LEARNING BY DOING: KEY STEPS FOR IMPROVING ONTARIO'S RENEWABLE ENERGY PROGRAMS

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Abstract

The use of renewable energies (RE) for electricity production can potentially deliver a range of social, environmental and economic benefits. With the passage of the Green Energy and Green Economy Act (GEGEA) of 2009, the Ontario government has introduced a comprehensive set of policy measures to foster the development of renewables and achieve other policy goals. The RE growth in the province has been accompanied by a number of challenges, preventing Ontario from realizing the full potential of its RE resources and capturing the associated benefits. As Ontario expands its RE generation, it is vital that it puts in place a robust support framework that can ensure successful RE implementation.

This study examines Ontario's current legal and policy framework for renewables in the power sector and offers policy recommendations for improving this framework A qualitative comparative analysis of RE policies and programs in three jurisdictions - Germany, Denmark and Ontario is used to identify policy parameters and conditions that have proved to be significant for successful RE deployment in Germany and Denmark, and to evaluate Ontario's RE policies against these "success factors". Qualitative expert interviews are employed to elicit experts' perspectives about the performance of Ontario's current RE policy framework, the barriers to RE implementation in the province and potential policy solutions to address these barriers.

The findings of this study suggest that Ontario has made important progress in establishing favourable conditions for RE development with the introduction of the GEGEA legislation and the FIT program. These policy initiatives kick-started the RE development in the province and have been key to a number of other positive developments, such as clean-tech innovation, emergence of a local RE industry and community power development. However, there have also

been adverse consequences and implications, such as local opposition to RE and the perception that FIT costs are excessive.

The study offers a number of policy recommendations for improving RE policy design and implementation and overcoming other barriers to RES in Ontario. The government should give higher priority to renewables in the energy planning. The specific design elements of FIT policy should be better tailored to RE policy goals. Following best international practices in RE policy design and implementation can help achieve this goal. The public engagement opportunities in RE development should be improved. A concentrated effort is needed to create an organizational culture supportive of RETs in the electricity sector. A longer-term perspective and a more integrated approach to energy policy-making is needed in Ontario. The province should initiative a discussion about the costs and benefits of nuclear refurbishment and the implications of continuing with the current nuclear path. Measures to improve integration of RES into the grid should be strengthened. Support for public outreach, education and provision of evidence-based transparent information can help improve the reputation of renewables and create stronger public support for this energy option.

Foreword

Growing up in a rural community where people rely on the local environment for many important elements of their livelihood, I developed a special respect for nature and a desire to learn how we can achieve a more environmentally sustainable way of living. My interest in environmental sustainability provided the motivation to apply for the Masters in Environmental Studies (MES) Program at York University. Throughout my time at the Faculty of Environmental studies I became interested in the opportunities that renewable energy (RE) offers to help address some of the most pressing complex and interrelated issues facing us today, including climate change, pollution, energy security, rural development and unemployment. My Area of Concentration in the MES program - "Policy success factors for the promotion of renewable energy" - reflects my interest in policy mechanisms, conditions and parameters that can facilitate development and deployment of RE to help us achieve a more sustainable energy system, achieve the shift to a low-carbon economy and build a more sustainable future. Recognizing that RE refers to a broad range of energy sources and that its effective implementation requires the participation of many actors, I narrowed down my research interests to RES in the electricity sector and ad-hoc governmental policy responses.

This research was conducted in partial fulfillment of the requirements of the MES program. Through a comparative analysis of RE policies and programs in three jurisdictions - Germany, Denmark and Ontario – I explored, in depth, key issues and questions related to my subject area to fulfil the learning objectives identified in my Plan of Study (POS). In particular, I examined Ontario's most salient renewable power options and the key drivers of RE deployment in Ontario and beyond, which satisfies several of my learning objectives: i.e. understanding the characteristics of different energy sources and the social, economic and environmental impacts of different energy options. The specific and emerging barriers to RE development, the strengths and weaknesses of RE support measures and their suitability in different contexts and situations have been other major themes of my plan study. I gained further insight into these issues by evaluating the key elements of the RE support frameworks in the selected case studies, such as RE targets and feed-in tariffs. Finally, and most importantly, my research paper helped me to meet the learning objectives of the third component of my POS: i.e. to examine the policy conditions that have driven successful RE deployment in leading RE jurisdictions and to understand how lessons learned there can be adapted and extrapolated to inform future RE policy development. I thoroughly examined which policy factors and parameters have successfully driven rapid and large-scale development of RES in two leading RE jurisdictions - Germany and Denmark. The comparison of RE experiences in these jurisdictions and Ontario enabled me to inform policy recommendations for improving Ontario's RE support framework. Interviews with experts helped assess the relevance and applicability of international best practices and lessons to Ontario's policy context. I hope that the findings and recommendations of this study will be useful to policymakers in Ontario and other jurisdictions seeking to design a successful RE policy support framework.

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Chapter One: Introduction

Since the oil crisis of the 1970s, there has been an increasing recognition of the important contributions that renewable energy (RE) can make to achieving a more sustainable energy system, driving the shift to a low-carbon economy and building a more sustainable future. Expanding the share of renewable energy sources (RES) in its electricity-supply mix is one of the cornerstones of Ontario’s current energy policy. The government has recently introduced a comprehensive set of RE measures and initiatives that have given a great impetus to RE development in the province, helping to meet a number of environmental, social and economic objectives. While Ontario’s RE policies have succeeded in some respects, they have fallen short in others. The RE growth in the province has been accompanied by a number of challenges, preventing Ontario from realizing the full potential of its RE resources and capturing the associated benefits. As Ontario expands its RE generation, it is vital that it puts in place a robust legal and policy support framework that can ensure successful RE implementation. This study aims to contribute to the discussions on how Ontario’s RE policies and programs can be optimized. The overall objective is to evaluate Ontario’s current legal and policy framework for renewables in the power sector and to develop policy recommendations for improving this framework, based on lessons learned in the leading RE jurisdictions of Germany and Denmark, and insights from RE industry experts.

This paper consists of five chapters and an appendix. The Introduction (chapter one) states the purpose of the study and outlines the structure of the report. The Literature Review section (chapter two) provides an overview of the issues and debates that have characterised the RE field. In particular, that chapter defines the concept of RE; provides a brief overview of the major renewable energy technology (RET) areas - bioenergy, hydro, solar and wind; discusses three key interlinked drivers of RE development – i.e. energy security, economic and environmental considerations; and then outlines key policy conditions and parameters that have driven successful RE penetration, with a specific focus on the RE sector in the province of Ontario. The Methodology section (chapter three) summarizes research methods and research design. A qualitative comparative analysis of RE policies and programs in three jurisdictions - Germany, Denmark and Ontario is used to identify policy parameters and conditions that have proved to be significant for successful RE deployment in Germany and Denmark, and to evaluate Ontario's RE policies against these "success factors". Qualitative expert interviews are employed to elicit experts' perspectives about the performance of Ontario's RE policies, the barriers to RE implementation in the province and potential policy solutions to address these barriers. The results of a comparative analysis of RE policies and programs in the selected jurisdictions (Germany, Denmark and Ontario) are presented in Appendix A. Chapter four presents the perspectives of RE experts and insiders on the RE situation in Ontario. Chapter five provides the key findings of this study and offers recommendations for improving Ontario's RE support framework.

Chapter Two: Literature Review

2.1 Renewable Energy Definition

"Renewable", when used in terms like "renewable energy" and "renewable electricity," can be a contested term (Rowlands, 2007). Renewable energy (RE) refers to energy generated from natural resources – sunlight, wind, water, ocean thermal, wave and tide action, and geothermal heat (Spellman and Bieber, 2011). These forms of energy are capable of being constantly regenerated by natural processes at reasonable rates (Spellman and Bieber, 2011). The term renewable energy excludes nuclear fuel and fossil fuels, such as coal, oil and natural gas, which are consumed at a rate exceeding the rate of replenishment (generally a rate of millions of years) (Fanchi , 2004; Casper, 2007). These supplies will eventually be exhausted, although experts disagree as to the rate at which this will happen (Bodansky, 2004; Fanchi , 2004). Renewable energy technologies (RETs) convert renewable fuels into usable forms of energy, such as electricity, industrial heat, thermal energy for space and water conditioning, and transportation (Spellman and Bieber, 2011; NRCan, 2014a). Of particular interest for this study is the generation of electricity, therefore the term "renewable energy" refers here to renewables in the power sector as opposed to RE for transportation or heating fuels.

It is important to make a clear distinction between the terms renewable, alternative, green and sustainable energy, which are not always synonymous. The concept of "alternative energy" is understood as an umbrella term that refers to any source of energy intended to replace fuel sources without the undesired consequences of the replaced fuels (Spellman and Bieber, 2011). Today, the term generally indicates fuels that are non-traditional and low- or non-polluting (Berinstein, 2001; Spellman and Bieber, 2011). Alternative energy may or may not be renewable. The term "green energy" typically refers to low- or non-polluting energy from renewable sources. This definition implies that some types of renewable energy, for example, large-scale hydropower, would not be considered green because of their potential adverse effects on the environment (Berinstein, 2001). Likewise, the terms renewable and sustainable are not always synonymous because the utilization of renewable energy resources may be in direct contradiction to the principles of sustainable development (Pettersson, 2013). The focus of this study is restricted to low- or nonpolluting renewables, which are sometimes called “low-impact renewables” or “new renewable” energy technologies (Rowlands, 2007).

2.2 Major Renewable Energy Sources: a Brief Overview

A wide range of energy-producing technologies and equipment have been developed to take advantage of renewable power (NRCan, 2014a). For the purposes of this paper, a brief overview of the most salient renewable technology areas, including their present utilization and future potential in Ontario, is warranted. These are: bioenergy for electricity; hydroelectricity; solar energy; and wind energy.

Bioenergy comprises different forms of usable energy produced from biomass material. Biomass can be defined as “biological material in solid, liquid or gaseous form that has stored sunlight in the form of chemical energy” (NRCan, 2014a). Power can be produced from biomass via thermo-chemical or bio-chemical processes, including combustion, gasification, pyrolysis and anaerobic digestion (see McKendry, 2002a and McKendry, 2002b for more detail).

Hydroelectric power is the energy derived from flowing water. A turbine converts the energy of falling water into mechanical energy, driving a generator that converts mechanical energy into electrical energy (IEA, 2010). There are three main types of hydroelectric projects: reservoir (storage), run-of-river and pumped storage (IEA, 2010).

Solar photovoltaic (PV) is the main technology for the conversion of sunlight into electricity. Solar PV are arrays of cells containing a semiconductor material that converts solar radiation into direct-current (DC) electricity by a process known as the "*photovoltaic effect*" (Jacobson, 2009; IEA-ETSAP and IRENA, 2013). Currently, crystalline silicon (c-Si) technologies dominate the global PV market (IEA-ETSAP and IRENA, 2013). PV cells are assembled into PV modules to build modular PV systems that can be used to generate electricity in both grid-connected and off-grid applications (IEA-ETSAP and IRENA, 2013).

Wind turbines convert the kinetic energy of the wind into mechanical energy which is then converted to electricity in a generator (Jacobson, 2009; Steeby, 2012). The power generation of a turbine is determined by wind speed, the diameter of the rotors, and the capacity and height of the turbine (IRENA, 2013a). Wind turbines can be categorised by whether they are horizontal axis or vertical axis wind turbines, and by whether they are located onshore or offshore.

