysed economic literature regarding property rights to determine if private property is superior to regulated common property. They then tested their findings on case studies of state versus communally managed forest, pasture, and fishery resources. Bland and Platteau (1996) found eight conditions facilitating success of community management of common-pool resources. However, Agrawal (2001) again split them into their component parts to identify 12 conditions.

Agrawal (2001) grouped like conditions together where appropriate and organized the resulting 25 conditions of the three authors into six higher order groupings, as seen in Figure 1 below. This list of facilitating conditions provides an initial template upon which to test the conditions facilitating a viable community power sector. The case studies of Denmark and Ontario are used to test this template and determine where the conditions are applicable and where they differ.

1. Resource system characteristics
(i) Small size (W)
(ii) Well-defined boundaries (W, O)
(iii) Low levels of mobility
(iv) Possibility of storage of benefits from the resource
(v) Predictability
2. Group characteristics
(i) Small size (W, B&P)
(ii) Clearly defined boundaries (W, O)
(iii) Shared norms (B&P)
(iv) Past successful experiences—social capital (W, B&P)
(v) Appropriate leadership—young, familiar with changing external environments, connected to local traditional elite (B&P)
(vi) Interdependence among group members (W, B&P)
(vii) Heterogeneity of endowments, homogeneity of identities and interests (B&P)
(viii) Low levels of poverty
1. and 2. Relationship between resource system and group characteristics
(i) Overlap between user group residential location and resource location (W, B&P)
(ii) High levels of dependence by group members on resource system (W)
(iii) Fairness in allocation of benefits from common resources (B&P)
(iv) Low levels of user demand
(v) Gradual change in levels of demand
3. Institutional arrangements
(i) Rules are simple and easy to understand (B&P)
(ii) Locally devised access and management rules (W, O, B&P)
(iii) Ease in enforcement of rules (W, O, B&P)
(iv) Graduated sanctions (W, O)
(v) Availability of low cost adjudication (O)
(vi) Accountability of monitors and other officials to users (O, B&P)
1. and 3. Relationship between resource system and institutional arrangements
(i) Match restrictions on harvests to regeneration of resources (W, O)
4. External environment
(i) Technology:
(a) Low cost exclusion technology (W)
(b) Time for adaptation to new technologies related to the commons
(ii) Low levels of articulation with external markets
(iii) Gradual change in articulation with external markets
(iv) State:
(a) Central governments should not undermine local authority (W, O)
(b) Supportive external sanctioning institutions (B&P)
(c) Appropriate levels of external aid to compensate local users for conservation activities (B&P)
(d) Nested levels of appropriation, provision, enforcement, governance (O)

Figure 1 ***Synthesis of facilitating conditions identified by Wade (1994)***

CHAPTER 3 METHODS

The objectives of this study fall under the category of applied policy research. Applied policy research is distinguished by its requirement to meet specific information needs and its applicability to potential action outcomes (Ritchie & Spencer, 1994). The study took place at a time when Nova Scotia's community power sector was undergoing significant changes. The research questions of the study reflected questions in the broader discussion of community power in Nova Scotia. Because of this potential for applicability, the study meets the requirements of applied policy research.

Applied policy research questions are classified into the following categories:

1. contextual: identifying the form and nature of what exists;
2. diagnostic: examining the reasons for, or causes of, what exists;
3. evaluative: appraising the effectiveness of what exists; and
4. strategic: identifying new theories, policies, plans, or actions (Ritchie & Spencer, 1994).

Srivastava and Thomson (2009) found that applied policy research is most frequently used in health care studies (e.g. Gerrish, Chau, Sobowale & Birks, 2004; Read, Ashman, Scott, & Savage, 2004; School of Nursing and Midwifery, 2002). However, it has also been utilized for studies of information online (Balley, Bucher, Petrelli, Ruas, van Kreveld, Sanderson, & Sester, 2004) and studies on student performance (Archer, Maylor, Osgood, & Read, 2005).

Qualitative research is increasingly employed in applied policy research. It typically includes both literature reviews and primary data collection to gather the experiences and perceptions of those likely to be affected by the outcomes (Walker, 1985). Since those involved in the community power sector in Nova Scotia are the ones most likely to be affected by any application of the findings of this study, their experiences and perceptions were sought during the data collection. Analysis of literature was also used as described below.

A research body specializing in qualitative applied policy research, the Social and Community Planning Research Institute developed the 'framework' analytical approach for applied policy research. The framework approach was used for this study. Steps of the approach are: familiarization, thematic framework identification, indexing, charting, and mapping/interpretation (Ritchie & Spencer, 1994).

3.1 Data Collection

The data collection and analysis process is described for each research question. As a reminder, the research questions are: 1) How was a viable community power sector realized in Denmark and Ontario?; 2) What are the barriers to greater community power development in Nova Scotia, Canada?; and 3) Drawing from the Nova Scotia experience, the experiences of Denmark and Ontario, and the broader literature, what are potential solutions to these barriers?

3.1.1 How was a Viable Community Power Sector Realized in Denmark and Ontario?

The first question is a contextual question, looking to understand the process by which viable community power sectors were realized in Denmark and Ontario. Data were collected through an analysis of literature and expanded through interviews. Academic and practical literature related to community power development was reviewed to understand experiences in Denmark and Ontario and to identify themes that would become the focus for the subsequent interview process. Interviews were undertaken to answer question three (see section 3.1.3 for an explanation of the interview process) but the data collected provided some insight into how community power was realized in the respective jurisdiction and thus were also applicable to answering question one. The process by which each jurisdiction arrived at a community power sector was understood through the means of case studies.

A substantial amount of the academic literature was found in the Science Direct database, in particular from the journal *Energy Policy*. Other databases I used included: Wiley InterScience, InformaWorld, Project Muse, and Research Library. The literature assessed also included historical accounts authored by academics and individuals involved in the sector, policy documents from Denmark and Ontario, and assessments of policies authored by the International Energy Association. Words used to search the academic and practical venues included: community, renewable, electricity, energy, distribute, policy, engagement, local, education, approval, economic, environment, and benefit. Reference lists from informative articles were frequently used to identify further reading.

To better understand the process through which viable community power sectors were realized in Denmark and Ontario, the literature regarding community management of common pool resources was assessed. The conditions found by scholars to be supportive of community management of common pool resources provided a template upon which to compare the process by which Denmark and Ontario brought about community power sectors. This comparison resulted in a list of conditions supportive of community power that provided the framework for the following stages of the study.

3.1.2 ***What are the Barriers to Greater Community Power Development in Nova Scotia?***

The second question falls under the category of a diagnostic question as defined by Ritchie and Spencer (1994) because it is looking to understand the reasons for the state of the present community power sector in Nova Scotia. Data gathering methods included: analysis of literature, interviews with key informants, and follow-up questioning with supplementary informants. For the literature review specific to barriers in Nova Scotia, policy documents, public consultation summaries, electricity-related studies, newspaper keyword searches, and descriptions of projects from within Nova Scotia were utilised. These were typically found on the websites of the Government of Nova Scotia, NSPI, municipal governments, and non-governmental organizations.

Purposive selection techniques were used initially to identify potential interviewees. In purposive sampling, the researcher's knowledge and judgement are used to identify elements from the sample that will best serve the study's objectives (Sullivan, 2001). The selection process was informed by the literature reviews, which identified the sectors of society that played a role in the community power sector. Those identified included: provincial and municipal policy-makers, electric utilities, technology and financial firms, community development organizations, education providers (formal and public), agricultural sector representatives, legal experts, business-people, urban planners, carbon accountants, and renewable energy opponents. Interviewees were selected from each of these sectors. In addition to purposive selection, snowball-sampling techniques were used in which referrals from initial participants helped identify additional informants (Goodman, 1961). Early interviewees were asked to identify others involved in the sectors of interest, which helped ensure that individuals whose knowledge and experience would be of value were identified and included in the study. As Nova Scotia is a relatively small and socially connected province in the realm of community power, the combined purposive and snowball sampling methods were seen to effectively identify study participants.

For the Nova Scotia-specific research, 21 semi-structured, face-to-face interviews with key informants who normally reside in Nova Scotia were conducted to elicit information regarding the perceived barriers to greater community power development in Nova Scotia. Interviewees signed a waiver form, permitting the use of their name or title in this study (see Appendix A for a list of interviewees and the interview guides). The objective of the interviews was to better understand how community power has been initiated in Nova Scotia and to uncover the challenges to its deployment. The individuals selected were those with particular involvement in electricity issues. At least one informant was selected from each of the categories identified in the purposive sampling process. Each interview focused on topics relevant to the interviewee's area of expertise; however, most informants provided insight into multiple areas, which allowed for a broader data set. All participants were asked to respond on behalf of the organization that they were representing. If they wished to state their personal opinion, they were asked to identify it as such. It should be noted that, since Nova Scotia has very little experience in community power, the barriers were identified based on the perceptions of key informants rather than an analysis of case studies.

Interviews focused on the interviewees' perceptions of barriers to greater community power development as well as suggestions to overcome the barriers. The specific topics discussed are as follows (the numbers of key informants with specific expertise on the topics are in parentheses):

- provincial policy: the visions for community power of the Departments of Energy (1) and Environment (1), resources directed towards it,
- municipal policy: authorities of municipal entities, with and without electric utilities (2);
- electric utilities: current process to generate renewable electricity, perception of community power, plans to procure community power (2);
- technical issues: aspects of grid interconnection, construction and decommissioning of facilities, generation technologies applicable (3);
- financing: process of accessing financing for community power projects, experiences with the CEDIF (3);

- education: formal education in post-secondary institutions involved in training the renewable electricity workforce (2), public outreach and engagement around community power (3);
- agriculture: interest and applications of renewable electricity in the agricultural sector, support needed for farmers to get involved in community power (2);
- law: authorities of municipalities under the *Municipal Government Act*, legal implications of electricity contracts and land lease contracts (1);
- business: business and management structures applicable to community power, entities to advise (3);
- urban planning: community consultation and the creation of by-laws for community power (1);
- carbon pricing: opportunities for revenue generation from carbon pricing (1);
- public opposition: reasons for opposition to renewable electricity projects, suggestions for more acceptable means to develop renewable electricity (1).

Particular effort was made to conduct all 21 interviews face-to-face. This was to eliminate any biases inherent in telephone interviews versus those performed in-person. It was also to earn the interviewees' trust and to ease the flow of ideas in the conversation. Electronic communication was used for follow-up questions when necessary. All interviews were arranged through electronic communication at a time and location suitable to each interviewee. A background document and consent form was provided to the interviewee prior to the interview date (See Appendix A). Interviews took place between June 2009 and February 2010. It was made clear at the outset of each interview that participation was voluntary and could be terminated at any time. Following this, participants were given time to read the background document if they had not done so previously, then were asked to sign a consent form (see Appendix A). In general, each interview took approximately 30 minutes but ranged from 19 to 62 minutes. Each was audio recorded to ensure that responses were documented accurately and fully. At the end of each interview, all participants were also invited to provide any follow-up information or thoughts electronically. All interviewees were fluent English speakers, thus all interviews were conducted in English.

Frequently, an additional literature review was undertaken after an interview to better understand issues that arose during the interview. In these cases, the literature consulted generally consisted of policy documents, public consultations, government-contracted studies, or publications by NSPI that had been referred to by interviewees. In a few instances, questions arose that literature could not sufficiently clarify. In these situations, supplementary informants were contacted with specific questions. These informants had expertise specific to the issue in question and were identified using either desktop research or snowball techniques. A list of the supplementary informants appears in Appendix A.

In some cases, I was familiar with the interviewee prior to the interview. In such cases, the participants may have had a pre-conceived perception of me. To mitigate any effects of this, I explained the objectives of the study in both the background document and in conversation at the outset of the interviews. Also, throughout the research process I was conscious of being neutral in tone and expression to reduce any influence on the data collected.

3.1.3 ***Drawing from the Nova Scotia Experience, the Experiences of Denmark and Ontario, and the Broader Literature, what are Potential Solutions to these Barriers?***

The third question is both evaluative, appraising the effectiveness of what exists, and strategic, identifying new theories, policies, plans, or actions (Ritchie & Spencer, 1994). Literature reviews and semi-structured interviews were employed to examine this question. This part of the study was not intended to undertake an exhaustive review of international experiences with respect to community-based renewable electricity development. Rather, it looked at select jurisdictions, namely Denmark and Ontario, because of their leadership in the field and/or their relevance to the Nova Scotia context, as explained in the Introduction Chapter (section 1.5). In some cases, literature from those jurisdictions was insufficient to understand a particular solution to a barrier, in which case broader literature was consulted.

The literature review focused on policy documents, policy reviews, and publications to assist community power projects, project reviews, and conference proceedings. Searches for this information focused on the keywords: community, renewable, electricity, energy, financing, distribute, policy, engagement, local, education, approval, economic, environment, and benefit.

Next, a second round of interviews was conducted with key informants from Denmark and Ontario. Again, purposive and snowball sampling techniques were used to identify appropriate individuals in each of these jurisdictions to interview. The focus for this phase was on learning from those with experience in community power. As such, individuals involved in community power projects or supporting organizations, as well as academics familiar with the history of community power in their jurisdictions, were selected as interviewees. In total, 12 interviews in this phase of the research were conducted, six in Denmark and six in Ontario.

Interview questions were framed around how community power attracted interest in the region, challenges it faced, support mechanisms that assisted, and suggestions for expansion of community power. See Appendix A for a list of interviewees and the interview guide.

Again, the literature was readdressed to better understand the topics discussed after certain interviews. In this case, the literature involved documents explaining case studies and demonstration sites mentioned by interviewees.

3.2 Data Analysis

Ritchie and Spencer's (1994) framework approach was employed for data analysis of all questions, with the following steps: familiarization, thematic framework identification, indexing, charting, and mapping/interpretation. Since data for question one informed the process of data analysis for questions two and three, they were analysed first.

3.2.1 Data Analysis for Question One

The data to answer the first question - how was a viable community power sector realized in Denmark and Ontario? - were collected through literature reviews. The data regarding the process by which community power was realized in Denmark and Ontario were collected from historical recounts, not a statistical analysis of actual uptake rates; therefore, the data were limited to the level of detail provided in the literature and interviews.

Familiarization with the data took place through re-reading of the two histories, Denmark and Ontario's. The data were organized chronologically for each jurisdiction.

For the thematic framework process, literature regarding community management of common pool resources was analysed. The list of conditions supportive of successful community management, as concluded by scholars, provided the thematic framework. This list was organized into six headings: resource system characteristics; group characteristics; relationship between resource system and group characteristics; institutional arrangements; relationship between resource system and institutional arrangements; and external environment (Agrawal, 2001).

Indexing involved comparing the conditions supportive of community management of common pool resources against the case studies of community power in Denmark and Ontario. Stages in each of the case studies were identified as relevant to each category of the list of conditions for community management of common pool resources.

Charting involved a more detailed analysis of the case study information in relation to the categories of community management. The community power information was separated in its relation to the sub-categories in the list of conditions for community management of common pool resources.

Mapping and interpretation involved editing the list of supporting conditions for common pool resource management to reflect the case studies of Denmark and Ontario. The result was a list of conditions facilitative of a successful community power sector.

3.2.2 ***Data Analysis for Questions Two and Three***

Interview data gathered to answer questions two and three were also analyzed using the analytical framework approach. The analysis was informed by the results of question one. The list of conditions identified in question one helped to inform the data analysis of questions two and three.

Familiarization

First, interview recordings were transcribed iteratively during the interview process, which allowed me to familiarize myself with the data (Srivastava & Thomson, 2009). Iterative transcription also informed more in-depth discussions during the following interviews (Kendall, 1998). All interviews were transcribed by me, which minimized the potential for misheard recordings since I also heard the interview first hand (Eason, Fry, & Greenburg, 2000). Interviews were transcribed into Microsoft Word documents in a non-verbatim format, which included point-form annotations of all ideas mentioned in the interviews. These transcriptions were to act as a guide to the location of information in the recorded data. The recorded data were then referred to during the analysis process to ensure correct interpretation. Referring to the recorded data rather than verbatim transcriptions was possible due to the manageable volume of data collected.

Data gathered through literature review to provide more in-depth understanding of the issues brought up by the interviews were reread for familiarization and sections of particular applicability were noted.

Initial Thematic Framework

Next, the interview transcriptions and literature data were reviewed and organized as data from Nova Scotia, Ontario, or Denmark.

Indexing

The next step was indexing, in which data were indexed as one of: a barrier to community power, a solution, or an example of either a solution or community power experience. Direct quotations of relevance were noted. Microsoft Excel was the software program used to organize the interview data from this point on.

Charting

Charting was undertaken by employing the list of conditions that emerged from the results of question one. Interview and literature data were organized under the condition headings. Some data fell into multiple conditions and were charted as such.

Mapping/Interpretation

The last step, mapping/interpretation, drew results by considering the results from question one with the charted data from questions two and three. First, the results from question one provided an understanding of the context. Then, the data from Nova Scotia indexed as barriers were considered. These barriers, as perceived from interviewees of different backgrounds, were triangulated with one another and with data from literature. This triangulation provided a more accurate and detailed understanding of the barriers. To find potential solutions to the barriers, the interview data from Nova Scotia, Denmark, and Ontario, as well as data from the literature, indexed as solutions were considered together. This resulted in multiple solutions being identified in some cases. Again, triangulation was used to determine which solution a) had been the most effective at overcoming a similar barrier, and b) would be most applicable to Nova Scotia. For the latter element, Nova-Scotia-specific data from interviews and literature provided insight to predict which solution would be the most applicable in the Nova Scotia context. Finally, the resulting list of recommendations was grouped first based on the entity responsible for enacting it, then by subject, and finally chronologically based on the experience of Ontario. Ontario's timeline was utilized solely for this chronology as Ontario has initiated a community power sector more recently than Denmark, which more closely resembles the situation in Nova Scotia compared to the century-long evolution of Denmark's community power sector. Not all of the recommendations had been demonstrated by Ontario; thus, for the recommendations that had not been demonstrated, the ordering was in no specific order.

CHAPTER 4 RESULTS

4.1 *Case Studies of Successful Community Power Sector Development*

The histories of community power in Denmark and Ontario reveal a general process through which viable community power sectors were realized. These case studies also provide a basis for comparing the conditions supportive of community power to those of community management of common pool resources, as summarized by Agrawal (2001) and seen in Figure 1.

Although community power in Denmark and Ontario was driven by different motivations approximately 100 years apart, an evaluation of the histories shows similarities in the conditions supportive of a successful community power program. Denmark and Ontario are both considered leaders in the field of community power in their respective continents. However, there are many other jurisdictions with successful or emerging community power sectors. An analysis based on the experiences of other jurisdictions may well uncover a different set of conditions that support the realization of a community power sector.

It should be noted, in the case of biomass projects, or other renewable energy projects in which the resource can be considered common pool, that this study considers community power to be only the community ownership and management of the power generation project. The harvesting of the resource could occur through many different methods, one of which could be community forest management, in which case, the studies of community management of common pool resources would apply. This study does not discuss the resource provision process in detail.

4.1.1 *Denmark*

Collective ownership models became commonplace in Denmark in the renewable energy sector for a number of reasons, many of which stem from the late 1800s. Since 1898, a financial instrument has been available to community groups through Kommunekredit, a municipal association, which allowed municipalities to offer loan guarantees for collective energy systems (Kommunekredit, 2010). Most of the community power projects to date still rely on this financial instrument to secure debt financing with banks at favourable rates.

The roots of community power in Denmark started with wind power as far back as 1891. In that year, a Danish inventor, Poul La Cour, invented the first electricity-producing wind turbine in Europe. The year 1891 also marked the opening of the first electric power plant in Denmark and, by 1918, the number of power plants had increased to 360, many of which used kerosene and diesel engines to generate power (Thorndahl, 2009). These power facilities provided the initial grid infrastructure. Early in the 20th century, La Cour attained a government grant to continue research and development in wind turbine and energy storage technology (Quistgaard, 2009). The increase in diesel and oil prices during World War I resulted in consumer demand for wind energy, the first wind turbine 'rush'. By 1918, there were 250 wind turbines operational in Denmark; 120 of the power plants operated wind turbines as well as many industrial companies that were not connected to a power grid (Thorndahl, 2009).

Training of the labour force started in 1904 when the Askov High School offered courses for rural electricians, including classes on wind electricity. From 1908 to 1918, the Danish Government funded the course until standardized training was implemented (Thorndahl, 2009). With this early training and the dispersed nature of the technology development, widespread expertise in the labour pool resulted. However, the efficiencies achieved in internal combustion engine design "strongly limited the possibilities of applying wind power" for the half a century following (Thorndhal, 2009, p. 23). Demand decreased for wind turbines because of the availability of a cheaper source of energy.

During this time, inventors in Denmark continued to research and develop the electric wind turbine design and, in the 1950s, Johannes Juul arrived at the design most prevalent today (Thorndahl, 2009). When the oil crisis struck in 1973, Denmark was severely affected as 92% of its energy came from imported oil (Maegaard, 2009b). In response, the Danish government proposed large-scale deployment of nuclear electricity. This triggered public demand for a renewable energy future as a preferred alternative. A small group of interested citizens formed the Organization for Renewable Energy and voiced demand for wind energy and co-operative ownership in particular (Lipp, 2007b). Because of a) Denmark's history in collective action, b) the dispersed capacity in the wind sector, and c) the fact that centralized energy generators favoured a nuclear future, the public demand for renewable electricity was coupled with demand for community ownership (Thorndahl, 2009). An association of wind turbine owners added to the lobbying strength. The wind turbine manufacturing industry, supported by the Danish Blacksmith Association, voiced its support as it saw business opportunities in wind power (Thorndahl, 2009). A coordinated public education campaign was undertaken by the wind energy sector, which increased awareness about the benefits of wind energy and the dangers of nuclear energy.

In response to public and labour pool demand, Denmark instituted a ban on nuclear energy, which it has maintained to date. In 1976, the Danish government expressed federal support for research and development of various renewable energy technologies through the Energy Research Programme (International Energy Agency, 2004). In 1979, the first investment subsidy for renewable energy technologies was created (Madsen, 2009). At the same time, the federal government sent letters to all municipalities asking them to act favourably towards renewable energy projects. Letters were also sent to utilities, requesting them to negotiate fairly with renewable electricity producers for grid connectivity (Madsen, 2009). A definition of community power was legislated federally, limiting individual ownership of wind turbine projects equivalent to the value of 9,000 kwh of generation capacity, the average annual household consumption at the time (Maegaard & Kruse, 2002).