The opportunities and challenges associated with the use of RES have been well-documented (see Brown *et al*., 2011; Sathaye *et al*., 2011). Appendix C provides an overview of potential benefits and issues associated with each specific RET. Generally, small-scale RE systems can improve natural resource utilization and provide associated economic and social benefits, particularly in remote and rural areas (IRENA, 2012a; IRENA, 2012b; IRENA, 2012c; Brown *et al*., 2011). Renewable fuels, particularly non-combustion RETs, have significantly lower GHG emissions and inputs of finite energy resources over the full life of a power source than fossil fuel-fuel technologies for power generation (Pehnt, 2006; Sathaye *et al*., 2011; Müller *et al*., 2011). Most RETs also have significantly lower water consumption profiles than fossil-fuel and nuclear plants (Müller *et al*., 2011). The decentralized structure of these technologies limits the potential for disastrous consequences of accidents related to RES (Sathaye *et al*., 2011). The issues with RETs generally include higher capital costs, lower capacity factors, and constraints on resource availability. Wind and solar variability at high shares can have impacts on power system reliability. Advanced grid management and energy storage are required to manage the variability of these fuels. Depending on technology, impacts may include visual intrusion and damage to wildlife, although these can be minimized through careful siting (IEA, 2008a). These considerations suggest that the impacts of RES should be carefully considered and measures should be implemented to minimize negative effects in order to ensure that RES contribute to a more sustainable energy system.

2.2.1 Renewables in Ontario: Present Utilization and Future Potential

Ontario is rich in RE resources that can be used to produce electricity. The province has many potential sources of biomass, such as agriculture and forestry wastes, the organic component of municipal wastes, and other organic material (Etcheverry *et al*., 2004). Currently, bioenergy makes a small contribution to the electricity supply in Ontario, accounting for less than 0.8% (< 1.3 TWh) of total energy production in 2013 (IESO, 2014). As of June 2014, the OPA was managing only 368 MW of combined capacity from bio-energy projects, of which 112 MW were in commercial operation and the rest under development (OPA, 2014f). There is thus a significant potential to expand biomass use in the province, although not as vast as the potential for other RES (see Appendix B).

With thousands of rivers, streams and lakes, Ontario has abundant water power resources. Water-power accounted for almost all the electricity production in the province until the middle of the 20th century (Hatch Acres, 2005). It remains a major source of RE in Ontario today, representing about 24% (8,119 MW) of the province's total installed electric capacity as of 2014 and accounting for 23% (36 TWh) of total energy output in 2013 (IESO, 2014). Much of Ontario's water-power currently comes from big projects (OMAFRA, 2014). Although the majority of favourable sites for hydropower plants have already been developed, there are still possibilities for refurbishing existing hydroelectric facilities and developing new small- and medium- scale projects in Ontario (see Appendix B).

Ontario currently gets less than 1% of its energy from solar, despite the fact that the province has some of the largest solar resources in Canada and compares favourably with Germany, the world leader in solar energy (CCE, 2014a; Etcheverry *et al*., 2004; Howell, 2014; Gibbons, 2008). The south eastern region of Ontario in particular has significant potential for large-scale solar power generation (see Appendix B).

Ontario is the leading producer of wind power in Canada (CCE, 2014b), with about 2,483 MW of installed capacity (2014) and an energy output of 5.2 TWh (2013) (IESO, 2014). The strongest winds are found along the shores of the Great Lakes and areas with high elevations and exposure to prevailing wind directions (Gipe and Murphy, 2005). Overall, wind is a relatively new contributor to the power supply in Ontario. It currently makes up a small fraction of Ontario's electricity supply, accounting for about 7% of total installed capacity and 3% of total energy output (IESO, 2014). Wind resource assessments suggest that there are opportunities for substantial expansion in onshore wind, although only a fraction of the total potential for large scale-developments (more than 10 MW) is south of the 50th parallel, close to populous areas and major energy-using sectors of Ontario (Helimax Energy Inc. (2005) cited in Peters *et al*., (2007)). A significant amount of this power is, however, close to existing transmission and distribution networks (Helimax Energy Inc. (2005) cited in Peters *et al*., (2007)). There are also significant offshore wind opportunities in the Great Lakes region (see Appendix B), although Ontario currently has in place an offshore wind moratorium.

To summarize, there are substantial opportunities for further development of RES for electricity production in the province. This applies to all major RES, although there are considerable differences in potential resource estimates between different studies (see Appendix B). This discrepancy arises from the scope of technologies considered, the methodologies used and the assumptions made with regard to important constraints and barriers, including, but not limited to technology costs, development complexity, the proximity of infrastructure, and conflicts with existing uses of the resource. As noted by the BIOCAP Canada Foundation in relation to biomass resources, this discrepancy highlights the existence of a continuum from easily accessed resources whose use would have mostly positive environmental impacts, to much more aggressive RE production, with some negative environmental effects (Layzell *et al*., 2006).

2.3 Drivers and Benefits of Renewable Energy

Renewable energy sources (RES) have been used by humankind since ancient times through different technologies. The recent decades have witnessed a renewed interest in modern renewable energy technologies (RETs) in different fields (Islam *et al*., 2004). Today, the RE sector is thriving, with global investment in renewable power capacity and fuels totalling USD[1] 249.4 billion in 2013, a more than fivefold increase over the period 2004-2013 (REN21, 2014). Annual investment in all RE assets is expected to reach USD 630 billion in 2030 (Turner, 2013). The reasons for supporting renewables have evolved over time, in response to national and

[1] Currency unit: 1 US Dollar (USD) = approx. 1.15 Canadian dollar (CAD)

international developments and issues. At present, many governments promote the deployment of renewables for three main interlinked reasons: to enhance energy security; to encourage economic development; and to address environmental and health impacts associated with the use of conventional fuels (Müller *et al*., 2011). The following sections will discuss these three principle reasons in greater detail, with a specific reference to the Canadian and Ontario context.

2.3.1 Energy Security

Concerns over energy security emerged following the oil crises of the 1970s which led to oil shortages and soaring oil prices. The promotion of RE has become part of many governments' efforts to enhance energy security (Zachman *et al.*, 2014). There is no universally agreed definition of energy security (Gheorghe and Muresan, 2011; Luft *et al*., 2011). A more conventional and narrow approach emphasizes availability and affordability; more recent definitions have a longer-term perspective, recognizing the need to take into account additional factors, such as sustainability (Müller *et al*., 2011). RE can contribute to energy security in a number of ways. Renewables deployment can increase energy availability by enhancing the overall diversification of the generation portfolio. RE resources are freely available through natural processes (Müller *et al*., 2011). The use of indigenous RES can reduce import dependency (Ölz *et al*., 2007).

In terms of affordability, renewable fuels are still perceived to be more expensive that conventional energy forms (Müller *et al.,* 2011). However, fossil energy technologies require an input fuel and are thus fully exposed to fuel price volatility and uncertainty (Müller *et al*., 2011). Future prices of fossil fuels are difficult to predict because they depend on many unknown factors, such as technology learning and new supply areas (CEC, 2008). Price volatility has negative effects on microeconomic growth (Awerbuch and Sauter, 2005). In contrast, most RE plants offer the benefit of price stability since they do not require purchased fuel and their operating costs are highly predictable (CEC, 2008). Renewables deployment can thus help reduce dependence on fossil fuels that are subject to price volatility and its detrimental economic effects. This benefit is particularly important considering that the levelized cost of electricity (LCOE) from renewables continues to decline (IRENA, 2013a).

The sustainability dimension of the energy security requires taking into consideration the long-term consequences of a given energy strategy (Müller *et al*., 2011). Current patterns of energy usage are unsustainable in the long-term because they depend on finite energy sources. By reducing reliance on finite resources, renewables can help build an energy system that is more sustainable, and therefore secure in the long-term (Müller *et al*., 2011).

In Canada, the energy security discourse has traditionally focused on the concern for US energy security (Hayden, 2011; GC, 2013). A net exporter of most energy commodities, Canada is the principal source of US energy imports (EIA, 2014). Maintaining the security of demand for its exports is also a growing concern for Canada as reflected in the federal government's efforts to boost Canadian energy exports to Asia (McClearn, 2012; Argitis and van Loon, 2012). These perspectives have contributed to carbon-intensive investments in Alberta's tar sands (Hayden, 2011). The need for energy security in Canada is downplayed because of the country's vast and diversified portfolio of energy resources (Hughes, 2007). The nation is generously endowed with major forms of energy, including coal, natural gas, uranium and hydroelectricity (NRCan, 2014a). However, this wealth is unevenly distributed between the provinces. Western Canada is self-sufficient, supplying its own fossil fuels and exporting the rest. Eastern provinces rely on energy imports; this makes them vulnerable to the impact of rising energy costs and disruptions in fuel supply (Hughes, 2007). These considerations are particularly relevant to Ontario which has become increasingly dependent on natural gas. The use of gas for electricity production in the province has doubled since 2000 (Solomon, 2014). While Ontario has some natural gas reserves, quantities are limited. Ontario's supply is derived mostly from outside the province, including imports from Saskatchewan, Alberta and British Columbia (OME, 2014a). The reliance on imported energy makes Ontario vulnerable to changes in world energy prices and supply shortfalls. The use of finite non-renewable energy resources is also unsustainable, compromising Ontario's energy security in the long-term. These observations highlight the important contribution that renewables deployment can make to energy security in Ontario.

2.3.2 Environmental and Health Benefits

Concerns over environmental and health impacts associated with the use of conventional energy sources have been some of the major drivers behind the widespread deployment of RETs. The combustion of fossil fuels is a major source of so-called greenhouse gases (GHGs), which cause Earth's surface temperature to rise. Rising global temperatures lead to melting of the ice caps, sea level rise and more intense and frequent extreme weather events, such as heat waves and floods (Barbir *et al.*, 1990). The burning of fossil fuels emits a range of other damaging pollutants, which cause damage to human health and the environment (Barbir *et al.*, 1990; Golomb and Fay, 2004; Veziroğlu and Şahin, 2008).

Potential impacts of nuclear power range from the biological effects resulting from the contamination by radionuclides, to waste disposal and reactor safety (Sathaye *et al.*, 2011). The radiotoxicity of spent fuels and uranium tailings are the most prominent health concerns (Sathaye *et al*., 2011). Managing unique, highly radioactive waste is challenging (Winfield *et al*., 2006). Nuclear power plants are so complex that almost every reactor has experienced some sort of incident over its history. Even if the risk of a true melt-down is low, the impact of such an accident is very large (Walls, 2011), as demonstrated by the Fukushima Daiichi nuclear disaster of 2011. The safety record of nuclear reactors has improved over time but no nuclear plant design is totally risk free, due to technical and workforce issues (Walls, 2011).

As discussed earlier in Section 2.2, renewable technologies impose significantly lower environmental and health costs and risks than conventional fuels and nuclear plants. RETs can thus make an important contribution to addressing climate change and protecting the environment. These considerations make the shift to renewable energy increasingly compelling.

Concerns over the environmental and health impacts of fossil fuels have been major drivers of RE deployment in Ontario (Rowlands, 2007). Most notably, the government's decision of 2003 to phase out coal-fired power plants and promote the use of renewables was driven primarily by the deteriorating air quality and health impacts associated with the use of coal (Rowlands, 2007; Winfield *et al*., 2010). In recent years, renewables development has become part of the provincial action on climate change. As a result of the Ontario's coal phase-out initiative, Ontario's electricity sector emissions declined from 41.4 Mt to 14.8 Mt between 2000 and 2011 (OME, 2013b; Miller, 2014). Despite this progress, the electricity sector is still the fourth largest source of GHG emissions in the province, accounting for 9% of the total of 170.5 Mt as of 2011 (Miller, 2014). Furthermore, electricity sector emissions are projected to increase to 190 Mt by 2030. In part, these trends reflect Ontario's increased reliance on natural gas-fired generation as nuclear plants undergo refurbishment (Miller, 2014).

Natural gas combustion emits lower quantities of GHGs and other undesirable compounds per unit of energy than coal (King, 1998; Bodansky, 2004). Although preferable to coal, natural gas is still a source of GHGs. Given the urgency of reducing GHG emissions, Ontario's overreliance on natural gas using inefficient thermal generators is problematic in the long-term. Although beyond the scope of this paper, combined heat and power with district energy presents an interesting GHG reduction proposition as two products (i.e. electricity and heating/cooling) are obtained by burning one unit of fuel. By taking greater advantage of RE, Ontario can potentially help reduce demand for natural gas and thus help mitigate the environmental impacts associated with this energy option.