In the early 1980s, both the governing party and that in opposition expressed political support for renewable energy. Thus, in 1981, the First Energy Plan set national targets for renewable energies accompanied with achievement mechanisms. Every two to five years following, the targets and plans were revised (Lipp, 2008). A demonstration and training facility for wind turbines was created in 1983 at the Folkcentre for Renewable Energy and a few years later at the Riso Research Centre. The nuclear energy plans were abandoned in 1985, while utilities were required to allow grid access to 100 MW of electrical generation from independent power producers. An income tax allowance was introduced for individuals owning up to 7,000 kWh of wind power (Lipp, 2007b). A wind turbine research facility, the Riso Research Centre, was opened in 1986 to ensure standardized testing of technologies (Lipp, 2007b).

In 1988, electric utilities were directed to pay a fair rate for wind power, which was based on retail rates but was not strictly defined (Bolinger, 2001). In 1991, a carbon tax was instituted on fossil fuelled energy. This tax has risen steadily and been augmented by taxes on other externalities such as sulphur emissions (International Energy Agency, 2004). These taxes made for a more accurate cost comparison between fossil fuelled energy sources and renewable forms of energy. Most of the revenues from these taxes were allocated to increasing energy efficiency and renewable energy generation (Vehmas, Kaivo-oja, Luukkanen, & Malaska, 1999).

In 1992, the required rate paid by utilities for renewable electricity was 85% of retail electricity rates. Then, in 1993 a true FIT was introduced and was set at 85% of the cost of utility production and distribution costs (Bolinger, 2001). Generators of renewable electricity also received substantial carbon and energy tax refunds (Farrell, 2009). In Denmark, it was found that the FIT was foundational to the widespread development and the increased public support for wind energy across Denmark (Hvelplund, 2005). From 1993 to 2000, wind capacity installed each year increased from approximately 50 MW in 1993 to 650 MW in 2000 (Meyer, 2006).

In the early 1990s, the Danish central government removed municipal authority over planning approvals for wind turbines, resulting in significant opposition (Danielsen, 1994). By 1993, this decision was reversed and municipalities were directed to allocate sites for wind power production (Danielsen, 1994). In 1994, the Ministry of Environment required municipalities to include 2,500 MW of wind energy in their land-use plans (International Energy Agency, 2004). Wind generation requirements were continually increased thereafter (Lipp, 2007b). On occasion this resulted in community conflict, as landowners who were granted renewable electricity sites on their land were able to profit from renewable electricity generation while neighbouring landowners received nothing; it also created opportunities for corruption and nepotism in the wind site selection process (Danish Community Power representative 2, Nov 30, 2009). Such conflicts were magnified in Denmark over the years that followed. Due to the large number of turbines already installed and the population density, sites for wind turbine were limited, resulting in higher values paid to land owners and intensifying neighbour conflicts.

A federal income tax credit, the Wind Energy Co-operative Tax Incentive, was introduced in 1997 to encourage individuals to invest in community-owned wind systems, which leveraged individual equity investments in wind energy. At the same time, federal legislation regarding local ownership of wind turbines was enacted. From 1997 to 1999, all investors in wind energy were required to be within the municipal boundaries where the turbine was erected (Sørensen, Hansen, & Larsen, 2002). This restriction resulted in broad involvement in the wind energy sector, a dispersion of the benefits, and wide acceptance of the technology (Maegaard, 2009).

At the height of public participation in Denmark, 150,000 households owned shares in wind turbines (Nissen, 2009) and community-owned turbines made up over 80% of wind power generation (Bolinger, 2001). It was noticed that local ownership of renewable electricity brought about widespread public support because the beneficiaries were community members (Meyer, 2006).

In 1997, a national competition was announced, offering financial support for a region to demonstrate a transition to 100% renewable energy in 10 years (Fairey, 2008). Samsø Island became this demonstration site. Supported by federal incentives until 2002, the island created a 10-step plan to energy autonomy (Samsø Energy Academy, 2011) in which community ownership of wind turbines and district heating systems played an essential role. The Samsø Energy Academy was established in 2006 to share the lessons learned (Samsø Energy Academy, 2011).

Federally subsidized training courses for trades people in renewable energy were reinitiated in 1998 and the 2001 budget included support for training and certification centres (International Energy Agency, 2004). Through their efforts in research, development, and training, the Danes achieved 80% cost reductions in wind power production and were the world leaders for many years (Danish Wind Industry Association, 2006; Hvelplund, 2005). In 1999, it was legislated that grid expansion plans prioritizing renewable electricity developments (*Denmark Act on Electricity Supply*, s. 12, 1999).

In Denmark, municipalities were given the ability to own renewable electricity facilities. In some cases, municipalities partnered with co-operatives to develop renewable electricity projects (Gipe, 2004). Revenues from municipally owned renewable electricity facilities were required to be re-invested in more renewable electricity generation but there was no restriction on how revenue from land leases or taxes was spent (Danish Academic representative 2, June 10, 2011).

Although some programs to support renewable electricity continued, Denmark also experimented with actions that hindered or halted the development of community power. In 2000, legislation removed the priority given to community ownership by allowing international ownership of wind turbines. In 2001, a new federal government changed the support for renewable energy significantly. The FIT was ended and renewable electricity generators were then paid the market rate set by the Nordic Power Exchange plus an environmental premium capped at 0.10 DDK/kWh. This offered less financial security to renewable electricity developers since the market price varied and was seen to be too low (Danish Wind Industry Association, 2006), which resulted in a significant slowing in the pace of renewable electricity development (Lipp, 2007b; Meyer, 2006). At the same time, the new policy direction stopped support for research and development efforts and centres of renewable electricity knowledge struggled to continue, resulting in a significant drop in the development of RE; by 2005 there was no new wind development (Lipp, 2007b). At the same time, a decrease in the number of Danish households invested in wind energy from 150,000 to 4,900 was noticed (Maegaard, 2009b; Nissen, 2009). An increase in the prevalence and persuasion of opposition groups was also noticed at this time (Maegaard, 2009b).

Other incentives were offered such as the re-power program, which paid a premium rate for wind developments replacing smaller turbines. Also, in response to the stagnation, the cap on the environmental premium offered to wind was lifted (Farrell, 2009) but wind development, especially community power, remains stagnated.

During these changes to the financial support for renewable electricity, other activities supporting renewable electricity were ongoing. In 2002, a national public awareness strategy was introduced to increase the general support for renewable energy (International Energy Agency, 2004). Facilitation entities including Energy and Environmental Data and Plan Energi were created to assist with the planning and development of many types of renewable energy projects.

In 2007, 3,300 MW of wind capacity contributed to the Danish electricity mix. With maximum and minimum system loads of 6,300 MW and 2,000 MW respectively, wind made up approximately 20% of total power consumed and often exceeded the total consumption (Akhmatov, Rasmussen, Borre Eriksen, & Pedersen, 2007). Akhmatov et al. (2007) described the steps that Denmark took to reach this level of wind penetration while maintaining a stable grid, some of which are described here. State-of-the-art wind forecasting technologies were developed to generate three forecasts per hour at each location. This was especially important for offshore wind generation because of the significant fluctuations in power output. Denmark joined the Nordic power market and purchases hydroelectricity from Norway to balance the wind generation. The many CHP facilities in Denmark provide voluminous hot water storage, which helps to balance production and demand. Investments in transmission lines between the east and west regions enabled more wind energy by transmitting the power from generation to consumption points. Technologies such as static VAR compensators and power ramp controls on offshore wind turbines help stabilize the voltage fluctuations and disconnection of onshore wind turbines help to stabilize the grid when the voltage falls outside the normal range (Akhmatov et al., 2007).

In 2008, the Danish Law on the Promotion of Renewable Energy introduced three aspects of relevance to community power. First, the new renewable electricity targets included a requirement that 20% of shares in new wind turbines over 25 m tall be offered to the local community (s. 13, 2008). Consequently, all wind development post-2008 has some level of community financial ownership. Second, landowners within a certain radius of the turbine were given the right to apply for compensation of land value losses (s. 6, 2008). This was seen as controversial as it was unprecedented for any other type of development (Jensen & Jacobsen, 2009). It was intended to increase local acceptance but it may support the idea that wind turbines create an undue burden on the local community (Danish Developer representative, Dec 3, 2009; Danish Academic representative 2, Feb 4, 2010). Third, the law enabled municipalities to provide recreational opportunities and educational programs to promote renewable energy. The funds available to the municipality correspond to the amount of wind capacity installed in the municipality (s. 18, 2008). It has yet to be seen if this new legislation will change the environment significantly for community power in Denmark.

4.1.2 Ontario

The history of community power in Ontario began in the mid-1990s. At that time, electricity in Ontario was produced with nuclear reactors (57%), hydro-electric power (26%), coal combustion (11%), and natural gas (6%) (Rowlands, 2006). The Ontario Medical Association and the Ontario Clean Air Alliance were both involved in increasing public awareness of the health concerns of coal combustion. This, coupled with increasing smog in urban centres, created public demand for a decrease in coal combustion (Rowlands, 2006).

In 1999, the Ontario Sustainable Energy Association (OSEA) was formed with representatives from renewable electricity developers, environmental organizations, and community organizations. This Association's objective was to bring about community power in Ontario. In 2002, the Toronto Renewable Energy Co-operative partnered with Toronto Hydro Energy Services to install Canada's first community-owned wind turbine in downtown Toronto, which subsequently became a noteworthy demonstration site. This project was developed prior to the FIT program without government subsidies (Toronto Renewable Energy Co-operative, 2006).

In 2003, just before an election, the governing Conservative Party of Ontario announced its political support for renewable energy and stated it would create a Renewable Portfolio Standard, setting targets for RE (Ministry of Energy, 2003). In August of 2003, before the Standard was legislated, Ontario experienced a widespread electricity blackout, which reinforced concerns regarding electricity supply. During the election of October 2003, all three major parties committed to phasing out coal-fired power with the Liberals committing to doing so by 2007 (Pembina, 2006). The Liberal party won the election, following which it confirmed its support for RE by setting generation targets of 5% by 2007 and 10% by 2010 (Ontario Liberal Party, 2003). To meet these targets, a competitive bidding process was employed until 2005, which did not facilitate community ownership.

Meanwhile, the existing nuclear facilities were nearing the end of their functional life and electricity consumption was increasing. Electrical supply was increasingly becoming a critical issue and RE was entering the public discourse. Starting in 2004, OSEA hosted workshops province-wide on the local economic benefit of community power and highlighted it as a real alternative to private ownership of renewable energy resources. The topic of co-operative ownership, particularly for electricity systems that had been centrally owned for decades, was novel to most participants in the workshops (Ontario Financing representative, Oct 8, 2009). After the community workshops, leaders in the community were identified and appointed to carry on the discussions in that community (Ontario Community Facilitator representative, Aug 23, 2010). Experience with community power in Europe provided the evidence. This awareness campaign, in addition to health concerns related to coal combustion, contributed to public demand for RE, community power specifically (Rowlands, 2006). The labour pool in Ontario also supported community power as a way to improve public acceptance and investment in the industry (Ontario Green Energy Act Alliance, 2009).

In 2006, after pressure from industry and environmental advocates, the request-for-proposal (RFP) process was foregone in favour of a Renewable Energy Standard Offer Program, which set standardized rates for four renewable technologies. The program was expected to generate 1,350 MW of renewable electricity and was viewed as a leader among green energy policies in North America at its time. It fell significantly short, resulting in only 55 MW of new generating capacity (Ontario Sustainable Energy Association [OSEA], 2011a). Although the Energy Minister had required non-discriminatory access to the grid for renewable electricity projects (Hamilton, 2005), just eight months after making that announcement, a contract was signed to upgrade a nuclear electricity facility on the Bruce Peninsula, which resulted in the creation of 'orange-zones' in much of southwestern Ontario. This orange-zone meant restricted access to the grid for renewable electricity (Del Franco, 2009). Community power projects stalled as a result. In addition to restricted grid access, lack of access to start-up financing was pointed to as a reason for the policy failing to meet its targets (Ontario Green Energy Act Alliance, 2011). In 2007, the Province of Ontario created the Community Power Fund, a one-time $3 million grant program, to help community power projects financially.

Representatives of environmental, labour, First Nations, and agricultural groups joined to form the Green Energy Act Alliance to advocate for legislation supportive of community power (Ontario Green Energy Act Alliance, 2009). A poll conducted in Ontario found that the most significant reason for individual support of the then proposed Green Energy and Green Economy Act was its perceived contribution to greenhouse gas reductions followed by reliable, local electricity generation (Pollara, 2008), showing that community power was desired by the public. In 2009, the *Green Energy and Green Economy Act* was passed, introducing a comprehensive FIT program including differentiated rates by technology and by size as well as premium rates for community ownership (Ontario Power Authority, 2009).

Community power was first defined in legislation in the *Green Energy and Green Economy Act*. It was defined on a financial basis, requiring one or more resident(s), charities, not-for-profits, or co-operatives of Ontario to be financial owners of the project. The definition included a sliding scale of ownership with incentives, called a community price-adder, relative to the level of community financial ownership (Ontario Power Authority, 2010b). Projects with 10% community ownership would receive 20% of the community price-adder (which ranged from $0.004 to

$0.01/kWh) up to 50% community ownership, which received the whole community price-adder (Ontario Power Authority, 2010b). There is a similar price-adder for Aboriginal power; the adder ranges from $0.006 to $0.015/kWh (Ontario Power Authority, 2010b). Ontario has included a microFIT program for projects under 10 kW in capacity, which receive the highest rates for the power they generate. This program to date has received 46,464 applications, which is 82% of all applications to the FIT and microFIT programs combined (while 2% of the MWhs) (Ontario Power Authority, 2011a). Because microFIT projects are small, individuals and small businesses are able to become involved in renewable electricity generation. Financing is accessible and the application, approval, and grid connection processes are simple. Schools, church groups, farmers, and individual home-owners are signing microFIT contracts and generating solar power on their properties.

It was legislated that all renewable electricity generation facilities meeting certain standards are given priority connection (Ontario *Electricity Act*, c. 15, s. 25.36, 2011). However, an upper cap on the FIT and microFIT programs of 10.7 GWh by 2017 was included in the Long Term Energy Plan (Province of Ontario, 2010). There is no target set for community power in Ontario. As directed by the Act, upgrades were planned for both the distribution and transmission grids to facilitate grid access for more renewable electricity generation and these plans were made public. All distribution grid operators in Ontario were required to provide free of charge any relevant basic grid capacity information to all micro-sized generators. This helps to facilitate an efficient process as projects proposed can be sized appropriately from the outset (Ontario Energy Board, 2010). The Act also grants the right to connect to either the transmission or distribution grid to renewable electricity projects of any size and gives renewable electricity priority before other forms of electricity generation (Ontario *Electricity Act*, c. 15, s. 25.36, 2011). Once granted a contract, Ontario renewable electricity proponents pay all project-specific connection costs.

Hydro One, the main transmission system operator, was required to make public the capacity for each of its sub-distribution stations as well as a list of those who have applied to connect (Hydro One, 2009). A breakdown of the costs that a renewable electricity project can expect for interconnection is also publicly available, which helps community power proponents understand the requirements they face for interconnecting (Hydro One, 2009).

The installation of smart-grid technologies was also legislated in 2009 (Ontario *Electricity Act*, c. 15, s. 53.0.1, 2011). A smart grid involves a two-way monitoring system that allows the generator to communicate with the end-use consumer and vice versa. This allows for more accurate forecasting of generation needs, engages the consumer in consumption choices related to generation costs, and shifts load off peak by automatically optimizing the timing of electronic devices (Ontario Independent Electricity System Operator, 2010).

Investments in the grid totalled over $1.5 billion in 2009, which enabled significant uptake of the FIT and microFIT programs, including both private and community-owned projects. Although renewable power was legislated to have priority access to the grid over other forms of power generation, many renewable energy projects have been put on hold because of nuclear power plants filling up the grid capacity (Weis, Stensil, & Stewart, 2010). By December 2011, 46,464 landowners had applied to install small solar systems and community and Aboriginal groups had proposed 391 projects, totalling 3,546 MW of community power. 22,497 MW had been applied for by the private sector (Ontario Power Authority, 2011a).

Included in the *Green Energy and Green Economy Act* was a domestic content rule, which required any solar photovoltaic (PV) installation to source at least 40% of its capital expenses from within Ontario until 2010; these numbers increased to 60% in 2011. Domestic content requirements for wind installations started at 25% and jumped to 50% in 2012 (Ontario Power Authority, 2011b). This domestic content rule worked to stimulate a renewable electricity manufacturing industry in Ontario; over 20 manufacturing companies agreed to manufacture solar systems and wind turbine components in Ontario, making Ontario the leading manufacturer of these technologies in Canada (Government of Ontario, 2010). However, in response to the domestic content requirement, Japan initiated a dispute under the World Trade Organization regulations for discrimination of imported products (Ontario Solar Academy, 2010). This dispute is not yet resolved.

The inclusion of rates for solar PV in the FIT program contributed to rapid uptake of renewable electricity in Ontario. By application count, 99.6% all of the microFIT applications have been for solar PV as well as 95% of the FIT applications (representing 40% of the MWs) (Ontario Power Authority, 2011a). Key informants found that Ontario chose to include solar installations, a more expensive technology, for the following reasons: to developing a local solar industry; to help transform its dwindling automobile industry into a solar technology manufacturing sector; to increase electricity production during the summer peak load (hot summer days) when generation costs were highest; to engage all residents of Ontario in renewable electricity development; and to help reduce line losses by generating power closer to urban loads (Ontario Renewable Energy Advocate representative 1, Oct 7, 2009; Ontario Renewable Energy Advocate representative 2, Aug 8, 2009).

Prior to 2009, municipalities were only permitted to generate electricity through an independent corporation (Ontario *Electricity Act*, c. 15, s. 144, 1998). The high overhead costs of creating such a corporation restricted this opportunity to only the largest municipalities (Manning & Vince, 2010). Supporting legislation of the *Green Energy and Green Economy Act* permitted municipalities to generate up to 10 MW of renewable electricity without creating an independent corporation (Ontario *Electricity Act*, c. 15, s. 144, 2011), which made it possible for more than just large municipalities to take part in the renewable electricity opportunities. In addition, the Act directed the Ontario Power Authority to create financial support programs for municipalities. It has been noticed in Ontario that, when compared to private ownership, municipally-owned RE generation can more easily garner public support because the owners are in more direct contact with their customers and have the ability to respond to issues more rapidly (Ontario Municipal representative, Oct 5, 2009). Unlike in Denmark, municipalities in Ontario currently may use revenues from renewable electricity facilities as they would any other revenue.

Although municipalities were granted the right to own generation facilities, they were stripped of their authority over the creation of renewable electricity by-laws and their veto power. In an effort to streamline the permitting process, a standardized by-law was set for the whole province; however, municipal consultation is required (*Green Energy Act*, c. 12, s. 5, 2009). Reducing municipal authority has been criticized since municipalities are known to provide helpful connections to local concerns (Epstein, 2009). Also, removing municipal involvement in renewable electricity permitting eliminated the associated revenue stream; thus, municipal capacity to maintain expertise on renewable electricity (Ontario Municipal Representative, Oct 5, 2009). During the 2011 provincial election, this issue faced vocal opposition (Howlett &

Ladurantaye, 2011) and was thereafter challenged by the official opposition party in Bill 10 (2011), which was defeated in December 2011.

After the announcement of the *Green Energy and Green Economy Act*, OSEA's focus began to shift from that of an advocacy group to one of a facilitation entity to provide assistance and support to the emerging community power sector (Ontario Renewable Energy Advocate representative 2, Aug 8, 2009). Community groups were finding that financiers would cover neither soft costs - costs for non-reclaimable assets – nor bridge funds - funds needed before revenues are earned (Ontario Financing representative, Oct 8, 2009). The Community Power Fund was expanded into the Community Energy Partnership Program, which is an ongoing program providing design/development grants and regulatory approvals grants ranging from $10,000 to $200,000 for renewable electricity projects greater than 10 kW but less than 10 MW (Community Energy Partnerships Program, 2010).

Alongside the Community Energy Partnership program, the Aboriginal Energy Partnership Program was also created, providing grants specifically for Aboriginal groups. Community power proponents in Ontario had recommended that, instead of a grant program, the funds should be created as a revolving, forgivable loan to make the fund more secure in the long term (Ontario Financing representative, Oct 8, 2009). Regarding debt financing of community power projects, financial institutions in Ontario have been typically offering loans on a take-out basis (once operational) at debt/equity ratios of no more than 70/30 (Ontario Financing representative, Oct 8, 2009). There is a loan guarantee program in Ontario but it applies only to Aboriginal groups and will debt-finance up to 75% of the project costs (Ontario Financing Authority, 2010a). Aboriginal groups face particular challenges accessing bank financing because reserve land cannot be used as collateral for a loan.

Multiple entities have started providing some facilitation functions to community power groups including the Department of Energy's Renewable Energy Facilitation Office, OSEA, and the Toronto Renewable Energy Co-operative. The Renewable Energy Facilitation Office acts as a one-window office for all permits and approvals and provides advice on the community interaction aspect of approvals (*Ontario Green Energy Act*, c. 12, s. 11, 2009). OSEA advocates for supportive policy on behalf of communities as well as providing budgeting and risk assessment advice, business plans, funding sources, and governing structures. They have published guidebooks on topics such as permitting, approvals, and financing. Along with the Toronto Renewable Energy Co-operative, OSEA is involved in creating information-sharing networks between community groups and politicians, government authorities, agricultural representatives, financial institutions, and academia. Experience from Ontario suggested that reference materials were useful to disseminate information about community power; however, an expert available to answer questions was found to be more useful than in-depth reference materials to community groups (Ontario Community Facilitator representative, Aug 23, 2010).

4.2 Relevance of Community Management Theory to Community Power Based on Case Studies

An evaluation of the two case studies in relation to Agrawal's (2001) list of conditions (see Figure 1) reveals the relationship between theory of community management of common pool resources and community power. The conditions will be discussed in groupings as they appear in Figure 1. At the end of each section, Tables 1 A through F summarize how Agrawal's (2001) conditions for successful community management relate to conditions for success in the community power sector. In the case where one of Agrawal's (2001) conditions for success has no related condition in the community power case studies, that condition is assumed to be not applicable (identified as N.A. in the Tables 1 A through F).

4.2.1 Resource System Characteristics

In Agrawal's (2001) list, many of the conditions under resource characteristics are to ensure manageability so that outsiders do not undermine the user group. Agrawal's (2001) relevant resource system characteristics include 'small size', 'well-defined boundaries', 'low levels of mobility,' 'possibility to store the benefits from the resource,' and 'predictability.' In community power, the resources that are necessary for a viable project include not just the energy resource but also the grid resource. See Table 1-A for a summary of Agrawal's (2001) resource system characteristics and their relative application to community power.

Denmark's 40 MW community-owned wind project in Copenhagen shows that community projects need not be small if the energy resource is available (Sorensen, Hansen, & Larsen, 2002). The community's financial and knowledge capacities are also equally important to the project size, which will be discussed more in section 4.2.2. 'Well-defined boundaries' and 'low levels of mobility' are specific to managing common pool resources and do not show up as applicable in the community power sectors of Denmark and Ontario. The 'possibility to store the benefits from the resource' draws parallels to the importance of access to the grid for community power, since the grid is used to instantaneously transmit all the electricity produced. Insufficient grid capacity was noticed to be a main factor for Ontario's under-achieved RE development in 2007 (Del Franco, 2009). Predictability of the resource is important for creating a secure business case. Wind energy in Denmark was the initial focus for community power because of the strength and predictability of the wind resource there (The Poul La Cour Foundation, 2009). The predictability of the technology to harvest the resource is also important and will be discussed more in section 4.2.6.

Table 1-A ***Conditions Facilitating Success – Resource System Characteristics***

Community Management of Common Pool Resources	**Application to Community Power**
1. *Resource system characteristics*	1. *Resource and grid system characteristics*
(i) Small size	(i) Economically-viable energy resource, size of project matched to community capacity
(ii) Well-defined boundaries	(ii) N.A.
(iii) Low levels of mobility	(iii) N.A.
(iv) Possibilities of storage of benefits from the resource	(iv) Ability to connect to grid in economically viable way; grid has capacity to take power
(v) Predictability	(v) Predictable energy resource and harvesting technology

Note: N.A. = not applicable

4.2.2 Group Characteristics

In community management of common pool resources, many group characteristics were found to be supportive conditions for common pool resource management. See Table 1-B for a summary of Agrawal's (2001) group characteristics and their relative application to community power.

A 'small group of users' facilitates collective decision-making. For community power, often a large group of investors is needed for the financial requirements. For example, Denmark's 40 MW community wind project has 8,650 investors (Sorensen, Hansen, & Larsen, 2002) while Toronto's community wind project has 400 investors (TREC, 2010). A governance model to ensure effective decision-making is necessary with such large groups; often the co-operative model is utilized.

‘Clearly defined boundaries’ of the group is necessary in community management of common pool resources for an understanding of who is included in the user group and, therefore, is subject to the conditions of the group and benefits from the resource. Boundaries of the community power group are typically guided by a legislated definition of community, which varies by jurisdiction. Community power peaked in Denmark when investors were required to be residents of the municipality where the turbine was erected and an income tax credit encouraged investment (Sørensen, Hansen, & Larsen, 2002). This suggests that community power is encouraged when community power is clearly defined and finds a balance between ensuring local benefit and enabling financial capacity.

‘Shared norms’ is found in common pool resource management to be helpful to ease collective action because participants have an understanding without explicit conversation and trust is more easily achieved among group members (Baland & Platteau, 2000). In Denmark, a high level of green consciousness and a general support for wind energy have been prevalent for years (Danielsen, 1995), resulting in a set of common norms amongst the population that facilitates community power. However, in Ontario, community power is a much more recent idea. Facilitators of community power projects state that shared norms are not always present initially but building a common sense of objectives and trust are important to community power success (Ontario Community Facilitator representative, Dec 14, 2011). This suggests that shared objectives and a sense of trust can be developed in a community and are more important than shared societal norms in general.

‘Past successful experiences’ or ‘social capital’ have been found to bring about a collective memory of the benefits of cooperation and a subsequent willingness to collaborate (Baland & Platteau, 2000). Data available from Denmark and Ontario were not sufficient to determine if all successful community power groups were those which had worked together before; however, experience in Ontario demonstrated that significant time and financial investments by community members increased the likelihood of success and that groups that have built social capital are more likely to contribute time and take on financial risk (Ontario Community Facilitator representative, Dec 17, 2012).

Baland and Platteau (2000) suggest ‘appropriate leadership’ facilitates community management, in particular leaders who are young, literate, familiar with external examples, and who collaborate with the traditional authorities. They go on to say that leaders take the following steps of community organizing: explaining to others of the real challenges they face; convincing them that collaborative action is beneficial; showing them successful examples; mobilizing a sufficient number of individuals to collaborate; and ensuring fairness in enforcing the rules. A key informant in Ontario suggested that those who are connected to or are familiar with examples of successful community power projects are more successful at initiating a community power project (Ontario Community Organizations representative, Sept 7, 2009). Connections to traditional authorities, such as the municipality and those with financial capacity, were important enabling conditions for the most successful community power projects in Ontario to date, i.e., those by the Toronto Renewable Energy Co-operative (Ontario Renewable Energy Advocate representative 1, Nov 18, 2011). There are no data from Denmark and Ontario suggesting that leaders are generally young or that they have other similar personality qualities. The steps of community organizing that Baland and Platteau (2000) found to be important all appear relevant to community power; however, only those where verifying data exist will be presumed to be relevant for community power.

'Interdependence among group members' facilitates success of community management of common pool resources by increasing the resolve of group members to abide by the harvesting restrictions (Wade, 1994). Resolve to the common objective of members of community power groups facilitates their success because each member depends on others to maintain support, financially and socially, over the timeline of the project. By collaborating, each member realizes social as well as economic benefits that the member could not realize on their own because of economies of scale. Through collaboration the members realize community cohesiveness as well as a more efficient renewable energy technology. For example, typically a 2 MW wind turbine is less costly to install and produces more energy than 40 turbines of 50 kW each, given all other factors to be the same. Although surveys of community power groups have not been performed in Ontario or Denmark on this topic, it is reasonable to assume that benefits that flow from economies of scale were instrumental for collaboration, hence interdependence among the group.

Another factor contributing to interdependence is the social benefit achieved by collaboration. It has been found that residents in the vicinity of a renewable energy development are more likely to be opposed to the development if profits accrue to those external to the local community (Gross, 2007; Hinshelwood, 2001; Loring, 2007; Walker et al., 2007; Warren & McFadyen, 2010). Hence, community power facilitates access to development sites that may otherwise be faced with local opposition. It has also been found that residents are encouraged to join and maintain their participation in community activities when their peers are also involved (Holman, Devane, & Cady, 2007) and they feel they are contributing to the common good (Funk, 1998). Based on those findings, it can be rationalized that successful community power projects are those in which members understand how collaborating with their peers increases their individual financial gain and benefits the community as a whole financially and socially. Indeed, facilitators of community power in Ontario have shared this message with communities across Ontario to encourage community power groups (Ontario Community Facilitator representative, Aug 23, 2009).

'Heterogeneity of endowments' was found by Baland and Platteau (2000) to make more resources available to the whole group by including those with wealth and capacity. This facilitated the achievement of group success, provided that interests were uniform and collaboration could be achieved amongst the groups. Again, the details of the group characteristics in Ontario and Denmark have not been well documented so an assessment based on empirical evidence is not possible. However, the first two co-operatively owned power projects in Ontario were made possible by local wealthy individuals providing upfront capital (Ontario Renewable Energy Advocate 1, Nov 16, 2011).

Successful community power projects in Ontario have also relied on a small group of members who are endowed with the knowledge necessary to achieve the project (Ontario Community Organizations representative, Sept 7, 2009). The knowledge is equally necessary as the capital for project success. This rationale supports the inclusion of heterogeneity of endowments as a condition that facilitates community power. The homogeneity of cultural identities and interests was found to ease communication and collaboration between group members (Baland & Platteau, 2000). Evidence supportive of cultural homogeneity in community power projects is less robust, as community power agreements are essentially business agreements and examples of businesses involving a wide spectrum of cultural identities are prolific. This can be understood when one considers the differences in objectives between a community power endeavour and a common pool resource management endeavour. The former is a voluntary monetary agreement between members of a community, often those who are sufficiently well off to invest multiple thousands of dollars into a project that is not necessary to meet their basic needs. The latter differs in that all resource users must participate and members are often dependent on the resource for their livelihood or for sustenance. This creates a much different environment and requires members to fundamentally accept the objectives of the collaboration, since the consequences are dire. In such a situation, collective agreement on the regulatory process is foundational; thus, homogeneity in cultural identities, facilitating collaboration, is more important. In the case of community power, as with a successful business, a common interest in project success is an appropriate homogeneity condition for success but empirical data from Ontario and Denmark on this topic have yet to be collected.

The final group characteristic is 'low levels of poverty.' In the management of common pool resources, this is thought to reduce the potential of overuse of common resources (Agrawal, 2001). In community power, the resources are not common pool so there is no opportunity for overuse. A similar condition that is relevant to community power is the financial capacity of the community to raise the equity required for the project, thus the community must have sufficient wealth to invest. This does not suggest that all residents proximal to the project must be wealthy as investment is voluntary. It should be noted that the ability to raise equity depends on the definition of community power – the geographic reach of the boundaries and the cost of financing available.

Table 1-B ***Conditions Facilitating Success – Group Characteristics***

Community Management of Common Pool Resources	**Application to Community Power**
2. *Group characteristics*	2. *Group characteristics*
(i) Small size	(i) Group large enough to cover investment. Decision-making process is functional with group size
(ii) Clearly defined boundaries	(ii) Clear and balanced definition of community power
(iii) Shared norms	(iii) Shared objectives and group trust
(iv) Past successful experiences—social capital	(iv) Past successful experiences
(v) Appropriate leadership—young, familiar with changing external environments, connected to local traditional elite	(v) Appropriate leadership – familiar with external examples, connected to local traditional elite
(vi) Interdependence among group members	(vi) Interdependence among group members

Community Management of Common Pool Resources	Application to Community Power
(vii) Heterogeneity of endowments, homogeneity of identities and interests	(vii) Heterogeneity of endowments; common interest in project success
(viii) Low levels of poverty	(viii) Ability to raise capital

4.2.3 Relationship between Resource System and Group Characteristics

Conditions for success that relate to the relationship between resource system and group characteristics and the parallel conditions for community power are described below and summarized in Table 1-C. Common pool resource management research suggests that where there is 'overlap between the residents and the resource location,' rules could be more easily enforced because residents could more easily monitor harvesting activities (Baland & Platteau, 2000; Wade, 1994). In community power, residents in the local area are more likely to be in support of the development if they are involved in decision-making (Gross, 2007) and benefit from the project (Warren & McFadyen, 2010). Therefore, an agreement with residents in proximate vicinity of the project site is a condition that facilitates success.

Wade (1994) found that 'high levels of dependence by group members on the resource system' resulted in a community committed to strong harvest constraints and enforcement measures. Except in the cases of off-grid community power systems, community power users are not directly dependent on the power produced by their project because they are connected to the public grid. However, commitment to the success of the project has been found to facilitate community power. In both Denmark and Ontario, commitment of the public as well as the labour force to renewable power production was instigated by supply concerns with the existing sources of energy and public concern with the alternative supply means (nuclear in Denmark and coal in Ontario) (Lipp, 2007b; Rowlands, 2006). This commitment and subsequent demand for community power was an initial condition in both Denmark and Ontario to instigate the community power sector.

Baland and Platteau (2000) found 'fairness in the allocation of benefits' from common resources to help maintain the resolve of the user group. When considering fairness of the allocation of benefits from community power projects, it has been found in Denmark to be important to ensure that not just those who invest but also those who are affected aesthetically or audibly by a project benefit. In Denmark, legislation was enacted to prevent opposition to wind developments. The legislation a) enabled landowners to request compensation from the project proponents for loss of land value and b) required large wind projects to offer 20% of their shares to the local community (Danish Law on the Promotion of Renewable Energy, s. 13, 2008) to improve the fairness in the allocation of benefits.

The final two conditions in this section, 'low levels of user demand' and 'gradual changes in demand,' are both only applicable in situations where the community uses the resource. As such, they do not apply to most community power projects (except those that are off-grid communities, but these were not the focus of this study).

Table 1-C ***Conditions Facilitating Success – Relationship between Resource System and Group Characteristics***

Community Management of Common Pool Resources	**Application to Community Power**
1. and 2. *Relationship between resource system and group characteristics*	1. and 2. *Relationship between resource system and group characteristics*
(i) Overlap between user group residential location and resource location	(i) Agreement with residents in proximate vicinity of project
(ii) High levels of dependence by group members on resource system	(ii) Commitment by public and labour sectors to community power generation
(iii) Fairness in allocation of benefits from common resources	(iii) Fairness in allocation of benefits
(iv) Low levels of user demand	(iv) N.A.
(v) Gradual changes in demand	(v) N.A.

Note: N.A. = not applicable

4.2.4 Institutional Arrangements

Supportive conditions for community management of common-pool resources and their related conditions supportive of community power are described below and summarized in Table 1-D. Baland and Platteau (2000) found that the condition 'rules are simple and easy to understand,' increased rule enforceability in community-based common pool resource management. For the community power sector, simplicity in the rules rather than enforcement of the rules increases engagement. Simple processes for community power groups to get involved in renewable power generation enables widespread involvement. Typical arrangements between the community groups and the overseeing institutions often include the application, the approval process, and the contractual obligations. Ontario demonstrates the importance of rule simplicity with its 'one-window' point of access with provincial government regulatory agencies to interface with community power groups (Ontario Ministry of Energy and Infrastructure, 2010). Also highlighting the need for institutional arrangement clarity, a facilitation group published a guidebook to guide communities through the application and approvals processes (OSEA, 2011b).

‘Locally devised access and management rules’ increases the applicability and acceptability of the rules to the local community (Baland & Platteau, 2000; Ostrom, 1990; Wade, 1994). State intervention in determining or enforcing the access and arrangement rules was found to corrode the success of the local authority (Baland & Platteau, 2000). For the community power sector, access rules are not applicable; however, locally devised ownership and decision-making arrangements have been found to facilitate the community power sector. The community power definition in Ontario includes many ownership and management structures, demonstrating the importance of allowing community groups to devise their own ownership arrangements to meet their specific conditions (Ontario Power Authority, 2010b).

‘Ease in enforcement of rules’ facilitates community monitoring of resource harvesting (Baland & Platteau, 2000; Ostrom, 1990; Wade, 1994). In community power, resources are renewable and not depleted when harvested. The most related condition would be ease of interactions with the overseeing government and institutional bodies. This was demonstrated to be a condition for success in Denmark when, in the late 1970s, municipalities and the grid system operator were both asked by the federal government to cooperate with community power proponents. Co-operative institutional bodies enabled the beginning of another wave of community power in Denmark (Madsen, 2009). In Ontario, interactions between community power applicants and the overseeing bodies were eased through transparent and predetermined formulas for grid interconnections and contract approvals as well as regulated timelines for responses (Ontario Power Authority, 2010d).

The next condition, ‘graduated sanctions,’ is specific to common pool resource management because of the need for enforcement of harvesting rules. Since community power does not include regulations on resource harvesting, this condition is not applicable to community power.

‘Availability of low cost adjudication’ was found by Ostrom (1990) to facilitate rule enforcement by making it affordable for communities managing common pool resources. Since harvesting restrictions are not a part of community power, this condition is not directly applicable. However, a similar condition - the availability of relatively low financing for debt and/or equity - is a condition supportive of community power. Denmark became a world leader in community power partially because of the low interest debt-financing available to cooperatives through the Kommunekredit program (Kommunekredit, 2010). Ontario has facilitated a community power sector through equity grant programs - the Community Energy Partnership Program and the Aboriginal Energy Partnership Program - which have been utilized by almost all community power developments to date (Ontario Community Facilitator representative, Nov 15, 2012).

'Accountability of monitors and other officials to users' was found to be helpful for community common pool resource management as it brings about respect of authorities (Baland & Platteau, 2000; Ostrom, 1990). In community power, the system operator and the governing officials are the authorizing bodies. Accountability of these authorities helps them gain respect by community power groups. The experience in Ontario provides examples of instances in which the accountability of authorities was missing and the community power sector lagged as a result. In 2007, when the first price mechanism for renewable power was introduced, new generation fell well short of the expectations due to insufficient grid capacity magnified by a new nuclear-power facility filling up much of the grid space in southwestern Ontario (Weis, Stensil, & Stewart, 2010). Then, again in 2009, renewable power was given priority access to the grid over other forms of power generation in legislation but in actuality many renewable energy projects were put on hold because of nuclear power plants filling up the grid capacity (OSEA, 2011c). Although renewable power had been given priority access to the grid, a lack of accountability for this rule restricted the community power sector.

Table 1-D ***Conditions Facilitating Success – Institutional Arrangements***

Community Management of Common Pool Resources	**Application to Community Power**
3. *Institutional arrangements*	3. *Institutional arrangements*
(i) Rules are simple and easy to understand	(i) Community power application and approval processes and contract are simple and easy to understand
(ii) Locally devised access and management rules	(ii) Locally devised ownership structure and benefit sharing
(iii) Ease in enforcement of rules	(iii) Ease in interactions with overseeing government and institutional bodies
(iv) Graduated sanctions	(iv) N.A.

Community Management of Common Pool Resources	Application to Community Power
(v) Availability of low cost adjudication	(v) Availability of low interest financing for debt and/or equity
(vi) Accountability of monitors and other officials to users	(vi) Accountability of the system operator and the governing officials

Note: N.A. = not applicable

4.2.5 Relationship between Resource System and Institutional Arrangements

'Matching the restrictions on harvest to the regeneration of resources' is not an applicable condition to community power as the resources are not depleted upon harvest (as summarized in Table 1-E).

Table 1-E ***Conditions Facilitating Success – Relationship between Resource System and Institutional Arrangements***

Community Management of Common Pool Resources	Application to Community Power
1. and 3. *Relationship between resource system and institutional arrangements*	1. and 3. *Relationship between resource system and institutional arrangements*
(i) Match restrictions on harvests to regeneration of resources	(i) N.A.

Note: N.A. = not applicable

4.2.6 External Environment

The supportive conditions for community management of resources and the parallel conditions supportive of community power are explained below and summarized in Table 1-F. 'Low cost exclusion technologies' for community resource management is equivalent to financially viable renewable power technology in the community power context. After years of research and development of wind turbines in Denmark, turbine designers arrived at a design that was productive and reliable enough to make wind energy cost-competitive. As well, advances in the labour pool contributed to the accessibility of maintenance and repairs. The financial viability of the turbine compared to other power-generating technologies was brought about by a diesel shortage caused by World War I. The first community power boom resulted, with many farms, workshops, and railways installing wind turbines to power their operations (Christensen, 2009). The second wave of community power in Denmark and later Ontario was triggered by financial mechanisms (such as FITs) that made the renewable technologies viable compared to the existing power systems and encouraged a labour industry. Only the technologies that had been developed to the point of being reliable and relatively cost competitive were included in these financial mechanisms.

Agrawal (2001) found that communities managing common pool resources benefited from having 'time to adapt to new technologies related to the commons.' In community power, the community 'adapts' to the idea of renewable power developments through education and participation. The initiation of Ontario's community power sector followed a public education and participation campaign by OSEA. In some cases, community leaders identified in that campaign became the local initiators of community power projects (Ontario Community Facilitator representative, Aug 23, 2009). Recently, the province has funded a follow-up education campaign to increase involvement in the community power sector (Community Energy Partnership Program, 2010).

'Low levels of articulation with external markets' is supportive of community management of common pool resources because demand for the resource by an external market tempts the users to harvest unsustainable levels of the resource for export (Agrawal, 2001). In relation to community power, when the opportunity exists for the renewable energy project location (or grid capacity resource) to be secured by an external proponent prior to the community, the likelihood of success of community power is diminished. Denmark, with its 20% community ownership requirement, requires some element of community involvement for all wind energy development (Danish Energy Agency, 2009). This prevents external companies from exploiting the renewable energy potential without some local benefit. Ontario used a carrot approach, the sliding price-adder, to encourage community ownership. Community power advocacy groups in Ontario have been calling for a percentage of the grid capacity to be set aside to ensure community power projects are not beat out by external developers (OSEA, 2010). Such legislation has yet to be passed.

'Gradual changes in articulation with external markets' was found to be supportive of community management of common pool resources because a rapid change in the external market forces, including the potential of new capital or outside institutions, was found to have a deleterious effect on community management. Given a gradual change, however, the community is able to adjust and maintain its authority (Agrawal, 2001). For community power, the financial support mechanisms are those that should be changed only gradually. When the rates paid for renewable electricity change suddenly and significantly, the renewable power sector can be stalled, community power in particular (Cory, Couture, & Kreycik, 2009). In Denmark, the rates paid for renewable electricity were changed significantly in 2001. The new rates were too low and the community power sector, as with most other renewable electricity generation, stalled for a number of years (Lipp, 2007).

Wade (1994) and Ostrom (1990) both found that community management was enhanced when 'central governments did not undermine local authority.' In community power, the local authority involved is typically the municipality. In the early 1990s, Danish municipalities were relieved of their authority over planning approvals for wind turbines, resulting in significant local opposition (Danielsen, 1994). In response, by 1993 municipalities were directed to identify and allocate the prime locations for wind turbines based on community consultation and wind resource (Danielsen, 1994). The capacity of wind generation required for siting by each municipality has continued to increase since (Lipp, 2007). By contrast, municipal by-laws regarding renewable energy developments in Ontario were superseded by provincial requirements and municipalities were relieved of their rights to veto proposals, although they maintained rights to approve project locations (*Green Energy Act*, c. 12, s. 5, 2009). That legislation was intended to expedite the development of renewable power and has been supported by community power groups (OSEA, 2011d). However, it has been a controversial issue. Experience in the recent provincial election showed that the lack of municipal authority over renewable electricity by-laws sparked some opposition groups (Howlett & Ladurantaye, 2011) and has since been challenged by the official opposition party (Bill 10, 2011). Based on the case studies of Denmark and Ontario, it appears that requiring municipal land-use planning processes to determine where renewable electricity will be developed prior to its widespread implementation reduces opposition.