Nuclear generation remains a major source of electricity in Ontario, currently accounting for about half of Ontario's power generation. The scale and extent of environmental and health risks and impacts of nuclear power have been debated (e.g. see Winfield *et al*., 2006 and Masri *et al*., 2008). The assessment of these issues is complex and beyond the scope of this paper. However, it is not unreasonable to suggest that RE deployment can help Ontario avoid some of the unique challenges and risks associated with the use of the nuclear and that a power system based on renewables is overall more environmentally sustainable than a system based on a share of nuclear in the energy mix.

2.3.3 Socio-economic Development Drivers

The socio-economic benefits of RE have become increasingly important drivers of RES deployment in recent years. These potential benefits include economic development opportunities through sales of new products, job creation, and increased local tax base;

technological learning and innovation capacity in what is viewed as an emerging industry; creation of local RETs manufacturing industry and export opportunities on international markets for RETs (EPA, 2011; Lewis and Wiser, 2005; Müller *et al*., 2011; IRENA, 2013b).

The nature and scope of socio-economic benefits associated with RE deployment has been a subject of discussion. Much debate remains focused on the impact of RE support policies on economic growth and employment. While studies focusing on gross effects generally agree that RES promotion gives a significant boost to the economy and employment (e.g. APPA, 2011; O'Sullivan *et al.*, 2012; REA and Innovas, 2012; IRENA, 2013b), the analyses of net effects have produced mixed findings. Some studies record a large positive net impact (e.g. Lehr *et al*.; 2012; Ragwitz *et al*., 2009); other investigations conclude that net effects may be negative (Hillebrand *et al.*, 2006; CEPOS, 2009). These contradictory results suggest that more research is needed to understand the economic implications of RE support initiatives.

The socio-economic development opportunities associated with RES have been particularly relevant in Ontario, which has witnessed a significant loss of manufacturing jobs over the last decade (MC, 2014). Several studies commissioned by RE industry associations suggest that RE deployment would bring substantial jobs creation to the province. In particular, wind energy developments installed in Ontario between 2011 and 2018 could create 80,328 person-years of employment; attract CAD 16.4 billion of private investments; and contribute more than CAD 1.1 billion of revenue to local Ontario municipalities and landowners in the form of taxes and lease payments (ClearSky, 2011a). In a similar fashion, Ontario's solar industry could create 74,000 person years of employment, or an average of 25 jobs per installed megawatt, and about CAD 12.9 billion of private investments by 2018 (ClearSky, 2011b). In contrast, a study of net effects suggests that employment growth in the green sectors of the Ontario's economy would be offset by job losses in other sectors (Bohringer *et al*., 2012). An examination of the economic effects of RE development is beyond the scope of this paper; however, it is important to highlight that targeted measures might be needed to minimize negative impacts of RES promotion in Ontario.

Reducing diesel-fuel dependency is an important issue in many Ontario's remote communities that use diesel fuel as the sole energy source to produce electricity (Arriaga *et al*., 2013). Ontario has a population of approximately 15,000 people distributed in more than 31 remote communities which depend on off-grid diesel-based power supply (Arriaga *et al*., 2013). New opportunities for economic growth and diversification can be created in these remote and rural communities by replacing fossil fuel based generators by small-scale RE applications.

2.4 Renewable Energy Support Policies

While there is a broad agreement that the deployment of RE is justified, there is no consensus on the most effective policy approach to support RES. Governments in different jurisdictions have experimented with a variety of RE policy mechanisms and some of them have demonstrated significant success in the deployment of several RETs. It should be noted that the notion of "success" varies between different jurisdictions. Generally, successful RE promotion policy aims to encourage rapid, sustained, and widespread development of RES (Couture *et al*., 2010). Governments often layer additional goals on top of this primary objective, such as cost-effectiveness, jobs creation and community power. The goals of RE policy determine what constitutes policy success and, therefore, what qualify as "best practices" (Couture *et al*., 2010).

Two policies have emerged as the most popular for RE promotion in recent years: the feed-in tariff (FIT) and the renewable portfolio standard (RPS) (Lipp, 2007). FIT is a price-driven regulatory mechanism whereby RE producers are offered guaranteed predetermined payments for renewable power. Quantity-driven regulatory mechanisms, such as RPS, set the quantity to be achieved and let the market to establish the price (Mitchell *et al*., 2011). Much debate has focused on the advantages and disadvantages of these two RE support mechanisms and their suitability and effectiveness in different contexts and situations (e.g. Held *et al*., 2010; WEF, 2010; Mitchell *et al*., 2011). According to a recent study by IRENA (2012e), the data is insufficient to draw decisive conclusions about which policy type can achieve high levels of RE penetration most consistently. Although FITs have not succeeded in every country, they have facilitated rapid growth in renewable electricity capacity and the creation of strong domestic RE industries in a number of jurisdictions, including Germany and Denmark (Farrell, 2009; Mitchell *et al*., 2011). Successful examples of other policies also exist, for example, quota schemes in Sweden, Australia, and the Canadian province of British Columbia (IRENA, 2012d; Mitchell *et al*., 2011). Drawing on historical experience with RE promotion policies in different jurisdictions, experts have identified a variety of principles and elements that need to be considered in designing RE support systems (see Mitchell *et al*., 2011). Successful FIT policies typically include three key provisions: (1) guaranteed access to the grid; (2) stable, long-term purchase agreements (typically, 15-20 years); and (3) payment levels based on the costs of RE generation (Mendonça 2007; Couture *et al*., 2010). A detailed discussion of best practice in FIT design and implementation can be found in Couture *et al.* (2010).

While highlighting the importance of economic support schemes, such as FIT, in driving RE growth, experts point out that a combination of policies is required to address the various barriers to RE deployment (Meyer, 2007; Mitchell *et al*., 2011). Many studies have placed RE in a broader context of national political, economic, technological and institutional developments, seeking to understand the complexity of contextual factors that influence the success (or failure) of RE uptake. A number of studies have attempted to distil these conditions focusing on individual jurisdictions, such as Denmark (Meyer, 2004), Germany (Lauber and Mez, 2004; Jacobsson and Lauber, 2006) and the UK (Mitchell and Connor, 2004). The qualitative case-study approach employed in these studies provides a valuable insight into the emergence, character and impacts of RE policy framework in a specific national setting. A common limitation of this approach is that it may not be clear to what extent case study findings can be generalized to other countries (Olsen, 2002). A growing number of studies have taken a comparative approach, examining and contrasting RE developments in a number of strategically selected jurisdictions (ECOTEC and Mourelatou, 2001; Breukers and Wolsink, 2007; Meyer, 2007; Lipp, 2007). Some comparative studies have examined the diverse policy approaches to a particular barrier hindering RE implementation or factor influencing RE deployment, such as integration of variable RE into the power system (Cochran *et al*., 2012), establishment of local RETs manufacturing industry (Lewis and Wiser, 2005), local acceptance and participation in RE development (Mendonça *et al*., 2009), public support for R&D (Klaassen *et al*., 2005). Denmark and Germany have been often selected as case studies in the literature due to the extensive experience of these nations with their respective policy frameworks and their success in RE uptake. While these studies provide valuable lessons for other jurisdictions seeking to implement effective RE policy, it is not clear how applicable are these lessons to more recent players in the RE field, given the rapidly evolving nature of the RE sector and the global developments that influence it. Generally, evidence from the existing literature suggests that a range of policy parameters and conditions have been critical to the success of RE implementation, including RE prioritization in official energy policy documents; support for research, development and demonstration of RETs; awareness building, education and information dissemination activities; meaningful public engagement in RE developments and local ownership of RE projects; and policies that aim to facilitate effective integration of RES into the power supply mix (ECOTEC and Mourelatou, 2001; Meyer, 2007; Müller *et al*., 2011). Importantly, the literature suggests that there is no one-size-fits-all approach to RE development. The successful promotion of RE requires a right policy portfolio at the right time and the choice of mechanisms will depend on a wide array of factors, including resource options; local political and economic conditions, ambitions and capacities; planning processes and market rules; institutional and human capacity, and what is happening in other jurisdictions (WEF, 2010; IRENA, 2012d; Cochran *et al*., 2012).

2.4.1 Ontario's Renewable Energy Policy Supports: Brief Historical Overview

Ontario's electricity system was founded upon the province's abundant hydropower resources, which remained almost as the exclusive renewable fuel utilized in the province until the first decade of the 21st century (Rowlands, 2007). As a result of the growing demand for electricity, Ontario's generation portfolio was supplemented by fossil fuels (mainly coal) in the 1950s and nuclear power in the 1970s (Rowlands, 2007). Although there were earlier efforts to increase the use of RE resources in Ontario, serious discussion about RE began in the late 1990s, following the deregulation of the provincial electricity system (Stokes, 2013). In 2003, the provincial government made a commitment to phase out all coal-fired electricity. This critical decision reoriented Ontario's policy landscape towards a greater emphasis on RE (Stokes, 2013).

The Ontario Ministry of Energy (OME) and the Ontario Power Authority (OPA) have been the key entities implementing the RE policies set for the province by the Ontario government.

The Ministry's responsibilities have focused on providing the regulatory framework and developing programs to advance implementation of Ontario's RE legislation (AGO, 2011). The OPA has played a key role in planning and procuring RE by contracting to buy power from RE developers (AGO, 2011).

Ontario has experimented with a variety of RE promotion policies (AGO, 2011). The two key mechanisms have been competitive procurement auctions and feed-in tariffs (Holburn *et al*., 2010). The competitive auction model, termed the Renewable Energy Supply (RES) program, aimed to procure a pre-determined amount of RE capacity at the lowest cost and targeted large commercial power developers (Holburn *et al*., 2010). Three RES rounds were issued: RES I in 2004, RES II in 2005, and RES III in 2008 (AGO, 2011). In total, these programs succeeded in securing 1,565 MW of renewable capacity, mostly wind (OPA, 2014g). The feed-in tariff model, originally termed the Renewable Energy Standard Offer Program (RESOP), was introduced in 2006 to encourage small-scale RE projects (up to 10 MW) (Holburn *et al*., 2010). A total of 830 MW were contracted through RESOP as of 2014 (OPA, 2014g). In 2009, the RESOP was replaced with a FIT program following a government policy decision to expand the procurement of RE more rapidly (AGO, 2011). Compared to RESOP, the FIT program is wider in scope and offers more attractive contracts to RE generators (AGO, 2011; Nishimura, 2012).

The FIT program remains as a key element of Ontario's current RE policy support framework, and was firmly established by the landmark Green Energy and Green Economy Act (GEGEA) of 2009 and the recently updated Long-Term Energy Plan of 2013. In addition to a new system of feed-in tariffs, these documents have established other key RE policies including provincial RE targets, arrangements for priority access to the grid for eligible RETs; single window, permitting and approval processes (Renewable Energy Approval); commitments to build transmission infrastructure to support RE development and other measures. Renewables deployment is a key element in the government's efforts to meet its GHG reduction commitments as was outlined in Ontario's Climate Change Action Plan of 2007 or OCCAP, and to achieve the goals established by the GEGEA of 2009. The OCCAP set the following targets: 6% reduction in GHG emissions by 2014, 15% by 2020, and 80% by 2050, relative to 1990 levels (GO, 2007). The GEGEA aims to boost economic activity, stimulate clean-tech innovation, foster domestic RE manufacturing capacity and create jobs in Ontario (OME, 2012).