'Supportive external sanctioning institutions' facilitates community management of common pool resources by making up for any deficiencies in the decentralized sanctioning systems (Baland & Platteau, 2000). The external institutions that are relevant to community power are the central and municipal governments as well as the grid system operator. Denmark's experience in the late 1970s demonstrated that supportive municipalities and system operators enabled a community power sector (Madsen, 2009). Also, the Danish government supported community power in the 1990s by requiring dispersed local ownership (Maegaard & Kruse, 2002). In Ontario, community power was made a priority by the central government, demonstrated by grant and education programs (Community Energy Partnership Program, 2010). The grid system operator was required to be supportive of all renewable power projects through priority interconnection legislation and required response times (Ontario *Electricity Act*, c. 15, s. 25.37, 2011).

Baland and Platteau (2000) found that 'appropriate levels of external aid to compensate local users for conservation activities' was a condition supportive of community management of common pool resources. They explained that compensating aid ensured users were able to meet their needs, not tempted to over-harvest the common, and encouraged to continue their participation in the resource management. In community power, members of the community power group are encouraged to continue their participation if they find the economic returns to be satisfactory. This is possible if a) the technology is reliable and productive (as described in section 4.2.6), b) the resource is sufficient (as described in section 4.2.1), and c) the payments for the kilowatt hours produced are sufficient to cover costs as well as a reasonable rate of return. The latter of these three factors was achieved in Denmark and Ontario through regulated FITs.

Ostrom (1990) included in her conditions for success 'nested levels of appropriation, provision, enforcement, and governance.' She found that this ensured all users who affected the resource were regulated in justifiable and effective ways towards the same ends. For community power, collaboration among the various decision-making bodies has been shown to simplify the application and approvals process for community power. In Denmark, the Ministry of Environment sets the direction for onshore wind turbine development and requires municipalities to implement the planning and permitting processes. The Danish Energy Agency, under the Ministry of Climate, Energy and Buildings, provides the one-stop shop for offshore wind turbine approvals and monitoring (Danish Energy Agency, 2011b). Ontario established a one-window committee for approvals, the Renewable Energy Facilitation Office, to simplify the approvals process (Ontario Ministry of Energy and Infrastructure, 2010).

Table 1-F ***Conditions Facilitating Success – External Environment***

Community Management of Common Pool Resources	**Application to Community Power**
4. *External environment*	4. *External environment*
(i) Technology	(i) Technology
(a) Low cost exclusion technology	(a) Financially viable technology and accessible labour
(b) Time for adaptation to new technologies related to the commons	(b) Public education and participation
(ii) Low levels of articulation with external markets	(ii) Low levels of competition for sites with external competitors
(iii) Gradual change in articulation with external markets	(iii) Gradual rate of change of financial support mechanisms
(iv) State:	(iv) State:
(a) Central governments should not undermine local authority	(a) Local authority involved in siting
(b) Supportive external sanctioning institutions	(b) Supportive permitting, interconnecting, and contracting institutions
(c) Appropriate levels of external aid to compensate local users for conservation activities	(c) Payments for power sufficient to cover cost of production and reasonable rate of return
(d) Nested levels of appropriation, provision, enforcement, governance	(d) Collaboration between governing bodies, one-window committee to interact with community for ease and clarity

The analysis above, based on the case studies of Denmark and Ontario, demonstrates that the facilitating conditions for community common pool resource management have many similarities to the conditions supportive of a community power sector. The resulting conditions supportive of a community power sector provided a framework for analysing the data from Nova Scotia. This framework helped determine the barriers and solutions to achieving a viable community power sector in Nova Scotia.

4.3 Community Power in Nova Scotia

There have been a few successful community power projects built or otherwise initiated in Nova Scotia. Recently, provincial policies have changed significantly, likely enabling more community power development. Based on the conditions facilitating a successful community power sector identified above, this section will examine the current state of the community power sector in Nova Scotia. In particular, barriers to the development of community power projects are identified. Also, solutions to overcome those barriers suggested by key informants are included.

Barriers identified are bolded below and solutions to them are examined in detail in the discussion chapter 5.

4.3.1 Resource and Grid System Characteristics

4.3.1.1 Economically-viable energy resource, size of project matched to community capacity

Nova Scotia has world-class energy resources (Nova Scotia Department of Energy, 2010b). Resource potential was not found to be a barrier to community power. However, it was found that the economic viability of a community power project is affected by the proximity of the project to a grid with sufficient capacity (discussed in section 4.3.1.2) and the rate paid for the energy produced.

Nova Scotia's COMFIT sets rates for renewable electricity projects in the 1 to 5 MW size range. The few community power projects developed prior to the COMFIT in Nova Scotia were in this size range. In addition, the FIT for wind projects 50 kW and below is unique to Nova Scotia. **The exclusion of solar PV from the COMFIT program was seen as limiting to the potential of community power in locations with a viable solar resource**, **particularly urban areas** where other energy resources are not available (CEDIF representative, Sept 30, 2009). However, a study in Nova Scotia discussed the effectiveness of solar PV in the province (Lipp, 2007a). It noted that, because Nova Scotia has a winter peak load, solar PV does not generate when electricity is most needed. The study also predicted that Nova Scotia's market would not be enough to encourage a solar panel manufacturing sector to develop in the province (Lipp, 2007a). Without these two motivations, the study suggested that a FIT for solar PV was not as financially justified as one in Ontario.

The current COMFIT rate structure was seen as a challenge to communities with wind resources whose resource or financial capacity most effectively align with a power project above 50 kW but less than 500 kW or so (the point where the COMFIT rate for wind is less economically viable) (E3 Analytics, 2011). To overcome this challenge, best practices in FIT rate design suggest size differentiation within each technology class, achieved by interpolation between two or more baseline points (Cory, Couture, & Kreycik, 2009). Baseline points are identifies as a jurisdiction builds experience and determines realistic costs per kilowatt-hour of projects of various sizes. Interpolation then is used to set rates for sizes between these points.

This can be achieved with only two baseline points, but more points makes the interpolated rates more accurate (Cory, Couture, & Kreycik, 2009).

4.3.1.2 Grid capacity to take power; Ability to interconnect to grid in economically viable way

Grid Capacity

For a renewable electricity generator project to sell his/her power, the grid must have sufficient capacity to accept the power. Many renewable technologies produce power variably, meaning their electricity generation is not available on demand but rather when the resource is available. Thus, grids must be operated to balance the variable technologies with other sources to meet demand. The state of Nova Scotia's grid infrastructure is discussed in two segments, the transmission lines, which handle electricity above 69 kilovolts and the distribution lines, which are less than 69 kilovolts.

The grid in Nova Scotia, because of its isolation, relatively small interconnection with the rest of North America, and historical lack of upgrading, has a limited capacity to handle variable generation (Developers representative, Jun 27, 2009; Provincial Policy representative 1, Jul 15, 2009; Community Organizations representative 2, Sept 30, 2009; Provincial Policy representative 2, Oct 26, 2009; Legal representative, Jan 14, 2010). Grid capacities vary in each part of Nova Scotia. In general, the transmission grid to the west of Halifax currently has some excess capacity while to the east its additional capacity is limited (SNC-Lavalin ATP Inc., 2009).

Under the current legislation in Nova Scotia, community power projects must connect to the distribution lines, so the capacity of the distribution grid has a substantial effect on development of community power. The distribution grid capacity is different in each sub-distribution zone as each has a different electric load. In most distribution zones, between 1 and 5 MW of additional capacity is available (Nova Scotia Department of Energy, 2010b). Spill-over of power from the distribution sub-stations into the transmission system is currently not permitted (Developers representative, Jun 23, 2009). This means that distribution-connected electricity generated must never exceed the electricity demand in that sub-distribution zone. To ensure this does not happen, NSPI requires that the sum of the maximum generation capacity of all distribution-connected generation equate to less than the minimum load in the sub-distribution zone (NSPI, 2011b). **The limited distribution capacity and lack of spill-over**

mechanism present a grid-related barrier to community power, as only one or two projects will be feasible per sub-distribution zone (Developers representative, Jun 23, 2009).

Interconnection Access

Once there is grid capacity to accept renewable electricity generation, a process for interconnecting that generation helps determine the priority of interconnection requests, which can either support or hinder community power. The distribution of electricity (which includes transmission and distribution) is a natural monopoly since one supplier most efficiently performs it. In Nova Scotia in 1992, both the generation and transmission/distribution of electricity services were sold to NSPI. It has been noticed that many renewable electricity businesses have abandoned their projects in Nova Scotia due to **unfavourable, non-transparent policy conditions related to the regulated, private monopoly of both generation and distribution**; "most places in North America would be envious of our [renewable energy] resources but we are turning people away" (Municipalities representative 2, Feb 2, 2010).

In the 2010 Renewable Electricity Plan, of a total predicted available grid capacity of 300 MW, NSPI was granted 100 MW of grid capacity for its own renewable electricity generation (Nova Scotia Department of Energy, 2010b) while community power was not guaranteed any grid capacity**. This preferable access to grid resources for NSPI presents a barrier to non-NSPI renewable electricity generators from establishing in Nova Scotia** (CEDIF representative, Sept 30, 2009; Municipalities representative 2, Feb 2, 2010).

Another potential barrier is the **lack of regulations regarding grid interconnection timelines for the system operator; NSPI is neither required to respond to applications nor perform the interconnections by a set timeline (**E3 Analytics, 2011**).** Expert evidence submitted in the COMFIT rate hearing suggested that:

> requirements should be imposed to ensure that interconnection studies and procedures occur in a timely manner, with penalties for excessive delays. Addressing these issues could help reduce the project costs and risks associated with grid connectivity, and accelerate the pace of project deployment (E3 Analytics, 2011, p. 12).

This suggestion is supported by literature on FIT rate design (Cory, Couture, & Kreycik, 2009). Nova Scotia's COMFIT program has not been in place long enough to determine if this will hinder community power projects.

Transparency and access to information regarding the state of the distribution grid capacity presented a barrier to community power in Nova Scotia (E3 Analytics, 2011). Proponents of renewable electricity projects in Nova Scotia currently are required to pay for two feasibility studies, a Preliminary Impact Assessment for $750 followed by the Combined System Impact / Facilities Study costing approximately $10,000 to obtain approval for connection (NSPI, 2011b). Steps have been made to increase the transparency of the grid capacity; an online map of the power grid with the corresponding distribution grid capacities has been published on the NSPI website (NSPI, 2011c).

To ensure public access to the distribution service, key informants expressed the desire to bring it back into the public sector (Legal representative, Jan 14, 2010; Municipalities representative 2, Feb 2, 2010). However, the costs to do so for the provincial or municipal governments were seen as prohibitive (Legal representative, Jan 14, 2010). Stakeholders in the 2009 consultation process suggested a more realistic solution, that the authority over electricity generation be separated from distribution (Adams & Wheeler, 2009). In 2010, the Province formed a new governing body, the Renewable Electricity Administrator, to manage the prioritization of grid interconnections for large-scale renewable electricity projects (Nova Scotia Department of Energy, 2010b) but the COMFIT program is managed by the Department of Energy.

4.3.1.3 Predictability of resource for business case

The predictability of the renewable energy resources was not specifically mentioned as a barrier. However, it was suggested that **solar PV is a reliable resource and that excluding it from the COMFIT program reduces the potential of the community power sector** (CEDIF representative, Sept 30, 2009).

4.3.2 Group Characteristics

4.3.2.1 Decision-making process is functional with group size

The experience of the Community Windfields found that community power groups had more attendance at meetings and made more timely decisions when members were all from the same municipality (Community Windfields representative, Jan 25, 2010). Rather than suggesting that groups be small in number, it was recommended that groups place a limit geographically on the core decision-making team (Community Windfields representative, Jan 25, 2010).

The requirement of 25 members in a community power group presents a barrier to small renewable power projects that do not require large financial investments, such as a 50 kW wind turbine (Research representative, March 12, 2011). The agricultural community in particular is interested in the opportunity to install 50 kW wind turbines on members' land but find the requirement of incorporating a co-operative and signing up 24 other members a hindrance (Research representative, March 12, 2011).

4.3.2.2 Clear and Balanced Definition of Community Power

The definition for community power in Nova Scotia was defined in the Renewable Electricity Regulations as generation facilities with a majority ownership by one of or a combination of:

> a university; a wholly owned subsidiary of a municipality; a Mi'kmaw band council; a co-operative or not-for-profit of which a majority of members reside in the Province and at least 25 members reside in the municipality where the generation facility is located; or a community economic-development corporation of which at least 25 shareholders or members reside in the municipality where the generation facility is located (Nova Scotia *Electricity Act*, c. 25, s. 20, 2010).

Additional restrictions apply such as the generation facility must be within the province, be connected to the distribution grid, and utilize one of the four accepted technology types including wind energy (above and below 50 kW), biomass combined-heat-and-power, run-of-the-river hydro, and in-stream tidal (Nova Scotia *Electricity Act*, c. 25, s. 20, 2010).

Relative to other jurisdictions, Nova Scotia's FIT program has a limited role for individuals. Currently, the net-metering program, which pays electric retail rates to producers of renewable power under 1 MW, is the only option available to individuals. A FIT program that allows individuals to construct renewable power systems that are not likely to spark local opposition was suggested (Research representative, March 12, 2011). Ontario's FIT program for small-scale solar has resulted in over 46,000 applications in approximately two years (OPA, 2011a). A majority of the small-scale solar projects are in rural areas; however, rooftop projects in urban areas are the most effective for increasing the efficiency of the grid (Bradford, 2006).

The different entities included in the community definition have relatively different access to expertise and financing. A concern raised at the COMFIT rate hearings held in Halifax in April, 2011 was that since the COMFIT rate is the same for all community power entities, **those with more expertise and access to capital will have greater success under the COMFIT program** (Vogel, 2011)**.** Those with early success will obtain the limited capacity on the distribution grid, **preventing other community power ownership models from developing projects** (Vogel, 2011).

Nova Scotia's definition restricts community power projects to distribution-connected (Giroux, 2011; Vogel, 2011)**,** which was seen as a barrier since only community power projects under the minimum sub-distribution zone load (typically 1 to 6 MW) will be permitted.

Potential membership in community power initiatives is based entirely on a willing participant's ability to invest financially, thus the involvement of non-invested community members in decision-making is not guaranteed. Strategies to involve community members in decision-making will be discussed in Section 4.3.5.5.

4.3.2.3 Shared Project Objectives and Group Trust

It was noticed that **participants became discouraged and lost trust in the group if the process took longer than expected** (Community Organizations representative 2, Sept 30, 2009). A guidebook similar to that created in Ontario for community power projects was suggested as a way to ensure realistic expectations of time and effort at the outset (CEDIF representative, Sept 30, 2009; Community Organizations representative 2, Sept 30, 2009).

4.3.2.4 Past Successful Experiences

In Nova Scotia, a few community power projects have been built prior to the release of the COMFIT program. Berwick's municipal electric utility has been producing hydro electricity for generations. An RFP for community power resulted in 18.95 MW of community power contracted in 6 projects in 2010 (NSPI, 2010b). Other community-type projects have been constructed behind the meter, which means they produce power for one customer. Regardless of these community power projects in operation, key informants mentioned demonstration sites as ways to inspire public confidence in community power (Municipalities representative 1, Jul 8, 2009; Community Organizations representative, Sept 1, 2009; Ontario Municipal representative, Oct 5, 2009; Formal Education representative, Oct 20, 2009), which suggests that **community power projects that are built are not raising public awareness**. It was recommended that demonstration sites make it a priority to share their success stories with the public (Community Organizations representative, Sept 1, 2009). Key informants in Nova Scotia identified multiple entities as having responsibility for demonstration: the Province, Municipalities, institutions, and the private sector (Community Organizations representative, Sept 1, 2009). It was mentioned that farmers have the land and resources, are mechanically minded, and could maintain small systems if given the opportunity (Agricultural representative, Aug 20, 2009). Because of their close social networking and desire for income diversification, if a few farmers constructed demonstration projects, it was predicted that other farmers would be quick to follow (Research representative, Aug 20, 2009).

4.3.2.5 Appropriate Leadership- Familiar with Community Power Model, Connected to Successful Leaders of Community Power Projects, Able to Raise Funds

A vibrant community power sector across the province requires skilled leaders for each community power project. However, it has been noticed that **leaders in rural communities are currently overloaded with fundraising efforts** (Community Organizations representative, Sept 1, 2009). The Rural Communities Foundation of Nova Scotia has noticed that community leaders are more able to use their skills for managing projects when seed funding is provided through grant programs (Community Organizations representative, Sept 1, 2009). Such a program would also increase the ability of leaders to raise funds (see section 4.3.4.4).

Knowledge of the community power model is limited in Nova Scotia. **Community groups do not consider electricity generation their role; they are not familiar with the electric system since it has been 'out of sight, out of mind' for many years** (Opposition representative, Jul 7, 2009; Community Organizations representative, Sept 1, 2009). There are some community groups with familiarity of community power projects whose knowledge could be shared to advance the whole sector. The most established are the Community Windfields, primarily made up of volunteers. **These community groups do not currently have an effective means of sharing their knowledge either with each other or new groups** (Community Windfields representative, Jan 25, 2010). It was suggested that a central entity to coordinate sharing of experiences and knowledge between the various community power groups would allow volunteer efforts to be more effective (Community Windfields representative, Jan 25, 2010).

4.3.2.6 Interdependence Among Group Members

The interdependence of members in community power groups was not mentioned by key informants as a barrier to community power development in Nova Scotia. It is possible that interdependence amongst group members is a condition that will become apparent only after community power projects are more common.

4.3.2.7 Heterogeneity of Endowments, Common Desire for Project Success

A common desire for project success is very similar to shared objectives, discussed in section 4.3.2.3. Although the key informants did not describe a lack of wealth heterogeneity explicitly as a barrier to community power, the empirical evidence suggests it to be a condition supportive of successful community power projects. Community power projects in Nova Scotia have to date been 100% privately financed (Roscoe, 2011). This suggests that where community projects have been successful, wealthy individuals with an interest in the project have been supportive.

4.3.2.8 Ability of Community to Raise Investment

Communities with access to private debt financing have been the only ones with successful community power projects to date. It is likely that the COMFIT will affect the ability of communities to raise equity and access debt financing. This is discussed in more detail in section 4.3.4.4.

4.3.3 Relationship between Resource System and Group Characteristics

4.3.3.1 Agreement with Residents in Proximate Vicinity of Project

Nova Scotia's definition of community that requires 25 members from within the municipality does require a higher level of local involvement as compared to the definitions of Denmark and Ontario but does not guarantee that residents in the immediate locality of the project are included in the benefits. Key informants mentioned that **some communities in the immediate locality of projects were opposed to developments because they felt like they shouldered the burden but do not benefit** (Co-operatives representative, Aug 21, 2009; Urban Planning representative, Aug 31, 2009).

4.3.3.2 Commitment by Public and Labour Sectors to Community Power Generation

In Nova Scotia, demand for community power was initially vocalized by the Nova Scotia Co-operative Council because of the opportunity for the co-operative sector (Co-operatives representative, Aug 21, 2009) and by an environmental non-profit because of the environmental and social benefits (Haley & Sodero, 2007). Meanwhile, a family of companies called the

Community Windfields was gathering investments in community power through the financial investment mechanism unique to Nova Scotia, the Community Economic Development Initiative Fund (Scotian Windfields, 2012). These three groups became founding members of the Nova Scotia Sustainable Electricity Alliance, which initiated a coordinated voice for community power (Nova Scotia Sustainable Electricity Alliance, 2010).

Because 70% of the population lives in coastal areas and 80% of the Nova Scotian coast has a high sensitivity to sea level rise, the Nova Scotian public is particularly vulnerable to climate change (DeRomilly & DeRomilly Limited, 2005). That vulnerability and the high percentage of coal-fired electricity in Nova Scotia are potential reasons why Nova Scotians strongly supported more renewable energy, as was found by a study conducted in 2009 of domestic customers of NSPI. It was found that wind had the highest support (99%), then solar (93%), tidal (91%), hydro (89%), natural gas (55%), biomass (32%), oil (20%), and coal (14%) (CRA, 2009). This research also identified that Nova Scotians believed that the responsibility to develop renewable electricity was shared by governments, individuals, environmental organizations, and NSPI. The primary ways that Nova Scotians suggested renewable electricity should be developed were: 1) large-scale renewable electricity developments and 2) small-scale renewable electricity by ordinary Nova Scotians (CRA, 2009). This demonstrated widespread awareness and interest in a decentralized energy generation model in which individual citizens play a role.

The breadth of popular demand for community power in Nova Scotia was initially deduced from the participation of stakeholders in the various consultations with some relation to community power. In autumn of 2009, the Province contracted Dalhousie University to organize a series of public consultations about how to best meet the renewable electricity target. It became clear at those consultations that there existed demand for community power. The consultations involved four stakeholder meetings in Halifax, which each had between 80 and 125 participants, followed by four regional meetings across Nova Scotia, each attracting 30 to 50 participants. For comparison, a similar consultation also hosted by Dalhousie in 2008 regarding energy efficiency in Nova Scotia drew 40 people to each of 3 sessions (Wheeler, 2008); the participation in the renewable electricity consultations was significantly higher, suggesting higher levels of interest in renewable electricity. During the consultations, there were strong expressions of interest from community groups wishing to play a significant role in the renewable electricity future of

Nova Scotia, including developing projects and contributing expertise (Adams & Wheeler, 2009). The final report from those consultations recommended that a FIT specific to community ownership be created with a target of 100 MW of community power by 2015 (Adams & Wheeler, 2009). This suggestion was heeded by the government and will be discussed more in section 4.3.5.7.