Ontario's FIT program, described as "the most progressive RE policy in North America in more than three decades" (Gipe, 2010:14), has given a great impetus for renewable power development in the province. As of June 2014, 4,632 MW of combined capacity was contracted through the FIT program (OPA, 2014g). However, RE growth has been accompanied by a number of challenges and concerns, threatening the political sustainability of the program (Yatchew and Baziliauskas, 2011). Specific issues have included the burden of RES-E support costs; the amount and nature of backup power requirements; issues around community engagement in RE developments; and opposition to RE (Etcheverry *et al*., 2009; SP, 2010; Gipe, 2010; Pineau, 2012; Stokes 2012). The government has attempted to address some of these challenges through a number of changes to its RE support framework. The stakeholder response to these changes has been mixed and the exact impact of these policy changes remains to be seen. There is a need to address the gaps in knowledge relating to the performance and impacts of Ontario's RE initiatives and improve our understanding on how Ontario's RE support framework can be optimized to ensure that Ontario realizes the full potential of its RE resources.

2.5 Research Objectives and Aims

The overall objective of this study is to evaluate Ontario's current RE legal and policy framework – focusing on renewables in the power sector – and to develop policy recommendations for improving this framework, based on lessons learned in leading RE jurisdictions and insights from RE industry experts. In my investigation, RE legal and policy framework refers to the key policy mechanisms for RE development, such as legislation and associated implementing regulations, feed-in tariffs and supporting arrangements, RE targets, policies, programs and other RE incentives.

The main objective of this study can be sub-divided into four specific aims:

- To identify and summarize policy parameters that have proved to be significant for successful promotion and deployment of RE in Germany and Denmark;
- To evaluate Ontario's RE policy framework against key policy "success" parameters;
- To elicit the perspectives of RE experts regarding the performance of Ontario's support framework for renewable power; the barriers to renewables in the province; and policy options to address these barriers;
- To produce recommendations for improving Ontario's RE policy framework based on lessons learned in other jurisdictions and insights from RE industry experts.

2.6 Chapter Summary

This chapter provided a brief overview of the issues and debates that have characterized the RE field, with specific reference to the Ontario context. It highlights that a major opportunity exists for Ontario to transform its electricity system from one that relies heavily on complex and polluting conventional fuels to one that is based on renewables, a strategy which will capture the associated economic, social and environmental benefits. The next section will describe the methodological approach chosen to achieve the objectives of this study, which are: to evaluate Ontario's current RE legal and policy framework and produce recommendations for improving this framework.

Chapter Three: Methodology

3.1 Introduction

The previous chapter provided the context for this study, highlighting the most important issues and debates that are relevant to the research question and setting out the overall goal and specific aims of this investigation. This chapter describes methods of data collection and analysis; it also discusses expected research problems and the approach taken to minimize them, and acknowledges the methodological limitations of the study.

3.2 Qualitative Comparative Analysis

To effectively answer the research questions, a qualitative comparative analysis of RE policies and programs in three jurisdictions – Germany, Denmark and Ontario – was conducted as part of this study (see Appendix A). Comparative analysis is a widely used research method, particularly in the studies of society and politics (Olsen, 2002). The comparative approach allows one to understand whether the conditions existing in a given jurisdiction are unique to it or are more widespread. This helps reduce the probability that a relationship between variables is misunderstood (Olsen, 2002). In addition, the comparative approach helps to distinguish between developments that are specific to a particular jurisdiction and those that reflect supranational trends, tendencies and decisions (Olsen, 2002). Importantly, it can help better understand the strengths and weaknesses of specific policies and identify enduring but largely inadequate arrangements and programs (Olsen, 2002). Comparative analysis provides an opportunity to learn from others' experiences and point to alternative or supplementary policy measures (Hill, 1996; ECOTEC and Mourelatou, 2001; Olsen, 2002).

There are different types of comparative social policy research. An approach which has taken hold in recent years and which was adopted in this study involves a close examination and contrasting of particular dimensions of a policy framework in a few strategically selected nations (Olsen, 2002). According to Olsen (2002), the jurisdictions that are selected for comparison should ideally be distinctive along a number of significant dimensions but also closely resemble each other in many other respects. The similarities will serve as "controls" for a number of background conditions that can be said to be "held constant", allowing to identify policy factors and parameters that might explain variation in levels of RE deployment.

Germany and Denmark are the selected case studies in this work for a number of reasons. Both countries have more than 20 years of experience with RE promotion and have earned an international reputation as world leaders in RE development (Lipp, 2007; Harper, 2010; Vasi, 2011). The nations are closest to meeting their ambitious RE targets and have been able to achieve a number of other objectives through their RE policies, such as establishing domestic RE manufacturing base and creating jobs (Lipp, 2007; Farrell, 2009; Mitchell *et al*., 2011). Experiences from these countries can thus provide important lessons for effective RE policy implementation. In fact, the commonalities between Denmark and Germany have prompted the inclusion of these two nations in many previous comparative studies on the topic (see, for example, Klaassen *et al*., 2005; Lipp, 2007; Meyer, 2007).

Germany and Denmark also possess a number of similarities with Canada in general and Ontario in particular, which makes these jurisdictions well-suited for comparative analysis. All three countries are economically advanced, industrialized welfare democracies, and therefore share many contextual factors (for instance, governance structures, industrial and political institutions, level of development and affluence, many energy production and consumption trends, and adherence to environmental and social standards) (Lipp, 2007; Meadowcroft, 2013). It is, thus, reasonable to conclude that the observed differences in their policy approaches to RE promotion and levels of RE penetration are probably not entirely, or even primarily, the result of economic organization or level of economic development (Olsen, 2002). The important differences between the selected jurisdictions include their resource endowments and energy policy history (Rowlands, 2007; Lipp, 2007; Adolino and Blake, 2011; Meadowcroft, 2013). Although Germany, Denmark and Ontario are different administrative units for comparison (i.e. the former ones are nations while the latter one is a province), the comparison makes sense due to jurisdictional arrangements (i.e. Canadian provinces and territories have jurisdiction over generation, transmission and distribution of electricity within their boundaries, including restructuring initiatives and electricity prices) and also by the fact that all three jurisdictions strive to be leaders in RE development.

Comparative analysis has a number of weaknesses and limitations. The fact that a set of policies has worked well in one national setting does not necessarily mean that these policies can be easily exported to other jurisdictions (Olsen, 2002). Furthermore, the same set of policies may not necessarily produce identical or even broadly similar outcomes even if they could all be implemented in a specific jurisdiction (Hill, 1996; Olsen, 2002). An appreciation of the socio-economic, socio-cultural, and socio-political contexts that have fostered the development of certain policy approaches in a given jurisdiction is needed in order to more accurately assess the chances of policy influence and to produce recommendations that will not be ignored or fail (Hill, 1996; Olsen, 2002). A consideration of relevant global developments and trends is also important, because these developments may be foreclosing at least some of the previously available opportunities for one nation to adopt another's policy approach (Olsen, 2002). These considerations highlight the importance of gaining expert and insider perspectives on current and emerging barriers to RE in Ontario and also about policy options to address these barriers. Interviews with experts will help better understand Ontario's specific variables and constrains to RE development and assess the relevance and applicability of international best practices and lessons to Ontario's policy context.

3.2.1 Data Collection

The comparative evaluation is based on secondary data sources. A comprehensive review of the relevant literature – scholarly books, peer-reviewed articles, legislation, policy and planning documents, and research reports was conducted to collect information relating to:

- The policy parameters and conditions that have proved to be significant for the successful promotion and deployment of RE in Germany and Denmark and the key features of their current RE frameworks;
- The energy situation in Ontario, the history of RE support programs in the province, the key features of Ontario's current RE policy framework and the specific and emerging challenges and issues surrounding RE development in Ontario;

The findings of the comparative analysis of RE policies and programs in three jurisdictions - Germany, Denmark and Ontario can be found in Appendix A.

3.3 Expert Interview

In addition to the comparative analysis of RE policy frameworks in the selected case studies, qualitative expert interview was considered an appropriate research method for meeting the objectives of this study. Expert interviews were conducted to elicit the perspectives of experts on the performance of Ontario's current RE policy framework, the various barriers to RE implementation in the province and potential policy solutions to address these barriers. This approach enabled obtaining a more comprehensive picture of the provincial RE policy framework and assessing the relevance and applicability of international best practices and lessons to Ontario's policy context.

Expert interviewing is typically associated with qualitative methodology and has been a popular method in social research (Bogner *et al*., 2009; Trinczek, 2009). Qualitative interviewing is useful for accessing complex issues, such as individual's views, interpretations of events and experiences (Byrne, 2004). Another advantage of this research method is its flexibility, which allows approaching research topics in a variety of ways (Byrne, 2004). The term "expert interview" raises the assumption that the methodological rationale behind this interview form is linked to specific characteristics of the target group, i.e. experts (Littig, 2009). What makes a person an expert has been a subject of debate. A number of expectations regarding experts' knowledge have been proposed to legitimize expert status. More specifically, expert knowledge is relatively exclusive, i.e. it is different from and superior to everyday knowledge (Froschauer and Lueger, 2009; Pfadenhauer, 2009). Experts possess explicit specialist knowledge which provides them with an in-depth understanding of a specific topic or field and enables to probe into the causes of complex problems and offer fundamental solutions to these problems (Froschauer and Lueger, 2009; Pfadenhauer, 2009). Expert knowledge is gained through specific training and practical work. Experts can be made responsible for the development and implementation of problem solutions, strategies and policies (Pfadenhauer, 2009; Van Audenhove, 2007). Experts are often in positions of power, although they do not necessarily make the high-level decisions at the top of an organization (Littig, 2009). Ultimately, “expert” is a relational concept and expert status is often set by the research goals and the actual field being investigated (Bogner and Menz, 2009; Littig, 2009). Experts are part of the RE sector in various forms and functions; they are involved in conception, planning, implementation, revision and further development of RE legislation, policies and programs. Since this study aimed to gain an insight into the many complex issues relating to RE in Ontario, broad-ranging competences were taken into account when defining the expert group for this study (see Section 3.3.1).

The form of expert interview employed here belongs to the category of systematizing interview. This form of interview is oriented towards gaining access to exclusive knowledge possessed by the experts, focuses on knowledge of action and experience which has been derived from practical work, and attempts to obtain systematic and complete information (Bogner and Menz, 2009). The systematizing expert interview is grounded in a positivist attitude and, consequently, “an objectivist cognitive ideal of both the generation and the analysis of the data” (Pfadenhauer, 2009:102). However, the interviewer must constantly be aware that the information the interviewee is supplying, is subjective in nature (Richards, 1996). An expert interview, thus, should not be conducted with the view to establish the “truth” in a crude, positivist manner. The function is rather to provide the researcher with an insight into the participant’s subjective analysis of a particular situation, issue or problem (Richards, 1996). The expert is treated here primarily as a guide who possesses certain valid pieces of specialized knowledge and information that is not available to the researcher. The main focus is not on the interpretative character of expert knowledge but rather on its capacity to provide facts concerning the research question. From this methodological perspective it is not the experts themselves who are the object of the investigation; their function is rather that of informants who provide information about the real objects being investigated (Bogner and Menz, 2009).

The choice of an interview strategy is an important consideration in interviewing because expert's impression of the interviewer influences the type of knowledge he or she will communicate in the interview (Bogner and Menz, 2009). The interaction model in which the researcher aspires to be seen as "an expert from a different knowledge culture" is commonly used in systematizing expert interviews (Bogner and Menz, 2009) and was considered an appropriate choice for this study. In this model, the interviewee assumes that the interviewer possess specialist competence and knowledge, but takes into consideration that she is a representative of a different discipline. Ideally, the interviewee orientates his or her responses towards the researcher's interest without abandoning specialist context as the expert whose knowledge is relevant to the investigation (Bogner and Menz, 2009). Another advantage of this interaction strategy is that it requires fewer preconditions: the interviewer does not have to show that she is well informed about every detail of the issue under consideration because the interview participants "accept" the divergent forms of background knowledge (Bogner and Menz, 2009). At the same time, the interviewer must show herself to be a competent partner for the interview to be successful (Bogner and Menz, 2009). This was achieved through careful preparation following the recommendations by Meuser and Nagel (2009) and Littig (2009): preparing the topic guide thoroughly; obtaining extensive knowledge about the expert's area of expertise; and learning the "right language". According to Meuser and Nagel (2009), the effort invested in the design of the topic guide provides the interviewer with the thematic competence enabling her for productive interviewing.