From November 2010 to May 2011, COMFIT rate-setting consultations took place in Nova Scotia. Participating in these consultations were 80 registered interveners including the consumer advocate, wind turbine manufacturers and installers, hydro-electricity developers, the Department of Energy, municipalities, saw-millers, First Nations representatives, universities, environmental organizations, and CEDIF companies (Nova Scotia Utility and Review Board, 2010). Of the interveners, 25 represented public entities such as non-profits, governments, and First Nations. Compared to most hearings at the Utility and Review Board, the COMFIT hearings were longer (five days) and had a high number of interveners, demonstrating the breadth of interest in community power.

A search of the major newspaper in Nova Scotia, the Chronicle Herald, between October 21, 2008 and October 21, 2010 (the two years prior to the COMFIT rate consultations), revealed that 91 articles included the words “community,” “renewable,” and “energy.” When the search exchanged “electricity” for “energy”, the number of articles dropped to 50. At approximately bi-weekly publications, this relatively low amount of coverage demonstrates that media attention was not commonplace during the two years prior to the COMFIT rate setting. When that same search was conducted over a six-month period starting the day the COMFIT rate consultation was announced (Oct 22, 2010 – Apr 22, 2011), 24 articles contained the words “community,” “renewable,” and “energy,” while 12 contained “community,” “renewable,” and “electricity.” This is relatively similar frequency of mention in the media, one article every 2 weeks. The frequency of mention in the media suggests that the **awareness and interest in community power is not yet common in the public, rather it is isolated to a distinct crowd of stakeholders such as those who intervened in the COMFIT hearings**.

It was noticed that a **barrier to renewable electricity development existed in the self-focused perspective of many ratepayers regarding electricity; keeping their own rates low regardless of the impact on other stakeholders** (NSPI representative, Jan 11, 2010). A government vision complemented with a comparison of the electric future options including the long-term effects on health, environment, and economics was suggested as a way to raise awareness of the other aspects of electricity generation than the present-day cost (Provincial Policy representative 1, Jul 15, 2009; Urban Planning representative, Aug 31, 2009).

Labour Pool

In Nova Scotia, the first company with community power as its main objective was Scotian Windfields, the development company associated with the Community Windfields. At the Renewable Electricity Consultations in fall 2009, many of the participants were from the labour pool. The consultations concluded that demand for community power was widespread amongst participants (Adams & Wheeler, 2009). Later, at the COMFIT consultations and hearings in 2010/2011, the labour pool again demonstrated its demand for community power. Of the interveners in the hearings, 41 were from the labour pool, representing 18 businesses.

4.3.3.3 Fairness in Allocation of Benefits and Decision-Making Power

It was noticed that **an unfair distribution of the economic benefits of renewable electricity developments leads to local opposition** (Co-operatives representative, Aug 21, 2009; Urban Planning representative, Aug 31, 2009). Community power can help realize a fair allocation of benefits and decision-making power if it is made an objective of the community group. To date, there is not enough empirical evidence in Nova Scotia to determine if community power reduces or prevents local opposition.

Fairness in the benefits received by the municipality is also relevant. A Nova Scotia key informant mentioned that **some constituents do not trust their municipalities to invest the revenue stream from renewable electricity in publicly beneficial ways**, which contributes to their opposition to renewable electricity (Opposition representative, Jul 7, 2009).

4.3.4 Institutional Arrangements

4.3.4.1 Application and Approval Processes and Contracts are Simple and Easy to Understand

Prior to the COMFIT, the **application process under the RFP system was found to be "loaded with disincentives" for community power; namely too onerous, lengthy, costly, and complicated with no guarantee of project success** (CEDIF representative, Sept 30, 2009). With the release of the COMFIT program, a one-window committee was created to handle the application and approvals process at the provincial level. A guide was created by the Province to explain the rules and walk applicants through the process (Nova Scotia Department of Energy, 2011b). All of these new elements should simplify the application, approval, and contract process. However, many approvals are still necessary from levels of authority outside the one-window committee including various departments of the federal government, municipal government, Aboriginal groups, and NSPI (Nova Scotia Department of Energy, 2011b). Empirical data are not yet available to confirm if the current process is sufficiently simple and easy to understand.

4.3.4.2 Locally Devised Ownership Structure and Benefit Sharing

Communities may structure themselves in any of the seven ownership structures pre-determined in the COMFIT program (see background section 2.1.1.1 for details). These structures include no requirements for how the ownership is divided or the benefits are shared. One concern was raised regarding municipal ownership; **the requirement under the Nova Scotia *Municipal Government Act* limits municipalities to partnering only with other municipalities** (Municipal Utilities representative, Jun 8, 2009).

4.3.4.3 Ease in Interactions with Overseeing Government and System Operator

The steps taken to simplify the application and approvals process also ease the interactions with the overseeing government authorities because the requirements are transparent and clearly explained (see section 4.3.4.1). **Municipalities without a renewable energy development plan or by-laws are more difficult to interact with because the regulations are not clearly defined** (Developers representative, Jun 23, 2009).

4.3.4.4 Availability of Low Cost Financing, Debt and/or Equity

For community power to play any role in the future, community power must be economically viable (Co-operatives representative, Aug 21, 2009). Because of their high upfront capital cost, most renewable electricity projects are financed through a combination of equity and debt.

Equity Financing

Equity is raised for community power projects through share offerings, debentures, or bonds. In some cases, investments of non-monetary resources (land access for example) are accepted instead of finances (Val-Éo, 2010). If individuals are the investors, the revenues benefit those who invested. If a municipality or municipally owned subsidiary provides the equity, the revenue goes into the public domain. **Raising equity was identified as a major challenge in community power** (Community Organizations representative 2, Sept 30, 2009).

Nova Scotia has a unique program to support equity fundraising for local entrepreneurial ventures, the CEDIF. Companies must apply for CEDIF status and, if approved, their shareholders are eligible in the first year for a Nova Scotia income tax credit worth 35% of their initial investment, in the sixth year a 20% credit, and in the tenth year a 10% credit. Also, investments in CEDIFs are transferable to Registered Retirement Savings Plans (CEDIF Management Ltd., 2010). Collectively, from 2001 to 2010, CEDIF-certified businesses have accumulated over $3.6 million from Nova Scotian investors (Government of Nova Scotia, 2010).

A few challenges to the CEDIF model surfaced during this study. The first barrier identified was **the lack of an exit strategy, namely a mechanism for investors to sell their shares** (CEDIF representative, Sept 30, 2009). Some CEDIF companies have provided a buy-back option, which is one form of exit strategy (CEDIF supplementary informant 2, Aug 13, 2010). Second, the high administrative fee, approximately $150 annually, for share transfer to Registered Retirement Savings Plans was identified as a disincentive for investors (CEDIF representative, Sept 30, 2009) but this barrier is already avoidable as the Canadian Workers Co-operative offers this same service for $60 annually (CEDIF supplementary informant 2, Jan 14, 2011).

Aboriginal communities in particular have limited ability to raise funds within their community because of high levels of poverty in the community and the definition of land ownership on reserves as defined under the *Indian Act* (1985, c. I-5, s. 89-90), in particular land cannot be used as collateral for a loan since reserve land is all federal Crown land (Kwilmu'kw Maw-klusuaqn Negotiation Office, 2011). In addition, the incentive of tax credits offered by the CEDIF program is not applicable to Aboriginal communities because they do not pay income tax (Kwilmu'kw Maw-klusuaqn Negotiation Office, 2011).

Debt Financing

Experience in Nova Scotia found that **securing debt financing was a major obstacle to community power projects** (CEDIF representative, Sept 30, 2009; CEDIF supplementary informant 1, Jan 13, 2011). Venture capitalists were often looking for rates of return above that which was feasible for community power (CEDIF representative, Sept 30, 2009) and banks in

Nova Scotia were not very familiar with the concept of community power (CEDIF supplementary informant 1, Jan 13, 2011). The large banks in Nova Scotia such as Royal Bank and Bank of Montreal were the most versed in loaning money to large renewable electricity projects. Credit Unions were the main lenders in rural areas as they were the only banks in many towns; however, Credit Unions can only lend up to $10 million to any project (Financier representative, July 15, 2009).

Debt/equity ratios requested by financial institutions were commonly 50/50 or 60/40 (CEDIF supplementary informant 1, Jan 13, 2011). However, no community power project has yet received debt financing from a bank (Roscoe, 2011). In general, to secure reasonable interest rates with banks, projects need to have a guaranteed buyer (such as NSPI) for the electricity, demonstrate a reasonable return on investment, and have a secured grid connection (Financier representative, July 15, 2009). These elements may be easier to secure with the recent COMFIT, so debt financing may soon be more readily accessible.

Aboriginal groups face particular challenges when accessing debt financing due to restrictions set forth in the *Indian Act* (1985, c. I-5, s. 89-90), in particular their inability to use land as collateral for a loan since reserve land is all federal Crown land (Kwilmu'kw Maw-klusuaqn Negotiation Office, 2011).

Municipally led projects can access debt financing through the Municipal Finance Corporation. This body provides long-term, low-interest loans for municipal projects by selling bonds collectively and reducing the risk for any one borrowing municipality (Legal representative, Jan 14, 2010).

4.3.4.5 Availability of Low-Cost Advice and Support

The lack of access to advice and support was frequently mentioned as a barrier to a community power sector in Nova Scotia, as shown in Table 2. **The areas identified for support included: advocacy, demonstration, education/outreach, financial advice, municipal issues, networking, organizational structure, permitting/approvals, and project planning.** The activities suggested for a facilitation entity are summarized in Table 2.

Table 2 ***Supporting Activities Identified for a Potential Facilitation Entity***

Theme	Gap/Activity	Identified as a need in Nova Scotia
Advocacy	Communities' voice to policy makers.	Municipalities representative 1, Jul 8, 2009
	Advise policy change at state/provincial and federal level	Municipal Utilities representative, Jun 8, 2009

Theme	Gap/Activity	Identified as a need in Nova Scotia
Demon-stration	Construct demonstration projects	Community Organizations representative 1, Sept 1, 2009; Co-operatives representative, Aug 21, 2009; Provincial Policy representative 1, Jul 15, 2009; Formal Education representative, Oct 20, 2009; Agriculture representative, Aug 20, 2009; Community Organizations representative 2, Sept 30, 2009
Education/ Outreach	Promote sustainable energy technologies	Formal Education representative, Oct 20, 2009; Urban Planning representative, Aug 31, 2009
	Clean energy reports, expert presentations, events listing, blogs, tours, meetings, webinars, guidebooks	Municipalities representative 1, Jul 8, 2009; Provincial Policy representative 1, Jul 15, 2009; Opposition representative, Jul 7, 2009; CEDIF representative, Sept 30, 2009; Community Organizations representative 1, Sept 1, 2009; Urban Planning representative, Aug 31, 2009
	Provision of information related to renewable electricity to encourage investors	Community Organizations representative 2, Sept 30, 2009; Community Windfields representative, Jan 25, 2010; Co-operatives representative, Aug 21, 2009
	Training and certification of trades people	Formal Education representative, Oct 20, 2009
Financial Advice	Consulting services related to economic studies. Provide information on risk assessment and aversion	Co-operatives representative, Aug 21, 2009
	Business plan models and assistance	Co-operatives representative, Aug 21, 2009
	Knowledge of funding sources. Assist applications	Co-operatives representative, Aug 21, 2009; Community Organizations representative 2, Sept 30, 2009
	Grants for soft costs	Municipal Utilities representative, Jun 8, 2009; Community Organizations representative 1, Sept 1, 2009
	Educate financial institutions on renewable energy as an investment to increase faith in industry	Developers representative, Jun 23, 2009
Municipal Issues	Vision, local targets, renewable energy and conservation plan and map for each region	Urban Planning representative, Aug 31, 2009
	Help define by-laws that facilitate development of renewable electricity in an accordance with vision	Developers representative, June 23, 2009
	Guidebook for municipalities on how to negotiate with developers	CEDIF representative, Sept 30, 2009
Networking	Website for information sharing	Municipalities representative 1, Jul 8, 2009
	Develop and share promotional materials and presentations	Community Windfields representative, Jan 25, 2010
	Documents all facilities, showcase positive ones	Developers representative, June 23, 2009
Organization Structure	Advise on type of structure of organization (i.e. co-operative, non/for-profit, etc)	Co-operatives representative, Aug 21, 2009; Community Organizations representative 2, Sept 30, 2009
	Organization governance assistance, webinars	Community Windfields representative, Jan 25, 2010
Permitting/ Approvals	One window for permits and approval for federal, provincial, and municipal approvals. Alert if new requirements coming.	Developers representative, June 23, 2009
	Assist with preliminary assessment for grid interconnect	Co-operatives representative, Aug 21, 2009
	System impact study for interconnect	Co-operatives representative, Aug 21, 2009
	Assist with EIA Process	Provincial Policy representative 1, Jul 15, 2009
	Help with securing power purchase agreement	Co-operatives representative, Aug 21, 2009
	Help with paperwork	Agriculture representative, Aug 20, 2009
	Guidebook on regulations, application, electric structure, funding options	Community Organizations representative 2, Sept 30, 2009
Project Planning	Identify site	Co-operatives representative, Aug 21, 2009
	Resource assessment	Co-operatives representative, Aug 21, 2009
	Feasibility study help	Co-operatives representative, Aug 21, 2009
	Consult during design of project	Co-operatives representative, Aug 21, 2009

4.3.4.6 Accountability of System Operator and other Officials to Community

The steps taken to simplify the application and ease the interactions with the authorities (discussed in sections 4.3.4.1 and 4.3.4.3) all directly affect the accountability of the system operator and officials.

4.3.5 External Environment

4.3.5.1 Financially Viable Technology and Accessible Labour

Technology

In Nova Scotia, it was recognized that a diversity of renewable electricity generation technologies would be beneficial for increasing electricity security (Nova Scotia Department of Energy, 2010b). It was noted that technologies that are most desirable in Nova Scotia are those that are both renewable and available when needed, thus contributing to grid stabilization (Provincial Policy representative 2, Oct 26, 2009).

Such technologies include biogas and sustainable biomass. **Biomass electricity technologies from forest products are well known but concern exists in Nova Scotia regarding a sustainable harvest process and limit** (Simpson, 2009); thus, more research is needed. **Biomass from agricultural products was suggested as a more ecologically and socially acceptable solution but research is needed to find the most appropriate crop and production process for Nova Scotia** (Research representative, Aug 20, 2009). The Nova Scotia Agricultural College has found potential ways to increase energy output but continues to work on developing the technology to market-readiness (Research representative, Aug 20, 2009).

Tidal electricity is one technology for which Nova Scotia is among the leaders internationally for research and development. The world-class tidal resource in the Bay of Fundy is the reason. **Tidal turbines are not yet commercially proven in Nova Scotia**, but research and development for tidal technologies is underway and supported by the Province (Nova Scotia Department of Energy, 2008). A FIT specifically for developmental tidal installations has been legislated (Nova Scotia *Electricity Act*, c. 25, s. 21, 2010).

Electricity storage was identified as the “watershed” technology to increase the capacity of the grid to handle variable renewable electricity (Formal Education representative, Oct 20, 2009). Potential for electricity storage facilities such as pumped hydro and compressed air have been identified in Nova Scotia (SNC-Lavalin ATP Inc., 2009). Key informants identified electric cars, heat storage, and flywheels as alternative storage techniques (Opposition representative, Jul 7, 2009; CEDIF representative, Sept 30, 2009). **A lack of investment in research and development to make such technologies more cost competitive is a barrier to their widespread application** (Developers representative, June 23, 2009; Opposition representative, Jul 7, 2009; CEDIF representative, Sept 30, 2009).

Skilled Labour Pool

Labour capacity in manufacturing, engineering, and trades is necessary for installation and maintenance of all renewable electricity. **Community power projects, because of their smaller size and dispersed nature, can be especially challenged in securing skilled labour** (Developers representative, June 23, 2009). Nova Scotia is well positioned to train a workforce in renewable electricity with its many dispersed universities and colleges (Municipalities representative 2, Feb 2, 2010). The Nova Scotia Community College is the main institution for renewable electricity technician training. It has been working with NSPI, industry, and various levels of government to predict the direction of the labour pool and to introduce "energy literacy" into the curriculum of many programs (Formal Education representative, Oct 20, 2009). It has a few courses specific to energy trades and started offering renewable electricity upgrading courses for existing trades-people across the province in the fall of 2010 (Formal Education representative, Oct 20, 2009).

Nova Scotia has significant labour capacity in wind technologies between 50 kW and 1 MW, partially because 50 kW machines are manufactured in the province (Developers representative, Jun 23, 2009). Soon, Nova Scotia will house a manufacturer of large-scale wind turbine blades, tidal turbine components, and possibly complete tidal turbines (Provincial Policy representative 2, Oct 26, 2009).

A domestic content law has facilitated a manufacturing industry in Ontario. An interviewee warned that a strict domestic content requirement for renewable electricity in Nova Scotia might create more of an obstacle than a benefit; Nova Scotia has a relatively small market demand potential, which may not be sufficient to attract a manufacturing sector (Provincial Policy representative 2, Oct 26, 2009).

Some municipalities and developers have noticed that procuring labour in the trades from within the local community is economic and elicits more community support; some have local labour preference written into their policies (Developers representative, Jun 23, 2009; Municipalities representative 2, Feb 2, 2010). Some of the large municipalities in Nova Scotia can have a significant impact on demand for local labour since they have more infrastructure and budget than many private companies. The Halifax Regional Municipality, for example, has installed more geothermal projects than any other entity in Atlantic Canada, which has contributed to the development of a skilled workforce (Municipalities representative 2, Feb 2, 2010). A workshop sponsored by the Province was found to be a successful mechanism for the Halifax Regional Municipality to help other municipalities follow similar paths (Municipalities representative 2, Feb 2, 2010). Key informants, after noticing that **skilled labourers trained in renewable electricity were leaving the province**, suggested that an incentive be provided for those who stay in Nova Scotia (CEDIF representative, Sept 30, 2009; Developers representative, Jun 23, 2009).

4.3.5.2 Public Education and Participation

Public Education

Public awareness of community power is a challenge; Nova Scotians do not consider electricity generation their issue (Financier representative, Jul 15, 2009; Community Organizations representative, Sept 1, 2009). In addition, **rural communities often have little access to information** (Developers representative, Jun 23, 2009).

It was suggested that an education campaign in Nova Scotia focus first on the audience most interested or those who can have the greatest impact (Municipalities representative 1, Jul 8, 2009). Municipal leaders, both elected and not, and leaders of community groups were identified as effectual players who need information about the opportunities that exist for community power. Once the leaders in the communities become aware of the opportunities, the focus should shift to the general public (Municipalities representative 1, Jul 8, 2009). Other influential and interested potential audiences identified included: faith groups (Community Organizations representative, Sept 1, 2009); those already involved in energy conservation (Community Organizations representative 2, Sept 30, 2009; Ontario Municipal representative, Oct 5, 2009); those with environmental consciousness; those who may benefit from the reputation; and farmers, accessible through the Nova Scotia Federation of Agriculture network

(Agriculture representative, Aug 20, 2009). **Financing and capacity is very limited at the municipal level to organize such workshops**, so provincial support was suggested (Municipalities representative 2, Feb 2, 2010).

For education and outreach efforts, experience of the Halifax Regional Municipality echoed the lessons learned in Ontario: the public is more receptive to information when it is presented by an external expert (Urban Planning representative, Aug 31, 2009; Developers representative, Jun 23, 2009; Opposition representative, Jul 7, 2009; Community Organizations representative, Sept 1, 2009). Also, a local champion supported by a committee is believed to be the most effective way to follow through on the ideas presented (Opposition representative, Jul 7, 2009). It was thought that most people would be interested if they understood how renewable electricity generation could save money or create jobs (Opposition representative, Jul 7, 2009; Agriculture representative, Aug 20, 2009; Community Organizations representative, Sept 1, 2009). This position was echoed: "if it is financially viable, people will want to get educated about it" (Co-operatives representative, Aug 21, 2009). Another recommendation included presenting the public with a long-term comparison of community power to coal combustion to highlight the environmental benefit (Urban Planning representative, Aug 31, 2009).

The provincial government and NSPI have noticed that participants in public education activities are a small sub-sector of the population and attracting widespread participation is difficult (Provincial Policy representative 1, Jul 15, 2009; NSPI representative, Jan 11, 2009). To reach those outside that sub-sector, multiple outreach techniques were suggested (Formal Education representative, Oct 20, 2009). It was noticed that many communities operate in an oral culture, thus workshops and guest lectures were suggested rather than print materials for sharing the idea of community power in those communities (Opposition representative, Jul 7, 2009). Other mechanisms that have been found to be successful for reaching people are tours of demonstration sites and positive media (Community Organizations representative 2, Sept 30, 2009).

Public Participation

Based on their experience with raising funds for community power projects, the Community Windfields organization of Nova Scotia identified that the community members most willing to invest were interested in the betterment of their community and were willing to accept less monetary returns than they would require of other investment options (Community Windfields representative, Jan 25, 2010). To broaden the interest in community power investment, increasing the understanding of and confidence in the community power sector was suggested, with government incentives, low-interest loans, and secured power purchase contracts identified as ways to do so (Research representative, Aug 20, 2009) (see section 4.3.4.4 for details).

A community outreach consultant in Nova Scotia noticed that a successful community leader was one who understood the community's values (Urban Planning representative, Aug 31, 2009). Those involved in community organizations in Nova Scotia noticed that **participants got disillusioned during the process if it took longer than expected** (Community Organizations representative 2, Sept 30, 2009**.** It was recommended that participants be told up front what the process will involve (Community Organizations representative 2, Sept 30, 2009). The Nova Scotia Department of Energy has created a guide to the COMFIT and training materials to provide a sense of what is involved in developing a community power project but the effectiveness of these tools is not yet known.

4.3.5.3 Low Levels of Competition for Sites with External Competitors

Because of the requirement that COMFIT projects be connected to the distribution grid, the sites that are applicable for community projects are generally not those that are desirable for private developers. Key informants did not mention access to sites as a barrier to community power. As community power progresses in Nova Scotia, this may become a more prominent issue.