It is important to acknowledge that the exclusive focus on the knowledge of a specific target group, i.e. experts, may be too narrow for the questions examined in this study. RE implementation affects different stakeholders in different ways and many barriers to RE need to be overcome through actions by other actors in addition to governmental policy measures. Due to the limited resources available for this study, interaction with a broader spectrum of stakeholders was not possible. Conducting interviews with representatives from different stakeholder groups, such as farmers, Aboriginal communities, and general public, can provide a more comprehensive picture of the barriers to renewables and policy solutions to these barriers in the province of Ontario. Interviewing representatives from different stakeholder groups would thus be a key suggestion for future studies on this topic.

3.3.1 Preparation and Implementation

Purposive sampling was considered the most appropriate technique for selecting participants with specialized expertise in the field of RE who are most likely to advance the interests of the research with the resources available for this study. This study did not aim to produce a statistically representative sample so that the findings could be generalized to a wider population. Rather, it aimed to select RE experts and insiders who were more likely to assist with understanding the RE situation in Ontario and whose views and perspectives could provide an indication of how provincial RE policy and legal framework could be improved. Another relevant consideration was the fact that there is no clearly defined pool of RE experts from which a sample might be chosen in line with specific guidelines. In such situations, non-probabilistic samples are commonly used (Littig, 2009; Wroblewski and Leitner, 2009). When used appropriately, purposive sampling is a practical and efficient tool for choosing knowledgeable and reliable informants (Tongco, 2007).

Broad-ranging competences were taken into account when defining the expert group for this study. RE implementation involves a wide variety of complex problems and issues. To ensure that all major gaps in existing RE policies were discussed, experts with different areas of competence were needed, such as familiarity with legislation- and FIT-specific issues; scientific and technical expertise; market-side and socio-economic know-how. Following the approach taken by Aichholzer (2009), this principle was implemented by determining corresponding target areas or institutional contexts as the basis for the choice of experts. The following basic categories were used: industry; government agencies; utilities; academia, and nongovernmental organizations. An attempt was made to select experts in a way that, as far as possible, achieved a balanced distribution over these basic categories. Potential interviewees were identified via company and organization profiles, media reports and prior studies, and the use of key networks/contacts available. The operational selection criteria at the individual level were a number of indicators for subject competence and professional reputation such as: relevant qualifications; prestigious positions and management functions; active membership in corresponding associations and organizations; and publications in relevant literature. These criteria were used to judge an informant’s reliability, i.e. how honest and truthful the informant is, and competency, i.e. how qualified the person is to answer the questions investigated (Tongco, 2007). Overall, 23 requests for an interview were made and 13 experts agreed to be interviewed. It is important to acknowledge that this sample is relatively small and that purposive sampling is an inherently biased method of informant selection (Tongco, 2007). For these reasons, data interpretations cannot be applied beyond the sampled population. However, the use of a larger sample and a combination of sampling techniques would be helpful strategies to enable generalization of results in future studies (Mayring, 2007).

A semi-standardized interview and flexible interview guideline (see Appendix D) were used to systematize data gathering. A semi-structured approach helps ensure that all relevant topics are covered while allowing for flexibility and greater depth than is generally the case in a standardized interview (Bloch, 2004; Richards, 1996). A flexible interview guideline is a list of predetermined topics and themes that must be covered, though the exact order in which questions are asked and the content of the specific questions can vary (Bloch, 2004). The preparation of an interview guideline for this study was informed by the work of Wroblewski and Leitner (2009). Relevant issues and problem areas were identified from government reports, academic literature, media coverage and previous studies on RE in Ontario and other jurisdictions. These issues were organized under the following thematic categories: political will; feed-in tariff program; social acceptance and other (e.g. grid integration). For each individual topic on the list, specific questions were developed, which were oriented at the function or position of the respective experts. Specific questions included but were not limited to, the appraisal of the individual aspects of Ontario's long-term energy plan; lessons learned with the implementation of FIT policy; and the causes and solutions to public opposition to RES in Ontario. The category "other" included an open question about possibly unaddressed barriers, issues and policy solutions that are important in the expert's view. By helping to focus the interviews, the guideline ensures their comparability (Meuser and Nagel, 2009).

The implementation of the interview followed a number of preparatory measures: an invitation e-mail to potential respondents explaining the nature and importance of the study, the role of the participant and the terms of confidentiality. A polite reminder e-mail was sent where necessary. The barrier of limited availability and access barriers personified in the form of personal assistants were overcome by following suggestions by Littig (2009), such as convincing the “gate-keepers” of the study importance, offering access to the research results in return for participation, and targeted references to the research supervisor.

The participants were offered a face-to-face or a phone interview option. Both styles have their advantages and disadvantages. Face-to-face interviews enable the use of non-verbal social cues to pace the interviews, determine the direction to move in and create a good ambience (Berg, 2004; Opdenakker, 2006). Compared to telephone interviewing, however, face-to-face interviews are less economical in terms of time and resources (Christmann, 2009). Phone interviews are more likely to motivate experts who are suffering from time pressure to participate in the study (Christmann, 2009). The disadvantage of this interview type is that questions have to be simple and interviews need to be kept short (Bloch, 2004). Overall, five face-to-face interviews and eight phone interviews were conducted. The length of an interview was agreed on with each participant individually based on their time budget. Generally, face-to-face interviews lasted around 45-60 minutes whereas phone interviews lasted about 30-45 minutes. Time restriction is a common problem in conducting expert interviews, which often have to run much tighter than other forms of interviews (Flick, 2009).

3.3.2 Data Analysis

Data analysis in this study followed recommendations provided by Meuser and Nagel (2009) and Littig (2009), and involved such steps as transcription, paraphrasing, coding and thematic comparison. Upon reviewing the interview transcripts, themes and patterns were identified and coding categories were developed and attached to the passages with similar topics. The coding scheme emerged both deductively from pre-existing concerns and questions, and inductively from the data itself (Seale, 2004). The thematic analysis of interviews sought to provide a reconstruction of experts' perceptions and beliefs regarding different problems and issues. A complete and thorough analysis of all the themes raised by the experts is beyond the scope of this paper. Instead, I will offer my personal reflections on the most interesting themes discussed by the study participants.

Chapter Four: Expert Perspectives on Ontario's Renewable Energy Policies

4.1 Introduction

The previous chapter described the methodological approach chosen to achieve the objectives of this study. This chapter conveys the opinions of RE experts and insiders on the performance of Ontario's current RE policy framework, the various barriers to RE implementation in the province and potential policy solutions to address these barriers. My reflections on the expert views are summarized at the end of the chapter.

4.2 Profile of RE Experts and Insiders

The RE policy experts and insiders interviewed in this study represent a range of professionals based in government, utilities, industry, non-governmental organizations and academia. More specifically, interviewees included former and/or current representatives from the Ministry of Energy, Ontario Power Authority, Hydro One, MaRS, RE cooperatives, and non-profit organizations. Many interviewees have been active in the RE sector both from a policy perspective and in other capacities, such as FIT design and implementation, FIT related consulting work, clean-tech investment, and RE education and advocacy work.

4.3 Perspectives on GEGEA and FIT program

The introduction of the GEGEA and the FIT program were generally viewed as a positive development in Ontario's RE policy. Experts acknowledged the role of the legislation and the program in kick-starting the RE development in Ontario, describing them as “instrumental in starting to build the foundation for RE future” and “a good first step towards a new type of economy in the province”. A number of other positive policy outcomes were highlighted, such as clean-tech innovation, RE industry development and community power. However, the experts also identified a number of negative consequences and implications, such as a boom-bust cycle of RE development, local community and municipal opposition to RE, and the rising cost of the FIT policy to ratepayers. These issues have been partially attributed to shortcomings in the provincial RE legislation and FIT program. In addition, the experts identified a number of wider issues in the provincial energy sector, which have contributed to the failures in Ontario’s RE policy. The following sections discuss these issues and problems in a greater detail.

4.3.1 Political Priorities and Specific RE Policy Objectives

Political priorities and overall policy goals affect the choice of specific elements of FIT design and the criteria for judging policy success (Couture *et al*., 2010). It was therefore important to gauge expert perspectives on the goals of Ontario’s FIT policy, the relative strategic importance of these objectives and policy performance and the success of the policy in achieving its goals.

4.3.1.1 Renewables Development to Meet RE and GHG Targets

Rapid renewables development to meet long-term RE targets has been the primary goal of FIT policies in many jurisdictions (Couture *et al*., 2010). In contrast, this goal was not considered to be a high priority in Ontario at present. The experts highlighted a very rapid RE uptake in the province and expressed confidence that Ontario is well on its way to meet its RE targets. Likewise, a related goal of GHG emission reduction was considered of low priority, due to the existence of a low carbon electricity grid in Ontario. One participant noted that "renewables don't necessarily displace carbon; they sometimes displace water power or nuclear".

Going forward, experts called for "a little bit more paced" and "a little bit more nurturing pursuit" of RE. Setting the overall target for RES in the Ontario's long-term energy plan and specific targets for installed capacity in the FIT program was considered an important element of such an approach. One expert explained:

> Regardless whether FIT program has the target, ultimately the electricity system establishes a target and we need to accept that there is a maximum contribution from the RES that are available in nature. Even if it is a 100% but it is still a limit. If there is a limit of 100% or 50% or 25% of the installed capacity, you still then need to say what is our time frame for reaching that limit and what then become the regular uptake targets that we apply to our jurisdiction.

Many experts noted that the province already has a surplus of base-load power, suggesting that RE projects should not be brought on at a rate that is going to exacerbate that situation. Avoiding as much as possible surplus base-load problem was thus considered a safe approach. One expert pointed out that by stretching out the timeline of RE development, Ontario can take advantage of the continued improvements in efficiency in these technologies. These perspectives suggest that it is important to better take into account the economic and practical realities of RES and the Ontario's electricity system in the decisions around RE deployment.

The support for the introduction of capacity caps among the participants of this study is interesting considering that the literature on best practice in FIT design is cautious about the use of caps as a way to control RE growth (see, for example, Couture *et al.*, 2010; Prest, 2012).

Poorly-designed caps can create uncertainty for investors because the precise date at which a given capacity target will be met is unknown. In addition, caps can lead to a stop/go investment cycle and limit the achievement of economies of scale in the markets for RETs, which are partly driven by rapid growth in market volume (Couture *et al.*, 2010; Prest, 2012). Capacity caps thus require careful implementation and are, generally, considered inferior to other FIT adjustment methods, particularly tariff degression, i.e. frequent FIT revision based on adjustment formulae tied to market growth (Gipe, 2010; Couture *et al*, 2010; Prest, 2012). The participants of this study acknowledged the importance of setting caps at the "right" level and referred to Ontario's caps as appropriate, suggesting that this aspect of provincial FIT policy was well-designed. The experts did not consider caps as a source of significant uncertainty for developers about the future market potential. This may be explained by the fact that Ontario's annual procurement targets are communicated early, which provides some measure of certainty for investors (Prest, 2012). The interviewees highlighted the problems that arose with the open-ended nature of the Ontario's original FIT and the benefits that caps in the later versions of the program brought along. In particular, significant RE capacity increase in a very short time was accompanied by significant market activity and followed by a contraction, as described by one participant:

> A lot of new companies established and set up in the province, to service 2,000 MW a year for two years, whether it is equipment or installation or design or finance or operations. A lot of people came to Ontario to support the opportunity, and those companies are now scaling back, consolidating, and downsizing.