4.3.5.4 Gradual Rate of Change of Financial Support Mechanisms

The first financial support mechanism for community power development, the COMFIT, has only just been introduced so experience with changing financial support mechanisms in Nova Scotia is minimal. Consequently, it is not unexpected that key informants did not mention the changing financial mechanisms as a barrier to community power. It was recommended in the COMFIT consultation process that the COMFIT rates change only after 1.5 years and thereafter the change be in response to the rate of uptake of the COMFIT, known as responsive digression (Nova Scotia Sustainable Electricity Alliance, 2011). Responsive digression ensures the change of FIT rates corresponds to the growth of the industry and drives cost efficiencies. To date the

Province has scheduled a review of the rates in 2012 (Nova Scotia Department of Energy, 2010b).

4.3.5.5 Local Authority Involved in Siting

Data available from the case studies of Denmark and Ontario suggest that municipal involvement in renewable electricity planning has a facilitating effect on renewable electricity development. Currently in Nova Scotia, municipalities have authority over planning and by-law definition for renewable electricity; however, **many of the municipalities do not have the expertise or capacity to create thorough renewable electricity bylaws** (Legal representative, Jan 14, 2010). It was suggested that regions with clearly defined by-laws attract development but those with no by-laws open the door to developments proceeding prior to public consultation, which can lead to public opposition (Developers representative, Jun 23, 2009). A province-wide, minimum set of by-laws was suggested whereby the municipalities would maintain the right to override the minimum by-laws if desired (Legal representative, Jan 14, 2010; Municipalities representative 2, Feb 2, 2010).

It was recommended that municipalities engage their constituents in a land-use and planning dialogue around renewable electricity to develop municipal renewable electricity plans (Opposition representative, Jul 7, 2009; Urban Planning representative, Aug 31, 2009; CEDIF representative, Sept 30, 2009; Ontario Municipal representative, Oct 5, 2009; Legal representative, Jan 14, 2010). Public conversations prior to the proposal of any project prevent potential economic gains from influencing the positions of the municipal and community stakeholders (Opposition representative, Jul 7, 2009). Involving the community at the outset helps to avoid a negative public reaction rooted in a fear of change (Urban Planning representative, Aug 31, 2009). The process of creating a renewable electricity plan was thought to facilitate potential projects by identifying locations rich with renewable electricity resources and deemed acceptable by the public (NSPI representative, Jan 11, 2010).

A voice for community members who are not invested in renewable electricity projects was identified as lacking (Opposition representative, Jul 7, 2009). It was suggested that, when creating RE plans, the consultation process resemble that undertaken by the Halifax Regional Municipality in which a map with layers of community-defined priorities for wind energy development was generated (Urban Planning representative, Aug 31, 2009). **Municipal finances**

to do so was seen as an obstacle, so it was suggested that the provincial government and the Union of Nova Scotia Municipalities coordinate and finance such a public process and share experiences between municipalities (Municipalities representative 1, Jul 8, 2009; Urban Planning representative, Aug 31, 2009; Ontario Municipal representative, Oct 5, 2009). The pilot projects in Cumberland and Shelburne Counties in which wind energy plans were created with significant community input were seen as successful and replication of them was suggested (Municipalities representative 1, May 2, 2011).

Regarding the neighbour conflicts experienced in Denmark as a result of land-use allocations (discussed in section 4.1.1), to date, Nova Scotia does not have the same concern of high land leases causing neighbour conflicts because the land availability for renewable electricity sites is not as restricted (see section 4.3.4.2 for detail).

4.3.5.6 Supportive Permitting, Interconnecting, and Contracting Institutions

Central Support

Targets for renewable energy procurement are often included in a central energy policy. Targets can be legislated or not. Often penalties are included if legislated targets are not met.

In Nova Scotia, the Department of Energy has legislated that 25% of electricity sales must be from renewable electricity by 2015 (Nova Scotia *Electricity Act*, c. 25, s. 6, 2010), increasing to 40% by 2020 (Nova Scotia *Electricity Act*, c. 15, s. 2, 2011). It has also set a non-legislated target of 100 MW for community power projects by 2015 (Nova Scotia Department of Energy, 2010b). The 100 MW is equivalent to approximately one third of the new renewable electricity required to meet the legislated target of 25% renewable electricity by 2015.

To earn public support and community interest for any new policy direction and targets, it was suggested that government implement the corresponding regulations in a timely manner. In Nova Scotia, the Province has been criticized on the “horrible delay” in regulation implementation that followed the Electricity Marketplace Governance Committee Report in 2007 (Municipalities representative 2, Feb 2, 2010).

Municipal Support

In Nova Scotia, six municipalities have retained ownership of their electric distribution grids. Only one of these municipalities, Berwick, produces some of its own electricity while the rest purchase power from NSPI. Other municipalities are interested in generating electricity, either for their public buildings or for their constituents but as of yet have not been able to do so (Municipalities representative 2, Feb 2, 2010).

Nova Scotian municipalities have the authority under the *Municipal Government Act,* c. 18, 1998 to own electric utilities but most have taken an "excessively modest" view of their abilities and have not yet exercised that right (Legal representative, Jan 14, 2010). One possible reason for this is that in the same Act: **municipalities are limited with whom they may partner** (Nova Scotia *Municipal Government Act*, c. 18, s. 60, 1998). To date, municipalities may only partner with other governmental entities (band councils, federal, provincial, or municipal). If a municipality wishes to involve a commercial enterprise, it must contract the private entity for all the work. This law is in place to protect municipal taxpayers but it has prevented municipalities from entering the electricity generation sector (Municipal Utilities representative, Jun 8, 2009).

Another factor deterring municipalities from renewable electricity generation was that, until the creation of the COMFIT, **municipalities had to compete in the competitive bidding process,** which was too risky of an undertaking (Epstein, 2009). The COMFIT has now created a relatively risk-free opportunity for municipalities to generate renewable electricity and receive a guaranteed rate of return.

4.3.5.7 Payments for Power Sufficient to Cover Cost of Production and Reasonable Rate of Return

The COMFIT determines the payments for community power while a FIT for developmental tidal projects greater than 0.5 MW has yet to be determined (Nova Scotia Department of Energy, 2012). An RFP process will continue to be used for all other renewable electricity projects. The COMFIT was mandated by the Department of Energy but the setting of rates was left to the Utility and Review Board to determine through a public hearing process. The provincial directive for setting the COMFIT required that the rates reflect:

> the cost of the physical assets of a facility and may make allowances for any of the following matters: depreciation; cost of labour and supervision; necessary working capital; organization expenses; overhead costs for engineering, superintendence, legal services, taxes and interest during planning and construction, and similar matters not included in the cost of the physical assets; costs in whole or in part of land acquired in reasonable anticipation of future requirements; costs to interconnect the generation

facility with the electrical grid; return on investment; additional matters that the Board considers appropriate (Nova Scotia *Electricity Act*, c. 25, s. 19, 2010).

The rates proposed at the rate hearing took into consideration the costs and benefits of community ownership in relation to the cost of production, including a higher cost of access to capital and debt financing (Keith, 2010).

Because of the small size of the distribution-connected COMFIT projects, rates proposed were set higher than if the projects could achieve more economies of scale. The proposed COMFIT rates have set rates of return at 13% for wind, biomass CHP, and run-of-the-river hydro, with a 15% return for in-stream tidal (Biewald, Rickerson, Keith, & Shaw, 2011).

A common concern regarding the introduction of FITs is their upward impact on electricity rates. A key informant in Nova Scotia suggested that a thorough econometric analysis be performed before FITs are implemented (NSPI representative, Jan 11, 2010) to find the balance between maximal spin-off economic benefits and minimal electric rate increases.

4.3.5.8 Collaboration Between Governing Bodies, One-Window Committee to Interact with Community for Ease and Clarity

In Nova Scotia, streamlining the permitting and approval process was identified as one of the ways to make renewable electricity projects more viable. It was recommended during the renewable electricity consultations that approvals and permitting all be housed in a “one-stop-shop” (Adams & Wheeler, 2009). Key informants also had concerns about the approvals process. The **RFP and queue process was found to be “loaded with disincentives” for community power, namely too onerous, lengthy, costly, and complicated with no guarantee of project success** (CEDIF representative, Sept 30, 2009).

Since these comments were made, various steps have been taken to streamline the permitting and approvals process. The COMFIT alleviates the concerns regarding the RFP process for community groups. The creation of a one-window committee with representation from eight provincial departments to advise on permitting and approvals for the FIT program was written into legislation (Nova Scotia *Electricity Act*, c. 25, s. 35, 2010). COMFIT proponents apply to this committee following the directions outlined in the COMFIT Guide (Nova Scotia Department of Energy, 2011b). For the application, the following approvals must be obtained: interconnection assessment from NSPI; community support; Aboriginal consultation; environmental assessment;

water approval; industrial approval; and special places, archaeological, and heritage resource requirements. Empirical evidence does not yet exist to determine if the steps taken are enough to streamline the permitting and approvals process.

CHAPTER 5 DISCUSSION

For the barriers identified in the results section, the case studies as well as the broader literature were consulted for applicable solutions. Barriers are in bold with potential solutions discussed below.

5.1 *Resource and Grid System Characteristics*

5.1.1 Economically-Viable Energy Resource, Size of Project Matched to Community Capacity

The exclusion of solar PV from the COMFIT program limits the potential of community power in locations with a viable solar resource, particularly urban areas.

A rate for solar PV has not been included in Nova Scotia's COMFIT program. In Ontario, multiple rates were set for solar PV of various sizes and installation types with the highest rate for solar rooftop projects of 10 kW or less (Ontario Power Authority, 2009). Solar PV in Ontario has been by far the most popular technology as it is available to most land or building owners, rural and urban alike. A small-scale program such as the microFIT facilitates widespread interest and involvement in renewable electricity generation; however, the higher rates paid for small solar installations have also been a focus of criticism for the FIT program in Ontario.

A study in Nova Scotia discussed the effectiveness of solar PV in the province (Lipp, 2007a). Although Nova Scotia does not have the same motivations as Ontario for a solar PV program (summer peak load and potential for a solar manufacturing sector) (Lipp, 2007a), a solar FIT in Nova Scotia could be used to achieve widespread involvement in renewable electricity generation by urban residents while reducing grid losses by generating close to the point of consumption. A program designed to achieve these objectives would be focused on small-scale rooftop projects in urban areas.

The current COMFIT rate structure was seen as a challenge to communities whose resource or financial capacity most effectively aligns with a power project above 50 kW but less than 500 kW (the point where the COMFIT rates are less economically viable).

This barrier is a result of the significant difference between the size ranges over which COMFIT rates apply and the lack of rates for projects between, specific for wind to date but the same principle would apply to other technologies. Size differentiation, achieved by interpolation between baseline points, ensures that projects are designed most efficiently for the site and financial capacity of the proponent (Cory, Couture, & Kreycik, 2009). Nova Scotia could start with interpolation between its two baseline points, 50 kw and 1.5 MW, for wind FIT rates and strive to determine baseline points before the review period for the COMFIT. Data in this study are insufficient to determine if size differentiation for other renewable electricity technologies included in the COMFIT is desirable; research into this question is recommended.

5.1.2 Grid has Capacity to take Power; Ability to Interconnect to Grid in Economically Viable Way

The grid in Nova Scotia has a limited capacity to handle variable generation.

Denmark's achievement of 20% wind electricity was accomplished through decades of grid improvements. To get to 20% and beyond, Denmark has demonstrated that it is necessary to invest in load shifting mechanisms, increased transmission connectivity, wind forecasting technology, energy storage, and purchases of hydro electricity from Norway and Sweden for balancing (Akhmatov et al., 2007). In Nova Scotia, it has been noticed that an Atlantic-provinces-wide approach to system operation (control of transmission and distribution) could facilitate a more efficient operation of the generation capacity and transfer of electricity between Atlantic Provinces and should be further studied (SNC-Lavalin ATP Inc., 2009).

A study specifically in Nova Scotia (Hatch, 2008) recommended that, to increase wind power, the following investments would be needed: upgrades of the high-voltage transmission lines intra- and inter-provincially; increases in distributed generation to decrease the relatively high - 11 to 13% - line losses; and a study of the time patterns of the wind resource to confirm if a correlation exists between electricity demand and potential wind generation. Energy storage was also identified as increasing the capacity for variable generation on the grid (Hatch, 2008). Such technologies can be encouraged through a FIT for storage or storage performance contracts (Peters, 2008) (see section 4.3.5.1 for detail).

The suggestions made by Hatch (2008) are focused primarily on increasing the capacity of the transmission grid system. However, currently community power projects may only connect to the distribution lines, so the upgrades would have little impact on community power. Two solutions are possible: 1) allow community power projects to connect to the transmission grid or 2) increase the capacity of the distribution grid (discussed immediately below).

Limited distribution capacity and lack of spill-over mechanism allows for only one or two projects to be built per sub-distribution zone.

Since community power projects can only be connected at the distribution level, increases in the distribution capacity most directly affect community power. Energy storage technologies embedded within distribution zones would increase the capacity for variable distribution-level generation without 'spill-over' (discussed in section 5.5.1). Upgrades to the sub-distribution stations would enable spill-over from distribution to transmission.

The regulated, private monopoly of both generation and distribution of electricity creates unfavourable, non-transparent policy conditions and discourages independent renewable electricity development.

Of the two solutions suggested by key informants, a public buy-back of NSPI versus a regulated separation of authority over the generation and distribution functions of NSPI, the latter has been implemented via the Renewable Electricity Administrator for large projects and a one-window committee at the Department of Energy for COMFIT projects. It has yet to be seen if these changes will bring about more transparency and access to the grid in Nova Scotia.

Preferential access to grid resources for NSPI discourages independent renewable electricity development.

The Province's Renewable Electricity Plan allocates 300 GWhs of grid capacity to transmission-connected independent power producers and another 300 GWhs to NSPI but does not do the same for community power. This non-transparent process that gives preferential treatment to one generator over another discourages community power proponents. Ontario's approach is a more transparent one with the prioritization of connection of projects defined by a pre-determined, publicly available formula (Ontario Power Authority, 2010d).

A lack of regulations regarding grid interconnection timelines for NSPI increases the risk for community power.

NSPI suggests that the queue for a preliminary assessment takes up to six weeks while the Distribution System Impact Study takes approximately three months (NSPI, 2008). The achievement of these voluntary timelines should be reviewed during the COMFIT review process and penalties established if necessary.

Transparency and access to information regarding the state of the distribution grid capacity increases the risk for community power.

Following the expression of this concern, steps have been taken regarding access to information and transparency. A map of the distribution capacity in Nova Scotia was released. It has yet to be shown if this map alleviates the barrier to community power but it is likely a positive step towards increased transparency and access to information.

The pre-feasibility study, which costs $750 in Nova Scotia, is provided free of charge in Ontario (Hydro One, 2009b), which helps prospective community groups determine if a project is worth pursuing before incurring costs. The Combined System Impact / Facilities Study, costing approximately $10,000 in Nova Scotia, has a similar price tag in Ontario of $10,335 except where a local distribution company is involved; then the price increases by $10,000 (Hydro One, 2009c).

5.1.3 Predictability of Resource for Business Case

Solar PV is a reliable resource and excluding it from the COMFIT program reduces the potential of the community power sector.

This barrier was discussed in section 5.1.1.

5.2 Group Characteristics

5.2.1 Decision-Making Process is Functional with Group Size

The requirement of 25 members in a community power group presents a barrier to small renewable power projects that do not require large financial investments.

Nova Scotia's requirement for 50% ownership and, in some cases, 25 local residents (Nova Scotia Department of Energy, 2011b) for all projects will likely slow down the development of smaller renewable energy projects that would be unlikely to spark community opposition and could be financed by individual landowners. Ontario's FIT program allows an individual to own renewable electricity projects; however they do not receive the incentives available to community projects (Ontario Power Authority, 2010c). Creating a cost-based rate in Nova Scotia for individually-owned, small-scale renewable energy projects should be considered. This would replace the net-metering program that currently is the only option for individuals to generate their own power.

5.2.2 Clear and Balanced Definition of Community Power

The various entities eligible for the COMFIT rates have different expertise and access to capital, thus those with more rapid success will prevent other community power ownership models from accessing grid capacity and developing projects.

Financial instruments for community groups with limited access to financing (discussed in section 5.4.4) and changes to the grid and interconnection process (discussed in section 5.1.2) are options to achieve more diversity in the successful community power proponents.

Nova Scotia's definition restricts community power projects to distribution-connected.

Solutions to this barrier include allowing community power projects to connect to the transmission grid, increasing the capacity of the distribution grid through energy storage technologies, and allowing spill-over from distribution to transmission (as discussed in section 5.1.2).

5.2.3 Shared Project Objectives and Group Trust

Participants get discouraged and lose trust in the group if the process took longer than expected.

As suggested by key informants, a guidebook which outlines the time expectations has been published by the Department of Energy (Nova Scotia Department of Energy, 2011b). Experience will tell if this guide provides clear expectations and prevents participants from becoming discouraged.

5.2.4 Past Successful Experiences

Community power projects that are built are not raising public awareness.

It was suggested that existing community power projects share their stories to inspire replication and that the Province, municipalities, institutions, and the private sector all play a role in demonstrating the potential of community power. Ontario's Community Energy

Partnership Education Program is one model that could be replicated. Ontario's program receives $500,000 annually from the province (Community Energy Partnerships Program, 2011). It was suggested for Nova Scotia that focusing the education program on the agricultural community, with its strong social networks, would be an effective starting point.

5.2.5 Appropriate Leadership- Familiar with Community Power Model, Connected to Successful Leaders of Community Power Projects, Able to Raise Funds

Leaders in rural communities are currently either in short demand or overloaded with fundraising efforts.

A funding program for community power is recommended as a way to allow leaders to move beyond the fundraising hurdle. Ontario's Community Power Fund is demonstrative (see section 5.4.4 for more details).

C**ommunity groups do not consider electricity generation their role; they are not familiar with the electric system.**

This barrier will be discussed in section 5.5.2.

Community power groups do not currently have an effective means of sharing their knowledge neither with each other nor new groups.

To network and share experiences between community power groups, a central facilitation entity is suggested. In Ontario, this role is played by OSEA which organizes webinars, conferences, and site tours for networking and information sharing. A facilitation entity to perform this role as well as others is discussed in section 5.4.5.

5.3 Relationship Between Resource System and Group Characteristics

5.3.1 Agreement with Residents in Proximate Vicinity of Project

Some communities in the immediate locality of projects are opposed to the development because they feel like they shoulder the burden but do not benefit.

Various methods for ensuring local residents benefit from the renewable electricity developments has been found to overcome local opposition to renewable electricity as well as to prevent conflict between neighbours due to an unfair division of the benefits. Studies in Europe found that community involvement in renewable electricity developments increased acceptance of renewable electricity amongst the public (Loring, 2007; Warren & McFadyen, 2010).

Denmark's requirement for 20% of wind turbine shares to be sold within the municipality (Danish Energy Agency, 2009) achieves some community involvement but it neither ensures the residents in the immediate locality benefit nor does it benefit those who cannot afford to invest. Another Danish approach, allowing neighbouring land owners to apply for compensation of any lost land value, was not recommended as it was predicted to contribute to an undue sense of burden of wind turbines. Also in Denmark, the central government provides funds relative to the amount of wind capacity installed to municipalities for public education of renewable energy (Danish Energy Agency, 2011a). It is yet to be determined if this program increases the community acceptance of wind turbines.

A revenue-sharing model whereby neighbours receive a percentage of the benefits has been legislated in Greece (Greece Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety, 2000) and applied voluntarily in Prince Edward Island (Prince Edward Island Energy Corporation, 2008) and Quebec (Val-Éo & Agrinova, 2007). Revenue sharing ensures that benefits received by residents in the vicinity of a renewable electricity development are a function of impacts experienced rather than of financial investments made or land leased (Val-Éo & Agrinova, 2007). Lafond, Mazier, and Cunningham (2009) suggested that municipalities should require revenue sharing. However, municipalities in Nova Scotia are currently not permitted to do so under the *Municipal Government Act* (c. 18, 1998). In Denmark, municipalities allocate the revenue they generate from renewable power projects to developing more renewable energy (Danish Law on the Promotion of Renewable Energy, s. 18, 2008) but the effect this has on community support is not known.

Renewable power proponents can encourage local investment by selling shares at prices affordable by the community members. Alternatively, proponents can fund community benefit projects to earn local support.

5.3.2 Commitment by Public and Labour Sectors to Community Power Generation

Awareness and interest in community power is not yet common in the public, rather it is isolated to a distinct crowd of stakeholders.

Public interest in community power in Denmark and Ontario sparked when the opposition to the status quo and a proposed energy future also peaked (Lipp, 2007b; Rowlands, 2006). The Nova Scotia public is most concerned about coal combustion for electricity (CRA, 2009). Community power stakeholders would benefit from heightened public concern regarding coal combustion, which would provide the motivation for public interest in renewable and community power. Public awareness programs would assist widespread familiarization with the community power concept (discussed more in section 5.5.2).

A second factor in increased awareness of community power, as demonstrated by Ontario, is its economic viability (discussed in more detail in section 5.4.4).

Many electricity ratepayers are focused on keeping their own rates low regardless of the impact it has on other stakeholders.

Public awareness regarding the broader impact of the electric system, such as health, social, and environmental implications, helped initiate a more altruistic general perception in Denmark and Ontario regarding renewable electricity. A shift in public perception in both cases was triggered by a general concern of the existing energy system (section 5.5.2 for a discussion of public awareness programs).

Taxes on emissions such as sulphur and mercury contributed to public awareness of the broader impacts of the electricity system in Denmark. With the implementation of the tax, ratepayers then became aware of the externalities of fossil-fuel electricity generation and the relative health benefit of renewable electricity (International Energy Agency, 2004).

5.3.3 Fairness in Allocation of Benefits and Decision-Making Power

An unfair distribution of the economic benefits of renewable electricity developments leads to local opposition to renewable electricity.

This barrier was discussed in section 5.3.1.

Some constituents do not trust their municipalities to invest the revenue stream from renewable electricity in publicly beneficial ways, contributing to a feeling of burden without benefit and local opposition.

Some solutions to overcoming this barrier are discussed in section 5.3.1. All of the solutions given are to ensure the broader community benefits from the renewable electricity development via the municipality. However, trust in the municipal allocation of taxes is a much broader issue spanning beyond just renewable electricity development and was not a focus for this study.

5.4 Institutional Arrangements

5.4.1 Application and Approval Processes and Contract are Simple and Easy to Understand

The application process under the RFP system was found to be too onerous, lengthy, costly, and complicated with no guarantee of project success.

Relative to an RFP system of renewable electricity procurement, FITs have been found to be simpler and less risky, facilitating community involvement (Cory, Couture, & Kreycik, 2009). As a result, the introduction of the COMFIT program in Nova Scotia was a big step to overcoming this barrier. In addition, the one-window committee for applications and approvals as well as the COMFIT guidebook both should simplify the application process for community power. There are still many other approvals necessary from levels of authority outside the one-window committee including various departments of the federal government, municipal government, Aboriginal groups, and NSPI (Nova Scotia Department of Energy, 2011b). Thus, empirical data from community power developments under the COMFIT program are necessary to determine if further simplification steps are necessary to overcome this barrier. A facilitation entity (discussed in section 5.4.5) would also play a role in simplifying the process for community power.

5.4.2 Locally Devised Ownership Structure and Benefit Sharing

The requirement under the Nova Scotia *Municipal Government Act* limits municipalities to partnering only with other municipalities

This barrier will be discussed in section 5.5.4.

5.4.3 Ease in Interactions with Overseeing Government and System Operator

Municipalities without a renewable energy development plan or by-laws hinder renewable electricity development because the regulations are not clearly defined.

In Denmark, municipalities are required to develop renewable electricity plans and allocate space in their land-use plans for a set amount of renewable electricity generation capacity (Danish Energy Agency, 2011b). In developing their land-use plans, municipalities also then determine their by-laws for renewable electricity development. A similar requirement in Nova Scotia would bring the issue to the forefront for municipalities and may result in more municipalities developing land-use plans as well as renewable electricity by-laws. However, it would not overcome the financial challenge many of them face in doing so and alone would not overcome this barrier.

Ontario's approach, setting provincial by-laws and prohibiting municipalities from setting their own, has been controversial and was not recommended by key informants as it reduces the opportunity for public input (Legal representative, Jan 14, 2010)..

Nova Scotia's pilot project with Shelburne and Cumberland counties provided a good example of a way to encourage municipalities to develop renewable electricity plans and by-laws (Union of Nova Scotia Municipalities, 2011). Facilitating other municipalities without renewable electricity by-laws to replicate the process would help overcome this barrier. Since one of the most controversial elements of a renewable energy plan is the set-back by-law, the distance between the renewable energy generator and the nearest dwelling, an alternative to the approach above could be setting a provincial minimum set back by-law. To allow municipalities to maintain authority over this area, a municipal right to override the provincial minimum could be considered. Such a policy has precedence in Ontario's Minimum Distance Separation Formulae for agricultural land (Ontario *Planning Act*, O. Reg. 154/03, s. 7, 2009).

5.4.4 Availability of Low Cost Financing, Debt and/or Equity

Equity Financing

Raising equity is a challenge.

Various mechanisms have been demonstrated to facilitate access to equity for community power groups. In Ontario, the Community Energy Partnership Program's grants for feasibility studies and bridge costs provide necessary equity to community power groups (Community Energy Partnership Program, 2010). In Ontario, the community power sector had requested that, instead of a grant program, the Province create a forgivable revolving loan fund to make the program more sustainable economically.

A program for start-up and bridge costs was requested in Nova Scotia, especially for community power proponents with less financial means (Vogel, 2011). In Nova Scotia, some existing programs could be used to provide capital for community power projects, including: the Green Municipal Funds, the Eco Nova Scotia, the Farm Investment Fund, or the Atlantic Innovation Fund.

Denmark's tax exemptions for individual investors in renewable electricity projects encouraged individual community power investors (Sørensen, Hansen, & Larsen, 2002) while also contributing to widespread support for wind technologies (Maegaard, 2009). Nova Scotia's CEDIF mechanism provides tax credits to individual investments in qualifying community businesses including community power projects. A few recommendations to improve the CEDIF program were identified. First, an exit strategy was mentioned as a way to encourage investors. Some CEDIF companies have provided a buy-back option. Collaboration between CEDIF companies for such a buy-back program could be a way to realize a more effective exit strategy while sharing the risk.

Aboriginal communities in particular have limited ability to raise funds within their community.

Two suggestions were submitted on behalf of the Assembly of Nova Scotia Mi'kmaw Chiefs during the COMFIT consultation process regarding access to capital. First, a differentiated COMFIT rate was recommended to increase the likelihood of investors in the project seeing a return on their investment as it was found that the cost of production for Aboriginal power projects would be higher than other community power projects (KMKNO, 2011). Second, a grant program for start-up costs was recommended. Each of these programs has precedence in Ontario where Aboriginal groups are faced with the same financial limitations under the Canadian *Indian Act* (1985, c. I-5, s. 89-90). Ontario's Aboriginal communities receive a $0.006 to $0.015/kwh adder on the standard FIT rate (Ontario Power Authority, 2010b) and are eligible for the Aboriginal Energy Partnership Program grants for start-up and bridge costs (Ontario Power Authority, 2010a).

Securing debt financing was a major obstacle to community power projects.

Banks are not yet familiar with community power in Nova Scotia. To date, community power projects have all been privately financed (Roscoe, 2011). The COMFIT program will likely increase the comfort of banks as it decreases the risk of the investment but empirical data are not yet available to confirm this. Also, a revolving loan fund as described above in this section would have an effect on community groups' access to financing. If such a financial support mechanism is established, the challenge of accessing debt financing may be alleviated. An alternative financial mechanism to facilitate access to favourable borrowing is demonstrated in Denmark. The Kommunekredit loan guarantee program enabled many Danish community power projects.

Aboriginal groups also face particular challenges when accessing debt financing. Regarding debt financing, the Assembly of Nova Scotia Mi'kmaw Chiefs recommended the creation of a loan program, similar to Ontario's Aboriginal Loan Fund, to increase the ability of Aboriginal groups to access debt financing (KMKNO, 2011). The Ontario program offers loans for up to 75% of project costs (Ontario Financing Authority, 2010a).

5.4.5 Availability of Low-Cost Advice and Support

Limited access to advice and support restricts the potential for community power.

A supporting body was suggested for Nova Scotia in the Stakeholder Consultation Report and referred to as the Facilitation Office (Adams & Wheeler, 2009). It was specifically mentioned that the entity should be accessible across the province, not "Halifax-centric" (Adams & Wheeler, 2009, p. 38). The structure of the facilitation entities in Denmark and Ontario varied, including independent consultants, not-for-profit organizations, coalitions, and government subsidiaries. In general, partnerships between government and independent organizations were found to be more successful in service delivery to a broad range of audiences as they improve the reputation, expertise, and cost effectiveness of the partnership (United Nations Department of Economic and Social Affairs, 1994). Based on the Ontario experience, a facilitation entity with a person available to answer questions is more effective than one that generates in-depth publications.

Funding sources for facilitation entities in Denmark and Ontario varied from government funding to fees for service. Funding from government grants has been found to result in service gaps as it tends to be for short-term projects (Scott, 2003). Richmond and Shields (2005) recommended that governments offer stable funding that includes administrative and operational costs. Also, entities that earn a significant portion of their money from services are more robust through political shifts.

5.5 External Environment

5.5.1 Financially Viable Technology and Accessible Labour

Agricultural biomass technologies are not yet appropriate for the crops and scale of Nova Scotia farms.

Research, development, and demonstration in agricultural biomass technologies specific to Nova Scotia would facilitate the development of community power biomass projects. It has yet to be seen if the COMFIT rate for biomass CHP projects stimulates investment in agriculture biomass installations; a rate specific to agricultural biomass may be necessary to do so. When determining a rate for biomass, either forest or agricultural, sustainability of the harvesting process should be considered as it affects the carbon neutrality (Simpson, 2009).

Tidal turbines are not yet commercially proven in Nova Scotia

Research, development, and demonstration in tidal power technologies specific to Nova Scotia would facilitate the development of community power tidal projects. The FIT rate for tidal projects greater than 0.5 MW has yet to be determined and it has yet to be seen if the COMFIT rate for tidal power projects below 0.5 MW is sufficient to stimulate installations.

Lack of investment in research and development to make storage technologies more cost competitive is a barrier to their widespread application.

Starting early in the 20th century, the Danish government funded research and development of energy storage technologies (Quistgaard, 2009). Energy storage technologies have contributed to Denmark's achievement of 20% renewable electricity on the grid (Akhmatov et al., 2007).

Storage technologies in Denmark have primarily been the widespread installation of district heating systems with large thermal storage units heated by electric boilers. Because of the time buffering provided by the hot water storage, the electricity demand can be shifted to times of high wind production.

Grid capacity has been identified as a barrier to community power (and renewable electricity in general) in Nova Scotia. In particular, energy storage embedded within distribution zones has been identified for its potential to increase the capacity for variable distribution-level generation without spill-over (see section 5.1.2). Potential for electricity storage facilities such as pumped hydro and compressed air have been identified in Nova Scotia (SNC-Lavalin ATP Inc., 2009).

Various ways to facilitate research and development in energy storage have been identified including a FIT for storage, which shifts the burden of risk onto the private sector (Peters, 2008).

Community power projects, because of their smaller size and dispersed nature, can especially be challenged in securing skilled labour.

Subsidized training and upgrading programs in Denmark were found to successfully encourage new and existing trade labourers to become trained in renewable electricity. The Community College in Nova Scotia launched a two-year course on sustainable energy technology in 2011. The success of this program in upgrading the existing trades-people has yet to be measured. Subsidies for the upgrading programs may be necessary to encourage skilled trades-people to take time away from their busy schedule to take the course, as was done in Denmark (International Energy Agency, 2004).

Comparatively, Ontario's domestic content rule has had successful results in stimulating local labour capacity. A Nova Scotia domestic content rule was cautioned against due to the small size of the market (Lipp, 2007a). An assessment of an Atlantic domestic content requirement to encourage manufacturing capacity in the region is one option needing more study. Developers of renewable electricity projects can write local labour preference into their company policies as a voluntary measure.

Skilled labourers trained in renewable electricity are leaving the province.

Incentives for trained nurses to stay in Nova Scotia after graduation have been implemented (Nova Scotia Department of Health, 2000). A similar program for renewable energy technicians could help overcome this barrier.

5.5.2 Public Education and Participation

There is minimal general public awareness of community power. Participants in public education activities are a small sub-sector of the population and attracting widespread participation is difficult.

Case studies in Denmark and Ontario showed that concern about the current energy system sparks general public awareness (Lipp, 2007b; Rowlands, 2006). Some public demand to end the use of coal in Nova Scotia is present in Nova Scotia (CRA, 2009). The benefits of community power including local job creation, rural revitalization, and environmental protection are likely to resonate with a broader crowd. Engaging leaders in communities first and having them become the local champions for community power was helpful in Ontario. Economic viability of the community power sector is a big step in realizing general public interest, which may be achieved by the new COMFIT program.

Studies have suggested that community members will be encouraged to become involved in a project if their peers are also involved (Holman, Devane, & Cady, 2007). Similarly, it has been found that the public more readily engages if they are recruited through acts of neighbourliness, such as invitation by acquaintances (Verba, Schlozman, & Brady, 1995). Peer-to-peer communication establishes a foundation based on community values (High-Pippert & Hoffman, 2008). Literature suggests that public participation can be maintained if members: a) desire to maintain good relations with neighbours, b) realize individual incentives, and c) feel part of the decision-making team (Rydin & Pennington, 2000).

Rural communities often have little access to information.

Bringing in outside experts on community power to introduce the idea has been found to stimulate public interest. Facilitation entities have helped with the initial presentation of ideas (see section 5.4.5).

Financing and capacity is very limited at the municipal level to organize informational workshops.

Public education activities receive central support in both Ontario and Denmark in various ways. In Denmark, municipalities are provided with funding for educational activities based on the amount of renewable electricity capacity they have installed (Danish Law on the Promotion of Renewable Energy, s. 18, 2008). In Ontario, the Community Energy Partnership Program provides funds for organizations to run educational programs across the province (Community Energy Partnership Program, 2011). A similar program in Nova Scotia would increase the general public awareness of community power.

Participants became disillusioned during the process if it took longer than expected.

The COMFIT guidebook includes a general timeline for the development of a community power project. It is yet to be seen if this results in more realistic expectations, thus preventing discouragement.

5.5.3 Role for Local Authority

Many municipalities do not have the expertise or financial capacity to create thorough renewable electricity bylaws.

The limited capacity of some municipalities to create renewable electricity by-laws was identified by the Province. The provincially funded pilot project for the creation of Wind Plans in Shelburne and Cumberland Counties was found to be helpful. Sharing the experiences learned in that pilot project would facilitate other municipalities to replicate the process but the costs may still be burdensome. Setting a minimum provincial by-law would ensure that no municipality is left without any renewable electricity by-law (see section 5.4.3).

A voice for community members who are not invested in renewable electricity projects is necessary.

The development of renewable electricity plans at the municipal level prior to the development of a renewable electricity project allows for community members who are not able to invest in a project to have a voice in the decision-making process. Public participation in decision-making has been found to be desirable because: 1) it is an essential element of democracy; 2) it reduces conflict, increases trust, and adds justification to decision making; and 3) it results in more-robust decisions (Fiorino, 1990) that are more in line with society's values (Rydin & Pennington, 2000). It has been found that "projects with high levels of participatory planning are more likely to be publicly accepted and successful" (Loring, 2007, p. 2658). It has been suggested that planning processes be designed to engage those affected by the outcome in the decision-making (Rowe, 2000).

5.5.4 Supportive Permitting, Interconnecting, and Contracting Institutions

Municipalities are limited with whom they may partner by the Municipal Government Act.

The *Municipal Government Act* does not allow municipalities to partner with private entities, only contract them. They may only partner with band councils or federal, provincial, or municipal government entities. For community power development, this restricts the ability of municipalities to access the knowledge and financial capacity of private corporations. An assessment of how this issue was approached in other jurisdictions such as Ontario would inform potential solutions.

The competitive bidding process is difficult for municipalities.

The COMFIT process has replaced the competitive bidding process for distribution-connected renewable electricity. A FIT for transmission-connected projects would lift this barrier for all renewable electricity development. Ontario's communities, municipalities included, are permitted to generate renewable electricity under the FIT program up to a maximum project size of 10 MW. This limitation has been challenged as communities have the desire to build larger projects and achieve the economies of scale therein. In Denmark, the world's largest community owned project is a 40 MW wind project in the Copenhagen harbour that is owned as a partnership between the municipal electric utility and a community co-operative (Sorensen, Hansen, & Larsen, 2002).

5.5.5 Collaboration Between Governing Bodies, One-Window Committee to Interact with Community for Ease and Clarity

For community proponents, the RFP process and the queue were found to be too onerous, lengthy, costly, and complicated with no guarantee of project success.

The discussion in the section immediately above deals with this in the case of municipalities but the information is also relevant to all forms of community power. Empirical evidence is required to confirm if the COMFIT program overcomes this barrier.

CHAPTER 6 RECOMMENDATIONS AND CONCLUSIONS

6.1 Recommendations

Based on this study on overcoming barriers to create a viable and significant community power sector in Nova Scotia, recommendations are made for various players in the public and private sectors. These recommendations have been grouped based on the entity responsible and the topic of focus. Within these groups, the recommendations have been ordered chronologically based on the experience of Ontario. Recommendations were organized this way because of it is transparent; key informants were not asked to prioritize recommendations that were concluded by the study, thus an ordering based on prioritization would not be founded in primary data. Ontario's timeline was utilized solely for this chronology as Ontario has initiated a community power sector more recently than Denmark, which more closely resembles the situation in Nova Scotia compared to the century-long evolution of Denmark's community power sector. Not all of the recommendations below had been demonstrated by Ontario; thus, for the recommendations that had not been demonstrated, the ordering was in no specific order.

6.1.1 Recommendations for the Nova Scotia Department of Energy

6.1.1.1 *COMFIT Program*

1. Community power projects should be allowed to connect to the transmission grid and to be of any size with rates set accordingly.

2. The FIT rate should be available to individuals who own small projects that have minimal impact on the surrounding areas.

3. A price adder to the COMFIT rate should be included to reflect the additional cost of production for Aboriginal power projects.

4. A COMFIT rate specific for agricultural biomass and biogas should be set.

5. A COMFIT for rooftop solar power up to 10 kw, similar to Ontario's microFIT program, focusing on urban areas should be introduced and communicated to the public as a way to increase grid efficiency and engage urban residents in renewable energy generation.

6. It should be determined if the Province's COMFIT Guidebook provides sufficient information to prospective community power groups or if further information is necessary.

7. An assessment should be undertaken to determine if the one-window approvals committee at the Department of Energy has effectively streamlined the approvals process or if further streamlining initiatives are necessary.

8. The COMFIT rates for wind power should be interpolated linearly (based on the current rates set for 50kW and 1.5kW projects) in the short term to determine baseline points before the review period for the COMFIT. During the COMFIT review, more baseline points should be determined for wind power to enable a more accurate interpolation and rate setting. Also, an assessment should determine if linear interpolation for all other technologies would be beneficial.

9. A COMFIT for energy storage should be set.

10. A clear definition of CHP should be set with a minimum efficiency standard to ensure life-cycle environmental sustainability of forest biomass.

6.1.1.2 *Regulating the System Operator*

1. The connection of renewable electricity projects should be based on a pre-determined, publicly available formula.

2. Requirements should be imposed to ensure that interconnection studies and procedures occur in a timely manner with penalties for excessive delays.

3. Information determined through the pre-feasibility study should be available to community power proponents free of charge.

4. The sub-distribution stations should be upgraded to enable electricity spill-over from distribution to transmission.

5. Taxes on the negative impacts of coal combustion such as sulphur or mercury emissions should be enacted to contribute to public awareness of the benefits of alternative energy sources.

6.1.1.3 Financing

1. Because Aboriginal groups face particular challenges with accessing debt financing, they should be considered separately when determining if a loan guarantee program is necessary with or without a revolving loan fund.

2. A program for feasibility studies and bridge costs similar to the Ontario Community Energy Partnership Program should be developed for community power proponents with less financial means. Instead of grants, the program should be designed as a forgivable revolving loan program to enable longer-term sustainability. The program should also service the Aboriginal community, taking into account their specific financial challenges. To replenish the forgiven loans, funds should come from electricity rates.

3. If a forgivable revolving loan fund is not created, a loan guarantee program should be considered to enable community power groups with limited access to debt financing. However, if a revolving loan fund is initiated, a review should take place of the empirical data at the 18-month review period of the COMFIT program to determine if access to debt financing is still a barrier. At that point, debt-financing programs may be considered.

6.1.1.4 Labour Pool Development

1. Along with the other Atlantic Provinces, an in-depth assessment of an Atlantic domestic content requirement to encourage manufacturing capacity in the region should be undertaken.

2. The success of the technician upgrading courses at the Community Colleges should be assessed to determine if they are adequately facilitating a skilled labour pool in Nova Scotia. If it is found that technicians are not upgrading rapidly enough to meet the demand for labour, subsidies to encourage skilled trades-people to take the courses should be considered.

3. An incentive should be offered for graduates trained in the renewable energy sector to stay in Nova Scotia.

6.1.1.5 Municipal Legislation

1. An assessment of how to enable municipalities to own and operate renewable power generation facilities should be undertaken. This study should particularly include an assessment of the restrictions in the *Municipal Government Act* that prevent municipalities from partnering with private companies.

2. Municipalities should be facilitated in developing renewable electricity plans and by-laws, as were Cumberland and Shelburne.

3. Municipalities should be required to allocate space in their land-use plans for a set amount of renewable electricity generation capacity.

4. A provincial minimum by-law whereby municipalities maintain the right to override should be implemented in the short term before all municipalities can afford to set their own by-laws.

6.1.1.6 Developing a Provincial Facilitation Entity

1. A facilitation office should be formed out of a partnership between government and independent organizations with membership from community power stakeholders. It should have representation across the province and a staff person capable and available to answer questions.

2. The facilitation entity should support existing community power projects to demonstrate the potential of community power.

3. The facilitation entity, along with community power stakeholders, should embark on a public awareness campaign to build upon the economic viability of community power achieved by the COMFIT. It should leverage the existing public opposition to coal combustion to bring about public familiarity with the community power concept. Messages that should be communicated to the public should include the local job creation, rural revitalization, and environmental protection that result from community power. External experts should be involved in introducing the ideas to communities.

4. Local leaders should be provided with capacity and should aim to engage others to form community power groups through peer relationships.

5. Some stable funding for the facilitation entity should be ensured by the Province, either through electricity rates or tax revenue, and the office should collect some funds by charging membership and/or service fees.

6.1.2 Recommendations for the Department of Economic and Rural Development and Tourism

1. The CEDIF program should be amended to include an exit strategy such as a buy-back option for shareholders who need to access their funds before the end of the term. More research should be conducted to determine if such a program should be offered individually by the CEDIF company or through a group of CEDIFs such as the Community Windfields to investors in community power CEDIFs.

6.1.3 Recommendations for Municipalities

1. An assessment of how municipalities in Nova Scotia could best encourage revenue sharing should be undertaken.

6.1.4 Recommendations for Renewable Power Proponents

1. Renewable power proponents should sell shares at prices affordable to a significant portion of the community of immediate locality and/or provide funds for benefit projects as determined by the community of immediate locality.

6.1.5 Recommendations for the Department of Natural Resources

1. Clear regulations around forest biomass harvesting practices should be set with the objective of environmental sustainability.

6.1.6 Recommendations for Academic Institutions

1. Partnerships between academic institutions and industry should be formed to work on research, development, and demonstration of agricultural biomass and biogas CHP, tidal, and energy storage technologies specific to Nova Scotia.

6.2 Conclusions

Implementation of the recommendations above will help achieve a viable and significant community power sector in Nova Scotia. This, in turn, will help Nova Scotia achieve its renewable electricity targets, enable a more stable and efficient energy system in Nova Scotia, and increase economic prosperity for Nova Scotia, particularly in rural communities.