According to the expert, the imposition of caps can create a boom and bust in a cycle, so that "everybody does their project work in January because it is an annual target". By ensuring that RE deployment occurs in a more controlled manner, caps can help Ontario avoid the worst-case boom-bust cycle in RE development, whereby an explosive growth is followed by a dramatic collapse. Another expert pointed out that caps help Ontario avoid high near-term program costs and keep the economy of scale working. Using the solar industry as an example, he explained:

> You give an inflated rate to renewable energy producers so it boosts the industry; then the industry gets bigger and becomes more economic and efficient and you don't need to pay as much. With that in mind, we only need this much solar to keep the economy of scale working and we can lower our rates to avoid a scenario whereby everybody runs to the market at the highest rate. It just regulates that you don't give away all your solar at the highest price.

Finally, caps can help Ontario ensure that a diversity of RETs is developed. One expert pointed out that the vast majority of the FIT 3 is currently awarded to solar because "it is such an omnipresent technology". It was suggested to break down Ontario's FIT into a variety of streams, so that there are individual targets for biogas, biomass, and landfill gas within the overall RE target. This will foster development in a wider variety of technology sectors.

4.3.1.2 Economic and Industrial Objectives

With regard to the economic objectives of the FIT policy, such as increased economic and export market opportunities, localization of RETs manufacturing and sustainable job creation, experts' opinions were split. Several interviewees considered FIT an important tool to help meet at least some of these objectives and highlighted the progress achieved since the program was implemented, such as "a lot of uptake from the manufacturing sector", "a lot of innovation" and the creation of many jobs. A number of study participants referred to the economic goals of FIT as somewhat important, noting that "in some respects, many of these goals can be met through whether a FIT is in place or some other mechanism". One expert felt, for example, that FIT is the second best policy option to achieve the government's economic and industrial objectives. A pollution levy on GHG emissions supported by border adjustments to avoid exported jobs was considered a far sounder economic policy than FIT because "bribing industry and the public to do the right thing is far less effective than charging them the full cost of doing the wrong thing". Another expert felt strongly that RE deployment driven by FIT policy would actually have negative effects on economic growth and jobs in Ontario, suggesting that RE promotion cannot be justified on the economic grounds. The expert argued that rising electricity costs, combined with high Canadian dollar, put the province out of step with its primary competitor, the Southern United States, creating a situation where manufacturers and industrial companies are reluctant to see Ontario as an appropriate location to invest and expand their business. As a consequence, the province is not benefiting from the economic recovery to the extent that it should. These perspectives highlight the gap in knowledge regarding the economic implications of RE support initiatives in Ontario, suggesting that more research is needed in this area.

Interestingly, although experts had different views on the economic and industrial objectives of FIT policy, the majority viewed negatively the domestic content requirement (DCR), which was originally the key element of Ontario's FIT aimed at directly supporting local RETs manufacturing. The DCR was not perceived a sustainable position in the long-term. One interviewee explained that the rules created an industry that was protected and, therefore, not really able to compete on the global market. Another expert added that the DCR kept project costs more expensive in Ontario, noting that most companies operating in the province would still come to Ontario because it makes economic sense to be close to the market. The removal of DCR from the FIT program was thus considered to be a positive development in the Ontario's RE policy. The government's current policy was perceived as an attempt to maintain the investment that has already been made and keep the jobs that have been created in Ontario. One expert reported that “many of the Ontario developers are working south of the border in order to keep their shops running and they are developing projects in the United States but as developers based out of Ontario”.

Going forward, the experts highlighted the need to capitalize on the outcomes of policies and initiatives such as FIT and support technology companies in order to gain a long-term competitive advantage in the clean-tech sector and make a lasting economic upside. For example, one expert noted that rather than “trying to compete against people that are producing equipment for cheaper”, we need to capitalize on the manufacturing expertise that has already been built and start coming up with “innovative ideas”, “breakthrough solutions”, and “really exciting products or projects”. By capitalizing on its expertise and knowledge, Ontario will be able to create new companies and potentially new jobs and position itself as a leader in the clean-tech sector. Another expert expressed similar views:

> The real value of putting renewables on the Ontario gird is that it unlocks clean-tech innovation, which is where we can have a lasting economic upside. We will never have a lasting economic upside just by building solar panels here, it was always about getting our grid updated and getting clean-tech innovation with renewable integration onto the grid.

Thus, Ontario needs to continue to develop and support technology companies in order to maintain the long-term competitive advantage in the clean-tech sector. Specific suggestions in this regard include supporting venture funds, giving tax credits to angel investors, continuing to build out the smart gird fund and the innovation demonstration fund. The expert noted that there are a number of initiatives that are in place but any more support for technology incubation is really important in the clean-tech sector. One expert explained that of the challenges that we are experiencing around innovation and the clean-tech sector in the province is that it is very hard to justify the return on investment. There is a need to find a way to sell investment in innovation and in new sectors. The policy recommendation is thus providing financing that will help demonstrate technologies locally and establish credibility. While the opportunity is global, our solutions and technologies should be demonstrated at home first before taking them to other markets.

4.3.1.3 Social Objectives

Social objectives, such as promoting local and community ownership and maximizing project benefits for host communities, were recognized as important goals of Ontario's FIT program by the study participants. The desire to gain public and political buy-in for the projects, raise awareness and reduce social opposition to RE were identified as relevant policy motivations in this regard. Experts agreed that the tools put in place to involve those parties are, to some extent, benefiting the target communities. However, several experts noted that some of the participation and hosting and municipal support prioritization mechanisms are not necessarily achieving the goals that the province had set. Many developers have found ways to game the rules and create almost fictional partnerships. One expert explained:

> 51% of the participation level of the First Nation, or a municipality or a co-op is being diluted through contracts that are entered into outside of the FIT…so while policy goals may be laudable, the mechanics of how they are achieved need to recognize that there are ways to get around and to take advantage of prioritization without necessarily providing very much benefits to the targets audience.

These observations suggest that the prioritization procedures should be revisited to ensure that the FIT policy is able to fulfil the social objectives that the government has set for the program.

A number of experts discussed the lack of community engagement in large-scale RE projects and offered their views on the removal of such projects from the FIT program. Many interviewees viewed this policy development positively from a community power perspective, recognizing that the majority of large-scale wind projects are currently developed by big companies, which are getting all the associated benefits. One expert pointed out that the economies of scale in large-scale wind are extremely large and this is not the kind of capital that even a municipality has access to. This interviewee felt that the role of FIT in kick-starting large-scale RE deployment in the province has been met and considered the removal of large projects from the FIT program as beneficial for the long-term future of the industry. The expert explained:

> For the long-term sustainability of wind, the industry needs to be able come in at competitive prices and be able to deliver affordable energy that has a rate based value. The wind energy is well-suited to do that and the best way to do that is in the competitive procurement process.

The competitive procurement was thus considered a more suitable policy for promoting large-scale renewable generation in the future. In contrast, another expert felt that the new large-scale renewable procurement is a regression and a step back from the community power perspective, noting that:

> It is basically ignoring everything we have learned about what's good about the FIT program, and it's reintroducing the old system that is inherently biased towards the biggest industries, the biggest players.

The expert pointed out that large-scale RE procurement has not demonstrated resilient success in other jurisdictions. It always resulted in wind and it always resulted in very large players, usually the big oil companies, “who come in, make a lot of money and so again you are basically perpetuating the system that favours those who are already making the most profits”.

There was a broad agreement among the experts that from a community power perspective, there needs to be more sharing of wealth associated with large RE projects at the local level. Experts’ views on the most appropriate approach to ensure this were split. Several experts felt that there are opportunities for community groups and municipalities to form partnerships with larger independent power producers who have access to expertise and the capital and the ability to actually operate and get these projects built. One interviewee suggested that a win-win situation can certainly be created:

> In the current context of the Ontario’s renewable energy sector … that’s unfortunate but a community cooperative is not likely to successfully build a wind energy project on their own without the involvement of independent power producer. Independent power producers increasingly see the value of incorporating partnerships at the community and municipal level. There are a handful of projects that have shown that partnerships do work and they are in fact very beneficial across the board.

Partnership agreements, equity agreements, price adders or priority points awarded for community participation were suggested as mechanisms to increase the benefits of large projects at the local level.

In contrast, several experts argued that the FIT program is the most equitable policy that can best ensure the distribution of wealth of a project. One expert noted that there are different ways of sharing the benefits and some options are more equitable and creative than others:

> It is a spectrum of things: it can be as tokenistic as building a playground or funding a hockey team or it could be that a community owns a part of the project, they have a joint venture or some kind of partnership with the revenues flowing back to whoever invests in that project on the on-going basis.

These options should be looked at “in a serious way, not letting the developers dictate what they are going to do”. The developers are “there for profit” and when they have to share some of the wealth, that drives the profit down, so they are “obviously going to be very careful about what they offer to the communities” and “allowing a community to buy-in to the project is usually the last thing they want to do”. The expert highlighted the need for real benefits, not “municipal resolution or hiring a few people”, suggesting that the large renewable procurement may not bring the real benefits to communities. The interviewee stated that the argument for going with the large procurement approach - that it drives prices down - is not convincing. The higher costs of going with FIT would not bankrupt the province and would be more acceptable with the public, if the benefits of community participation were communicated properly. The participant felt that the move towards the new approach is driven by large players:

> It’s a political game, it’s a lobbying game, it’s played by the players that can afford to do it and the rest of us just have to sit outside and hope that there is a couple of jobs out there.

Several experts identified the suspension of municipal approvals as a problematic provision of the Ontario’s RE legislation, noting that “while we have a single process for approvals, the REA, this been shown to take a lot more time and cost a lot more”. This was attributed to the fact that many municipal planning powers over the development of RE generation facilities were stripped away, which contributed to a significant amount of public and municipal opposition to RES in the province. It was also noted that there are no avenues for meaningful citizen input or opposition beyond legal challenges. As a consequence, “there is a path to project approval but it is slow and litigious and usually has ended up ultimately in projects ultimately getting approved but the delays are expensive and time-consuming and challenging for developers”

4.3.1.4 Minimizing FIT Policy Cost and Ratepayer Impact

There was an overwhelming agreement among the experts that minimizing FIT policy cost and ratepayer impact are a huge priority for the provincial government at present. The strategic importance attached to these objectives is the result of a strong market response to incentives offered under FIT and the perception that FIT costs are excessive. Extremely high FIT prices that were available under the FIT 1 and the lack of effective mechanism to adjust the rates were identified by a number of experts as the key contributing factors to this situation. Combined with the open-endedness of the original FIT program, the availability of very favourable FIT prices led to a massive investment bubble, likened to "gold rush" and a significant capacity in a very short time, as "everybody run to the market" to take advantage of high FIT rates. This was met with a counter-reaction by the government in the form of rate cuts. The need to minimize policy costs and ratepayer impact has become a huge priority for the province while other original goals of the program have become less important.

While the first round of FIT did not succeed in encouraging the cost-effective deployment of RE, several experts noted that progress has been made to make the policy more cost-appropriate: FIT rates were reduced and yearly price reviews were put in. The FIT rate setting procedure now involves an analysis of the costs of actual project development, "looking for the years that they will actually be developed and then setting the rate appropriately based on that". These changes helped address the issue of FIT rates being biased to different size projects in the original program. The reduction in FIT rates and the introduction of yearly price reviews were viewed favourably by the experts. One interviewee stated, for example, that "most of us accepted the prices coming down are a good thing" although FIT cuts were considered "a little steep for the co-ops where costs are higher". Experts' support for downward FIT adjustments is in line with the academic literature which is unequivocal on the need to amend FITs to incorporate technological learning into the RE policy and control costs to ensure that the policy meets its objectives in a cost-efficient manner (Couture *et al*., 2010; Prest, 2012). One of the areas where improvements can be made in terms of policy cost control is FIT price setting. Several interviewees suggested that greater prioritization should be given to parties who agree to develop their projects at a lower cost than what is on the FIT rate, i.e. a developer would bid a lower price and secure priority points in that way.