6.2.1 Help Nova Scotia Achieve its Renewable Electricity Targets

Achieving the renewable electricity targets and moving towards a 100% renewable electricity future is necessary to wean Nova Scotia off its dependence on coal for electricity. This will improve energy security, electricity price stability, and the health of the population and environment in the province. A viable and significant community power sector will help achieve the renewable electricity targets by increasing contract success rates, improving local community support, and reducing the time needed to develop renewable electricity projects.

A FIT for all renewable electricity development in Nova Scotia would help to improve the contract success rate all the more. To date, some renewable electricity development projects in Nova Scotia have been hindered by local opposition. Community ownership will increase social acceptance in the immediate community by including that community in the decision-making and the economic benefits.

Finally, community power as a part of the renewable electricity strategy will allow the renewable electricity targets to be achieved more quickly. Also, it can be predicted that community power will stimulate more capital investment in renewable electricity.

6.2.2 Enable a more Stable and Efficient Energy System in Nova Scotia

Community power, which tends to be distributed and relatively small scale, can be used to achieve a more stable and efficient electricity system by decreasing line losses, alleviating the need for investments in transmission grid upgrades, and decreasing the impact of power outages. Also, community power will enable CHP systems and help to inspire a culture of conservation.

If FIT rates are set such that they enable community power developments for many energy resources and geographies, the distances between generation and consumption will be reduced. The result will be improved line efficiencies and a decreased need to upgrade the transmission grid, which will offset the diseconomies of scale of the smaller generation facilities. An additional benefit of a more distributed electricity system is grid outages will affect fewer customers.

A community power sector that includes many small-scale combustion facilities will enable the use of the heat by-product for district heating, which increases the overall efficiency of the generation facility by 40% to 50%. The current biomass COMFIT rate will ensure the development of some CHP but would be augmented by an additional COMFIT rate for agricultural biomass and for biogas technologies. Strict conditions would be necessary to ensure overall environmental sustainability and greenhouse gas emissions reduction.

A FIT allows renewable technologies to compete with conventional sources of energy that are otherwise under-priced because many of their costs to society are externalized. A full-cost accounting approach to pricing all energy sources would augment a FIT. With a significant community power sector, more members of the public are engaged in the electricity sector and become aware of the relative benefit of renewable electricity. In Nova Scotia, as more members of the public become aware of electricity generation, they will become more open to ideas of energy conservation that are being encouraged through demand-side management program, which will help improve the overall efficiency of the energy systems in Nova Scotia.

6.2.3 Increase Economic Prosperity for Nova Scotia, Particularly the Rural Communities

Many of Nova Scotia's rural communities are dwindling in population because of declining natural resources upon which they were dependent. Renewable power generation offers a stable source of income for rural communities with energy resources. Community ownership results in significantly more economic benefit and job creation for the local community than external ownership (Galluzzo, 2005). A significant community power sector will help to achieve the objective of rural revitalization set by the Province.

6.2.4 Further Research

Areas for further research in addition to those identified in the recommendations include the applicability of a thermal grid for energy storage in Nova Scotia, the replicability of the conditions for success for community power when compared to jurisdictions other than Ontario and Denmark, and the transferability of the recommendations of this study to other jurisdictions with privately-owned electricity utilities.

In conclusion, the recommendations resulting from this study depict a path to achieving the unlegislated target of 100 MW of community power in Nova Scotia and expanding the significance of the sector beyond that initial step. Developing 100 MW of community power will be an effective initial step for achieving a viable community power sector but a more significant role for community power will enable an efficient and renewably powered future for Nova Scotia in which communities enhance their economic and social prosperity.

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APPENDIX A INTERVIEWEES AND INTERVIEW GUIDE

Table 3 ***Interviewees in Nova Scotia***

Interviewees	Title for Study	Topics Discussed
Aftab Erfan	Urban Planning representative	municipal policy, permitting, public education, opposition
Andy MacCallum	Developers representative	technology, community development, provincial policy, permitting,
Bob Upton	Financiers representative	financing, business model
Bob Williams	Co-operatives representative	business model, demo site, public education, financing, managerial, provincial policy
Debbie Nielsen	Municipalities representative 1	municipal policy, networking, demonstration sites, public education
Donald Regan	Municipal Utilities representative	policy, provincial and municipal
Gay Harley	Carbon Credits/Community Windfields representative	carbon accounting, business model, CEDIF program, management
George Foote	Provincial Policy representative 2	provincial policy, public education, permitting,
Howard Epstein	Legal representative	legalities, municipal policy
Joan McArthur Blair	Formal Education representative	Education (formal + public)
Judith Peach	Opposition representative	opposition, public education, policy
Julian Boyle	Municipalities representative 2	municipal, policy, demonstration sites, formal education
Julie Bailey	Agriculture representative	agricultural, demonstration sites, public education, networking,
Kenny Corscadden	Research representative	agricultural, demonstration sites, networking, technology
Linda Scherzinger	Community Organizations representative 2	financing, managerial, education (public)
Government of Nova Scotia Staff	Provincial Policy representative 1	provincial policy, public education, permitting
Pam Harrison	Community Organizations representative 1	financing, management, public education
Interviewees	**Title for Study**	**Topics Discussed**

Table 3 ***Interviewees in Nova Scotia***

Interviewees	Title for Study	Topics Discussed
Peggy Cameron	CEDIF representative	financing, CEDIFs, business model, provincial policy, managerial
Robin McAdam	NSPI representative	provincial and municipal policy, technology, carbon accounting, public education, financing
Vivian Godfree	Public Education representative	public education, demonstration sites
Will Marshall	Technical Training representative	technical training, labour force

Table 4 ***Supplementary Informants in Nova Scotia***

Interviewee	Title for Study	Topics Discussed
Noris Bushell	Developer supplementary informant	technology, business, financing
David Swan	CEDIF supplementary informant 1	CEDIF, business, financing
David Stevenson	CEDIF supplementary informant 2	CEDIF, business, financing

Table 5 ***Interviewees in Denmark***

Interviewee	Title for Study	Topics Discussed
Henrick Lund	Danish Academic representative 1	federal and municipal policy, business, financing
Jakob Greth	Danish Developer representative	financial, technology, business
Jane Kruse	Danish Community Power representative 1	federal and municipal policy, business, financing
Jorgen Hansen	Danish Agriculture representative	business, financing
Karl Sperling	Danish Academic representative 2	federal and municipal policy
Preben Maegaard	Danish Community Power representative 2	federal and municipal policy, business, financing

Table 6 ***Interviewees in Ontario***

Interviewee	Title for Study	Topics Discussed
Ambrose Raftis	Ontario Community Organizations representative	business, financing
Devin Causley	Ontario Municipal representative	municipal and provincial policy
Meghan MacLennan	Ontario Financing representative	financing, business
Roberto Garcia	Ontario Community Facilitator representative	public education, provincial policy, business

Interviewee	Title for Study	Topics Discussed
Roger Peters	Ontario Renewable Energy Advocate representative 1	public education, provincial policy, business
Tim Weis	Ontario Renewable Energy Advocate representative 2	public education, provincial policy

INTERVIEW GUIDE

Prompts are in italics

Questions for Department of Energy:

1) a) What are the Department's priorities with respect to distribution-scale renewable energy development?
- *Plans to promote? require? up to NSPI?*
b) What is the perception of the Department on the set-aside Request for Proposals contracted for distributed power by NSPI?
c) In the Department's view, can it significantly contribute to electricity generation? What percentage of electricity?
d) What challenges would be faced if distribution-scale energy were to make up a large portion of the electricity generation mix?

2) a) What are the Department's priorities with respect to the net metering program?
- *Plans to promote?*
b) What were the drivers of the recent changes?
c) In the Department's view, can it significantly contribute to electricity generation? What percentage of electricity?
d) What challenges would be faced if net-metered energy were to make up a large portion of the electricity generation mix?

3) What role does the Department think public education and awareness raising will play in community power?

4) a) Are there any plans to develop demonstration sites for community power?
b) Does the government believe that demonstration sites will increase public interest or involvement in renewable electricity?

5) a) How does the Department envision renewable electricity development in NS to meet the Renewable Energy Standard in 2013, 2020?
- *18% by 2013, 25% by 2020*
b) What is the role of community power in that vision?

6) a) Are there any financial resources directed for community issues with regards to renewable electricity development?
   b) Has or would the Department consider supporting low or no-interest loans for community power development?
   c) Has or would the Department considered issuing bonds similar to those used in PEI to gather capital for wind developments?
   d) How could the Renewable Credits market play a role in the financing of community power projects?

7) a) How does the Department currently interact with Municipalities about the by-laws and permitting procedures for renewable energy developments?
   b) What challenges arise under the current permitting procedures for community power developments?
   - *streamline permitting procedures for net metering, connection queue, standard by-laws across province,*
   c) How could these challenges be overcome?

8) a) Is the Environmental Impact Assessment procedure a barrier for community power developments in the 2-15 MW range? In the <2MW size?
   b) How could these barriers be overcome?
   - *for <2MW and >2MW*
   c) How is the Department involved in the EIA process right now?
   - *for <2MW and >2MW*
   d) How could the Department help to overcome some of the barriers?
   - *for <2MW and >2MW*

9) As a concluding question, what are the Department's plans for community power development?

Questions for the Department of Environment:

1) What is the Department's position regarding the current renewable electricity development system in Nova Scotia?
- *utility-scale, RES/RFP process, distribution set-aside, net-metering*

2) a) What role does the Department see for distribution-scale renewable electricity development?
   b) In the Department's view, can it significantly contribute to electricity generation? What percentage of electricity?
   c) What role does and should the department play in distribution-scale renewable electricity developments?

3) a) What role does the Department see for net metered electricity?

b) In the Department's view, can it significantly contribute to electricity generation? What percentage of electricity?

c) What role does and should the department play in net-metered renewable electricity developments?

4) What role does the Department think public education and awareness raising will play in community power?

5) a) Are there any financial resources directed for community issues with regards to renewable electricity development?
b) Has or would the Department consider supporting low or no-interest loans for community power development?
c) How could the Renewable Credits market play a role in the financing of community power projects?

6) a) Are there any plans to develop demonstration sites for community power?
b) Does the government believe that demonstration sites will increase public interest or involvement in renewable electricity?

7) a) How does the Department envision renewable electricity development in NS to meet the Renewable Energy Standard in 2013, 2020?

- 18% by 2013, 25% by 2020

b) What is the role of community power in that vision?

8) a) Is the Environmental Impact Assessment procedure a barrier for community power developments in the 2-15MW range? In the <2MW size?
b) How could these barriers be overcome?

- for <2MW and >2MW

c) How is the Department involved in the EIA process right now?

- for <2MW and >2MW

d) How could the Department help to overcome some of the barriers?

- for <2MW and >2MW

9) As a concluding question, what are the Department's plans for community power development?

- prompt re. topics at top

Interview Questions with Agricultural Informants

1) What is the general level of interest amongst farmers in NS for community power?
2) What is the potential for farmers to contribute to community power in NS?
3) What challenges does the agriculture community face in community power developments?

4) What support would farmers need to become involved in community power?
- *education, training, networking, financial assistance, technical expertise, legal help, ease of regulations, etc?*

5) a) From your experience, are demonstration sites a good way to increase the agriculture community's interest or involvement in community power?
   b) What role could Farm Energy play in that?

6) a) Would facilitating networks for sharing experiences and lessons be beneficial for increasing the interest and involvement of the agricultural sector in community power?
   b) What role could Farm Energy play in that?

7) a) Would assistance with business planning and/or co-operative modeling be beneficial for increasing the interest and involvement of the agricultural sector in community power?
   b) What role could Farm Energy play in that?

8) After reading this background paper, what model do you think is best for farmers to be involved in generating RE? (provide info from EU models document)

Interview Questions for Nova Scotia Power Incorporated

Request for Proposals

1) a) What role does NSPI see for distribution-scale renewable electricity development?
   b) Based on the previous distribution-scale RFP's what has been the experience of NSPI so far with distribution-scale developments?
   - *grid connectivity and stability, community acceptance, cost, operation and maintenance, ease of construction, down-time*
   c) In NSPI's view, can it significantly contribute to electricity generation? What percentage of electricity?
   d) How should/will NSPI pursue distribution-scale renewable electricity developments in the future?
   - *public education? Promotion? Leave that to govt? Expand program? End program?*

2) a) What are some of the challenges that face local businesses when they are applying for a distribution-scale RFP?
   b) How could these barriers be overcome?

3) There have been challenges regarding the cost of upgrading the distribution lines to connect a distribution-scale project; are there any plans or programs to assist with this cost for distribution-scale generators?

4) a) Is the EIA process for distribution-scale customers a barrier?
   b) If so, how could NSPI assist in overcoming that barrier?

5) a) Are Municipalities permitted to apply for distribution-scale contracts?
   b) If not, how can this barrier be overcome?

6) a) Would there be challenges to the grid if all of the RES was met with distribution-scale renewable electricity projects?
   b) Would storage technologies assist in overcoming any grid challenges?

   c) What is needed to increase the deployment of storage technologies in NS?

7) Where is the money from the Renewable Energy Credits allocated?
8) Does NSPI plan to encourage technologies other than wind in distribution-scale RFPs?
   a) Is there a role for the DoEnergy to define this in the legislation?
   b) What support would be needed to allow NSPI to create more encouraging programs for other renewable electricity technologies?
   -R&D? demo sites? Low cost financing? Regulation from DoEnergy?

9) Is there any consideration given to spending some of the DSM program money on community power since it has the effect of encouraging energy efficient lifestyles in the communities in which it is installed?

10) Would there be any way to include social and environmental costs and benefits in the decision-making process around renewable energy generation?
   - *division of tasks of UARB, Dept of Energy, NSPI*

Grid

1) Does NSPI believe that distributed energy would result in savings on grid upgrades or a more stable grid?
2) a) What would be needed technically to be able to increase the amount of renewable energy in the electricity mix?
   b) Is this different if it is distribution scale vs. transmission scale?

3) a) Would storage technologies assist in overcoming any grid challenges
   b) What is needed to increase the deployment of storage technologies in NS?

Interview Questions for Nova Scotia Co-operative Council

1) a) If a community group were interested in setting up a co-operative to invest in a collectively owned wind turbine that would be either net-metered or to bid on a distribution-scale request for proposals under NSPI, what would be the structure of that co-op?

b) How difficult would it be to organize and maintain?

c) What sort of skills would be needed in that group to make such an opportunity possible?

2) How could these skills be developed in communities in NS?

- *whose responsibility? Education training programs? subsidized? Resources? RDAs? Academic institutions?*

3) a) What does NS Coop Council offer to support such a project?

b) What other support programs would be helpful to encourage the development of community power using a co-op structure?

4) Is there a need for legal assistance/advice for communities involved in renewable electricity generation?
   a) If so, where can this advice be obtained?
   b) How can it be made easier to access?

5) a) Is the CEDIF, Community Windfields model a useful tool for Community renewable electricity development in NS?

b) What are the benefits and challenges of this model?

c) How could it be made more effective?

6) Considering the models in EU described in this article, do you think that any of these models would be appropriate for NS?

Interview Questions for Community Windfields

1) What is you opinion regarding the NSPI's DSM program as a means to support community power development?

2) a) What, if any, technical challenges would be faced by the grid if community power were to be developed at a significant scale?
   b) What is the importance of electricity storage to overcome these challenges?
   c) Do demonstration sites help to overcome these challenges?
   d) What else would assist the deployment of electricity storage technologies?

3) a) What are the challenges for eliciting community investment in RE?
   b) How can these challenges be overcome?

- municipal regulations, provincial policy changes, financing available, education programs or materials, either in academic institutions or outside, technical training, demonstration sites, networking, co-operative structure assistance, etc

4) a) How could a re-structuring of the grid operation affect community power opportunities?
   b) How could that restructuring happen?

5) Are Renewable Credits an option for financing community power developments?

6) a) Are the EIA's required for community power <2MW, >2MW a barrier?
   b) If yes, how could this barrier be overcome?

7) a) Are the permitting procedures at the municipal level a barrier to community power?
   b) If yes, how could they be overcome?

8) What is the importance of assistance with business planning or co-operative modeling on community power projects?

9) What other challenges are barriers to community power in Nova Scotia?

10) What is the role of demonstration sites to overcome these challenges?

Interview Questions for Credit Union

1) What is the procedure to acquire financing for a renewable electricity investment currently?
2) Is there much interest in such investments? Why or why not?
3) How could the financing opportunities be made more attractive to community groups in NS?
   a)What would the Credit Union need to make that possible?
4) Is there a way to measure the economic spinoffs that are created when an investment dollar is re-invested in the local economy?

Interview Questions for Nova Scotia Community College

1) What skills are needed to see a distribution-scale renewable energy development (<15MW) through from the ground up? For de-construction?

2) What skills are needed to build and maintain a grid that incorporates a significant amount of distributed renewable energy (<15MW)?

- *presume intermittency*

3) What will the role of electricity storage play in such an energy future?

4) What is needed to bring storage infrastructure to that point? Skilled labour?

5) What skills will the graduates of the current renewable electricity technician program have?
6) What suggestions would you have with respect to a labour pool strategy in Nova Scotia to develop these skills identified in 1-4 and not met by 5

7) How many graduates is the program expecting to have in the future?

8) What would it take for all renewable electricity developments in NS to employ only local labour?

Interview Questions for Municipal Utilities Co-operative

1) What are the opportunities for municipal utilities to initiate community power developments under the existing policy structures?

2) What are some of the challenges to realizing those opportunities?

3) What would assist the actualization of these opportunities?

- education programs, training, networking, resources, subsidization, financing assistance, etc

4) a) What are the opportunities for community power under the new net-metering policy?
   b) What support would assist the realization of those opportunities?

5) How does the Municipal Utility Co-op play a role in the encouragement of community power in NS?

6) What role would they like to play in the future?

Interview Questions for renewable electricity developers

1) What skills, technical and managerial, are needed to install a wind turbine (50kW – 1MW) (1-15MW)?
2) a) Does your company try to source these skills locally?
   b) If so, why? Does the company consider/benefit from the economic spinoffs in the local area?

3) a) Can these skills currently be sourced locally?
   b) If not, what would be needed to get to that point?

- institutional support?, training for existing technical sector?

4) What challenges are proponents of a project faced with regards to grid connection?

5) a) Do storage technologies have a role to play in overcoming some of the technical grid challenges?
b) If so, how can the deployment of storage technologies be realized?

6) a) Does the permitting process create challenges for community power?
b) If so, how could these challenges be overcome?

7) Can you gauge the level of interest that you have seen so far amongst communities in NS for generating their own electricity?

8) What do you see as the opportunities for community power in NS?

- net metering and distribution-scale RFP

9) What are the barriers to these opportunities?

10) Can you suggest methods for overcoming these barriers?

11) Can Renewable Energy Credits provide a source of revenue for community power?

Interview Questions for NGO's

1) How do you envision the role of community power in Nova Scotia?
2) What level of interest do you think exists in the province for that vision?
3) What do you see as the barriers to that vision?
4) How would you recommend that they be overcome?
5) How can non-governmental groups assist overcoming the barriers?

Interview Questions for opposition groups

1) What are your concerns regarding wind energy developments?

2) After reading this document on community power, would this form of development of wind energy overcome some of your concerns?

3) If not, what other concerns would you have?

4) What strategy would you recommend to overcome those concerns, taking into consideration the requirement set by the NS Government to supplying 20% of electricity renewably by 2013?

Interview Questions for support groups in Ontario

1) a) How did the interest for community power gain support in Ontario?
   b) What was the role of the DoEnergy, DoEnvironment, DoEconomic Development, academia, communities, municipal governments, NGOs, exterior influences, etc?

- not just in bringing about Standard Offer Contracts but the initial interest too

2) What did/do communities need in addition to a progressive policy to be able to generate RE?
   - role of government, private sector, academia, NGOs, public, etc

3) What are the main challenges for communities in realizing community power?
   - education, financial capital, managerial, technical know-how, NIMBY-ism, access to information and expertise, etc

4) How are the community renewable electricity developments structured in Ontario?
   - percent ownership locally, labour, training, sitting, environmental impact assessment process, permitting/approval process, management, grid interconnect, manufacturing of technologies, etc

5) a) Are you familiar with NS's net metering policy?
   - explain if not

   b) If so, what potential do you think it has to stimulate community RE?

Interview Questions for case studies in Ontario and Denmark

This interview will be translated into French and/or Danish and performed with translation services if the participant does not speak English adequately.

1) a) How did the interest for community power gain support in your region?
   b) What was the role of the DoEnergy, DoEnvironment, DoEconomic Development, academia, communities, municipal governments, NGOs, exterior influences, etc?
   - focus on non-policy instruments, prompt with topics above

2) What did/do communities need in addition to a progressive policy to be able to generate RE?
   - topics above

3) What are the main challenges for communities in realizing community power?
   - topics above

4) How is your the community power development structured?

- percent ownership locally, labour, training, sitting, environmental impact assessment process, permitting/approval process, management, grid interconnect, manufacturing of technologies, etc

5) What recommendations would you have for other community power developments at the initial stages?

6) a) Are you familiar with NS's net metering policy?

- explain if not

b) What potential do you think it has to stimulate community RE?

Interview Questions for resource centres and academics in Denmark

This interview will be translated into Danish and performed with translation services if the participant does not speak English adequately.

1) a) How did the interest for community power gain support in Demark?

b) What was the role of the DoEnergy, DoEnvironment, DoEconomic Development, academia, communities, municipal governments, NGOs, exterior influences, etc?

2) How did your organization come into being or become focused on community power?

3) What did/do communities need in addition to a progressive policy to be able to generate RE?

- role of government, private sector, academia, NGOs, public, etc

4) What are the main challenges for communities in realizing community power?

- education, financial capital, managerial, technical know-how, NIMBY-ism, access to information and expertise, etc

5) How does your organization help communities to overcome those challenges?

6) How are the community renewable electricity developments structured in Denmark?

- percent ownership locally, labour, training, sitting, environmental impact assessment process, permitting/approval process, management, grid interconnect, manufacturing of technologies, etc

7) a) Are you familiar with net metering policies?

- explain if not

b) What potential do you think it has to stimulate community power?