4.3.1.5 Policy Transparency

The overall transparency in RE policy is an important consideration because it can influence how many people take advantage of the policy (Couture *et al.*, 2010). Ensuring the transparency in Ontario's RE policy for developers, manufacturers and the public was identified as a high priority goal by the study participants. One expert noted that "transparency in policy is critical in order for the industry to know whether to stay or to go and whether there is going to be a future for them in Ontario". With regard to the success of Ontario's FIT framework in meeting this goal, the experts' opinions were split. A number of interviewees felt that the lack of transparency is a huge problem in Ontario. In contrast, several other experts argued that although the first round of FIT was not necessarily successful in terms of transparency, great strides have been made on this front in the later versions of the policy. Tariff setting and adjusting procedure was discussed as a relevant consideration in this regard. More specifically, the government performs yearly reviews of FIT prices, which are communicated about two and a half months ahead of time before the price becomes effective. Despite this progress, several experts felt that future changes in FIT rates should be made more predictable. Price digression was proposed as an option to improve FIT design in this respect. The experts' perspectives are consistent with the best practice literature which identifies the provisions surrounding payment adjustments as a central component of a well-designed FIT policy and tariff degression as a best practice adjustment mechanism (Couture *et al*., 2010). Automatic adjustments create greater investor certainty than administrative adjustments, primarily because they are more transparent and established in advance (Couture *et al*., 2010). These considerations suggest that tariff degression can foster greater investor security by removing the uncertainty associated with annual program revisions and FIT price adjustments in the Ontario's program.

Stakeholder consultation on FIT policy design and effective communication of outcomes in the decision-making processes was considered another "big part of the transparency piece". Several experts noted that there have been "a lot more stakeholder initiatives" since the program was launched. For example, FIT revision process involves stakeholdering the industry "on basically every draft provision of the program", including the changes made and the reasons for these changes. More transparency has been established around the decision-making processes, with the data made public on where the projects are on the development side, how many applications are being given, and why people are failing the application processes. Despite these improvements, a number of experts felt that the lack of transparency in the stakeholder engagement process and decision-making around FIT remains a problem in Ontario. According to one expert, this is evident in how the FIT rules are established without proper consultation:

> Everything seems to happen inside the black box at the OPA, the Ministry every once in a while sends a Directive but the way that they gather information…even when they develop the policy, they don't look at some independent consultancy that actually goes out and asks relevant stakeholders. I don't really understand how they make changes because they always seem to manage to piss off the most amount of people … Why can't you have an open dialogue about what's possible and what's not possible … I feel like they just do everything behind the closed

> door and then they send it out and do the quasi-consultation, but usually the consultations don't amount to a lot of change. It is really a kind of windows dressing: it looks like a consulting but not really hearing what's been said.

This statement clearly suggests that there is a need for more transparency, openness and consultation on FIT policy design in Ontario.

The simplicity and clarity in FIT design as well as the rules surrounding approval process, transmission and interconnection were identified as important contributing factors to the transparency of the overall FIT policy by the experts, in line with the literature on best practice in FIT design and implementation (e.g. Couture *et al.*, 2010). Several experts described Ontario's approval and certification processes for RE projects as "perfectly appropriate at present", i.e. sufficiently streamlined and simplified for smaller projects and sufficiently rigorous for larger projects. In contrast, other experts felt that these rules are unnecessarily complicated and time-consuming, involving cumbersome paperwork, priority points and "all kinds of screening regulations". As a result, it is hard for smaller companies to satisfy the requirements and be part of the industry. Reduced costs for connection, streamlined permitting, building permits, standardization were identified as opportunities for reducing uncertainty, timelines and costs associated with FIT projects for developers.

Partly, the complexity of Ontario's FIT program was attributed to the challenge of setting different objectives for the FIT program and tailoring specific FIT design elements to these goals. One expert noted, for example, that the provincial RE policy has tried to achieve so many goals that FIT 2 and FIT 3 have become overly complicated and the transaction costs of participation have increased. A number of experts agreed that the government needs to revisit, reprioritize and re-establish its priorities with regards to FIT. According to one expert, the competing goals of continued price reduction have been compromised as a result of mixing different policy goals. The interviewee felt that if reducing the burden for ratepayers is the highest policy priority, then the industry and the government should put an action plan in place to assist in reducing the overall cost to ratepayers. In contrast, another expert argued that the government should strive to implement a policy framework that can reconcile multiple objectives in a FIT policy. Noting that the OPA and even the Ministry of Energy see their role as ensuring the lowest price of electricity, the expert argued that the Ministry is a part of a bigger government that pursues a number of social, environmental and economic objectives. Energy was perceived as a policy area where multiple objectives can be met if “you are smart about it”.

4.3.1.6 Other Objectives

Several experts identified a number of FIT policy goals which are not currently prioritized in the provincial FIT program but which should be. These objectives include peak shaving, distributed generation; diversity of technology, project size or location; the use of specific waste streams and high efficiency systems. The lack of prioritization of these goals in the Ontario’s FIT is not surprising, considering that these objectives are also identified as tertiary in the literature (Couture *et al.*, 2010). It was suggested, however, that by giving higher priority to these considerations in the Ontario’s FIT policy, the valuable contribution that RES make to Ontario’s electricity mix could be increased.

4.4 Learning from Best Practices for Renewable Policy Design and Implementation

The importance of following best practices for RE policy design and implementation has been a common theme that emerged from the interviews. Comparing elements of Ontario’s RE support framework with the policy experience in other jurisdictions, the experts suggested that many problems with Ontario's RE policy would have been avoided if the government had followed more closely the model implemented in leading RE jurisdictions, such as Germany, Denmark and California. Specific areas where there have been opportunities for Ontario to learn from lessons in other jurisdictions include elements of FIT policy design. For example, the failure to get the pricing closer to German pricing and establish the price digression mechanism as did Germany were considered some of the reasons why the Ontario's FIT program was not a success. One interviewee contrasted gradual and predictable reduction in FIT rates in Germany with the situation in Ontario, where rates drop all of the sudden by 10-20 cents and "people rush to get the applications in", followed by quiet market conditions because the rate just dropped. Implementing "a very strict and rational" price digression based on the German FIT model was suggested by several interviewees as an important measure to improve Ontario's FIT policy.

In addition, permitting processes and connection rules for RE projects were frequently mentioned as areas where Ontario can learn lessons from other jurisdictions. Several interviewees contrasted German simplified permitting model with the Ontario's process, describing the latter as extremely costly and time-consuming for developers, involving a host of "little road blocks in the paperwork" and delays. Several experts criticized the OPA's practice of releasing project approvals in batches. It was noted that "if you look at Germany, they don't have this weirdness". Many experts perceived utilities' connection rules too stringent in Ontario, when compared to leading RE jurisdictions. The amount of renewables that Hydro One in particular allows on their system was considered too low. For example, one interviewee noted:

> The way they calculate if the solar system is really acceptable in a certain area or whether the grid is already overloaded is very different from the way other countries calculate that. Hydro One is unnecessarily cautious, more cautious than any other country in the world that I know of.

As a consequence, a lot of projects that “would be totally fine by German standards are just not happening” in Ontario because of the unnecessarily cautious rules established by Hydro One. In a similar vein, another interviewee contrasted the Hydro One’s 7% limit on distributed RE generation with a higher ration in the US, where it is 15% and where some states (e.g. California and Hawaii) are looking at increasing it. There is thus an overwhelming agreement among the experts that permitting processes and connection rules for RE projects need to be reconsidered in Ontario, taking into account relevant lessons from other jurisdictions.

Finally, there are opportunities for Ontario to draw from best practices with regard to community engagement in RE development. In Ontario, RE development is developer-led, whereby developer try to find a place where they can build RE projects with the minimum amount of opposition. In contrast, in the successful jurisdictions of Germany and Denmark a lot of RE projects are owned through co-operatives, but also just by the community members, and it tends to be more in the direction that community members decide that they want a project in the area, and then they partner with a developer to have that project go forward. Several experts agreed that for RE projects to move successfully and in a socially acceptable manner, these projects need to be initiated by communities. To achieve this, Ontario should re-instate community powers through the local jurisdiction so that municipalities and communities had more flexibility around project siting.

4.5 Overcoming Organizational Inertia

Organizational inertia about adopting change in the power sector was another theme that emerged during the interviews with RE industry insiders. Many study participants felt that utilities and agencies responsible for RE implementation in Ontario are generally hostile to renewables and this remains a barrier to RE in the province. The two biggest players tasked with shaping the whole RE implementation - Ontario Power Authority (OPA) and Hydro One - in particular were perceived as “not really interested in” or “committed to supporting renewables”. A number of interviewees suggested that these players are trying, to a certain extent, to undermine the success of the FIT program through unnecessarily complicated requirements, archaic rules for interconnection and other hurdles for RE developers. For example, one insider noted:

> The way the institutions are set up are a part of the problem and we see that in the way the laws are written, the way they are implemented, these crazy deadlines, these rule changes at the last minute, rejecting good applications for no reason.

Similarly, another interviewee stated that OPA throws up “insane blocks in the paperwork that serve absolutely no purpose”. In addition to “ridiculously difficult” management of applications, the interviewee pointed out that “there is never any chance to repair anything that you did wrong, if you do anything wrong they just throw you out”. Several interviewees mentioned numerous delays that have accompanied OPA’s approval process, noting that “all these delays cost people money” The OPA’s practice of releasing project approvals in batches has been another relevant issue. One interviewee explained:

> Another thing that really makes it hard for us is that they [OPA] release project approvals in batches so nobody gets an approval for a long time and everybody is starving in the industry and companies go bankrupt. All of the sudden they flood us with a whole batch of approvals and everybody is fighting for the solar panels because everybody is buying them. So if the approvals were coming gradually, the whole industry would move smoother. What's the point of that? I can't think of any other reason than just making our life hard.

These delays and hurdles have been attributed to the OPA's culture, which "has no respect for the fact that time is money amongst the people that actually have to earn a living".

Ontario's largest electricity transmission and distribution company Hydro One has its own share of roadblocks. "Excessively restrictive" rules and restrictions imposed by the utility on the incorporation of renewables into the grid are perceived to be another manifestation of a built-in organizational inertia and resistance towards adopting change in the electricity sector. One interviewee described people in the electricity sector as "very traditional", coming out of "the traditional system planning side of the electricity". The interviewee noted: "Ontario Hydro trained everybody that is still working in the electricity sector". These traditional attitudes are not limited to renewables but are particularly endemic to the electricity sector. The mindset adopted by political leaders and public agencies is that nuclear is cheap and it is the backbone of Ontario and that "all those renewables are just driving industry out of the province". Another interviewee added that there is an old mind-set that electricity is centralized with a few large players and that "the attitude that we see" is that "it is the engineers that figure the stuff out". Several experts noted, however, that there are many individuals in the electricity sector that support RE, noting that the closer people are to the customer the more enlightened they are. The experts felt that there needs to be a concentrated effort to change the organizational culture and engage utilities and public agencies legitimately on opening the grids up to renewables.

4.6 Adopting a Long-term Perspective to Energy Planning

There was a broad consensus among the RE experts that some of the greatest challenges associated with renewables in Ontario stem from the fact that the provincial government's energy policy is too political and short-term. The electricity sector in general and renewables issue in particular were described as very politicized in the province. This politicization represents a big barrier to RE development. As explained by one interviewee, existing political parties in Ontario have different opinions not only on the benefits or the desirability of bringing on large amounts of RE but also on the policy mechanisms to achieve this goal. The Ontario situation was contrasted with that in Germany and Denmark, where the decision on whether or not the renewables would be brought online was not so much a political decision because all parties had it in their frameworks. Another interviewee related the cross-party consensus on the energy policy in Germany to the recognition of "an obligation to our children and our grandchildren to get off carbon in every way we have", which is at the heart of the German FIT program, making it something that operates across parties. By contrast, in Canada, which adopted a petro-state mentality, "climate change and getting off carbon has now become sort of a political third rail, in terms of not something that is popular in public policy". In Ontario, only one party, the liberals, currently support the larger-scale expansion of RES. This suggests that if political winds change, we might run into the situation with the new government where that push likely is not going to exist at all or at least not to the same extent. Political instability was considered "one of the key factors that drive away investment and that continues to play a big piece in terms of a barrier" to RES in Ontario. In addition to polarization in politics, the issue of renewables is highly polarized among the public. This was partially attributed to the ham-handed way that FIT program was done and launched. In such a polarized environment, securing a social license for RES is a challenge.

The presence of political will was mentioned as one of the key reasons behind the FIT policy in Ontario. There was particularly high level of commitment during the launch period of the FIT.

The current levels of commitment was described by one interviewee as “somewhat less enthusiastic but still a good level of support”. Many experts felt, however, that at the time of its launch, the FIT policy was overly ambitious, which was reflected, for example, in the “ridiculously high” FIT rates and the fact that it was not supported by proper infrastructure. To some extent, this was attributed to the fact that Ontario’s FIT policy did not have a long-term vision because it was designed for a short-term political gain. One interviewee stated: “The political ambition was to create a short term industrial economic activity without a view to how the Ontario electricity system could sustainably over many years continue its RE policies”. In a similar vein, another expert noted: “There is a very strange way of doing policy in this province as in this country, it is not really based on good sound analysis, it just seems to be chopping onto popular ideas and then later on thinking”.

Going forward, the experts highlighted the need for the government to de-politicize energy sector, adopt a long-term perspective and a new approach to energy policy-making in the province. For example, one expert noted that any renewable discussion going forward in Ontario needs to become “a little less emotional and a little bit more balanced, and a little bit less polarized”. Another expert argued that RE policy needs to be viewed as a long-term investment on a new post-carbon vision. This long-term perspective requires the consideration of a broader range of issues than just renewables, such as turning off oil and natural gas, electrifying public transit, and promoting the use of storage technologies. All of these should be supported as a public policy matter. Through their implementation, the potential for effective use of RE will substantially increase in the province. Another interviewee felt that there is a need to start thinking completely differently about how energy policy is made in the province because the old model is not working anymore. The expert suggested an alternative approach whereby the energy policy is done through an all-party committee that takes an approach to a complex problem.

4.7 Opening up a Discussion about the Costs and Benefits of Nuclear

As discussed in Appendix A, a formal commitment to phase out nuclear/fossil fuels in Germany and Denmark opened the door to more renewables in those jurisdictions and led to stronger governmental commitment to and action on RE. Given these considerations, this study sought to gauge experts' perspectives on whether nuclear is a barrier to more RES in Ontario and how do they see the role of nuclear energy in meeting future electricity needs. The experts' views on the issue of nuclear varied from strong support, to ambivalent views, and to outright opposition towards nuclear power. A number of interviewees did not consider nuclear as a barrier to more renewables in the province, viewing nuclear and RE as complementary components of a balanced energy mix. The experts highlighted the perceived benefits of nuclear energy option, such as relative affordability, a good source of base-load power, low environmental impacts and job creation, suggesting that these benefits outweigh the costs. In particular, many experts acknowledged the contribution of nuclear power to reducing the GHG emissions as well as avoiding other environmental effects associated with alternative power generation options. For example, several interviewees gave a historical perspective, noting that excessive reliance on coal is much more damaging for the environment and human health than would have been to have built the same capacity using nuclear. One interviewee noted that although renewables are clean on the operational side, they have a number of other problems that "are bothering other people" or that "nobody wants to talk about", such as low-frequency noise and the unsightliness pf wind turbines and the GHG emissions resulting from the use of coal power to produce solar panels in China.

Several experts perceived nuclear to be cheaper than renewables. For example, one expert claimed that even if the costs of nuclear refurbishment were taken into account, nuclear power would still be cheaper than solar or wind in Ontario, particularly when the costs of RE integration are included in the assessment of the overall costs. Furthermore, the expert noted that nuclear is the only power source that includes the cost of disposal of the radioactive fuel and the costs of decommissioning in the price of the fuel. The expert acknowledged that what is the real cost of disposing radioactive material is a matter of debate and it all depends on whether you accept the deep geological burial as safe or not, which is a scientific argument. The interviewee also acknowledged the hidden cost of nuclear, i.e. the cost of a major accident. Although these costs are generally covered by insurance for most plants, which contribute payments to an insurance fund, those funds are not big enough to handle a major accident. However, the risk of a major accident was considered artificial rather than real in Ontario because four safety rules never got broken in the operation and oversight of the nuclear plants: 1) staff are properly trained and certified; 2) a strong independent regulator oversees nuclear energy matters, such as safety and security; 3) there is a strong safety culture on the part of the plant; 4) the defence in depth strategy, which means no major critical function is allowed to operate without a backup.

Inexpensive energy was considered critical to the competitiveness of Ontario's economy, affecting our ability to supply goods and products at lower rates than competitors, such as Southern US, and to attract investment. In addition, some experts pointed out that the nuclear industry supports good-quality jobs. According to one interviewee, the nuclear sector has given

60,000 jobs with only 12,000 MW of generation in Ontario and it is one of the few industries that hires a high ratio of college and university graduates.

A number of interviewees noted that Ontario currently has a significant fleet of nuclear assets and expressed confidence that nuclear should remain a viable energy option in the long-term. One expert shared his views on how Ontario's electricity mix can be optimized. In this scenario, nuclear and hydropower provide base-load electricity. Natural gas will also play an important albeit minor role, meeting peak electricity demand. Renewables are not seen as primary dependable energy sources, rather they are displacement energy sources and their value comes from the net benefit of displacing the backup. This implies using only enough wind and solar where it can be used efficiently and stored for a short period. The expert explained:

> It [nuclear] gives you a lower cost energy that's clean and you accept some particulate emissions from the gas and some nuclear disposal costs but at least you survive as an economy. Then over the period of next 50-60-70 years, something else will come along, either the price of storage will come down and we can put in more renewables, or fusion will take over and then we don't have the waste problem with nuclear. We need 50 to 100 years to transition to what I call a future energy source and the nice thing about nuclear and gas is that it gives us that 100 years to do the R&D and to develop the new technology. You cannot get rid of fossil and nuclear without killing yourself financially.

In this scenario, nuclear is a key technology to support Ontario's transition to a low-carbon energy future. It also gives "people the renewables they want" but in a way that does not hurt the grid and the economy.

While supporting nuclear technology in principle, several experts highlighted that the economics of nuclear should be an important consideration in the decision to refurbish Ontario's nuclear fleet. Several interviewees were not convinced that the business case has been made for refurbishing the existing reactors, criticizing the decision to authorize the nuclear asset operator OPG to spend up to a billion dollar on planning for nuclear refurbishment – "a huge amount of money, if you don't even know whether you are going to actually do the refurbishment at all". There was a general agreement that "nuclear plants should defend themselves on an economic basis going forward, calling for a full, open and honest discussion about the costs of refurbishments.

A number of experts did not feel that the current generation of nuclear is going to be an enormous impediment to RES due to their own economic problems. They felt that the technological improvements and falling costs as well as an increasing recognition of the costs that are imposed by the alternatives make renewables an increasingly competitive energy option. According to one interviewee, "the costs and the efficiencies of wind and solar power in particular are continuing to converge to justify their place in the supply mix on the economic basis rather than the policy basis". Another expert held very similar views:

> The economic disadvantage of nuclear is such that it is almost destined to wither away as the true fully loaded cost of it becomes apparent and as the continually declining costs of renewables become better understood, so I am less concerned about that as a policy matter because as long as there is continued rational decision-making from an economic perspective, renewable energy is going to become an increasingly promising part of the energy mix.

While not being particularly worried about nuclear as a major problem in the current configuration, the experts did not exclude the possibility that some negative or ill-advised decisions around continuing to invest in nuclear refurbishment will be made in the short term. It was noted that the province has a significant fleet of nuclear assets and there is a number of companies and jobs supporting and servicing the nuclear industry. Due to the resistance of those who have established a vested interest in the nuclear industry, the expert expected the reliance on nuclear to diminish slowly, unless there is a development in areas such as thorium reactors or other less damaging technologies. Another expert also acknowledged that in the short-term it is unrealistic to shut down all nuclear power plants in Ontario. However, the expert suggested that Ontario should consider a mix of what makes sense from an economic perspective in terms of refurbishing some nuclear power plants and not refurbishing others by having more hydropower imports from Quebec and Manitoba. It was suggested that Ontario could optimize its electricity mix thorough a mix of domestic nuclear and hydropower imports from the neighbouring jurisdictions. Implementing this option presents many challenges, such as costs and public opposition. For example, it was mentioned that "people don't like transmission lines" and this creates some issues in terms of how much nuclear Ontario can get rid of.

Several experts considered nuclear a barrier to further growth of RES in the province. They felt that there are opportunities for further increase in RE. However, it was also acknowledged that the province does not necessarily need new electricity generation because the long-term forecast of demand and supply is relatively flat and the existing supply meets the current demand. One expert stated that if the government would make the decision to phase out existing nuclear assets more quickly, this would create a gap in demand, opening up an opportunity for large-scale RE deployment. The interviewee stated: "Renewables certainly can fill that gap and they can do it better than nuclear from affordability and the economic perspective, but that gap in demand needs to be created". These observations suggest that renewables are well-suited to meet the requirements of the existing supply but policy initiatives to back up further growth in RES are needed. The implication is that there are some significant decisions that need to be made around nuclear in the long-term as well as in the short term and depending on these decisions, the opportunities for further RE development in the province will or will not be realized.

A number of experts did not consider the nuclear path a prudent or wise choice for Ontario's energy future. One expert questioned the rationale for continuing the nuclear path considering that there is a surplus power generation in Ontario:

> If that [surplus power] is the trend then why are we even talking about going nuclear, why are we not looking at how we can accelerate that trend and then all you need to do is having your renewable energy call every once and a while, and you know exactly what your costs are, and you start to build out better procurement system.

It was noted that while we are talking about conservation, we are building the system that requires the base-load:

> Nuclear locks us into something and it is going to take us 50 years to pay off those systems and to pay those off we need people to continue to use a lot of electricity, that's the irony here.

Noting that the costs of nuclear are always higher than projected, the expert suggested that a much wiser way for moving forward would be to put the investment that was going to nuclear into modernizing the power system so that we are in a position to not need nuclear base-load. This was considered to be a question of, "Do you want to achieve it?" and a matter of putting some sharp minds to the task, not a question of, "Is it possible?" It was noted that we have adequate timelines and resources to come up with a better, modernized system:

> We have a 10 year window to phase-out nuclear and if we see just how much innovation and even price reduction we have seen over the last 10 years around the whole smart grid, smart meters, distributed generation, the trend is really towards the distributed energy system.

Noting that there are plenty of systems in the world that do not have nuclear power, the expert argued that "to suggest that you cannot manage without nuclear is completely missing what other jurisdictions have already done and demonstrated".

Another expert felt that going down the nuclear path is irresponsible, regardless of all kinds of financial and environmental arguments. The question that should be asked "before we even go down that path" is whether nuclear is safe. The interviewee explained:

> I have always heard people say that certain things cannot go wrong, the Titanic cannot sink, this and that cannot happen. In my experience with the way humankind operates and evolves – that has always been a wrong statement.

It was thus suggested that Ontario should very aggressively try to remove nuclear power plants from the energy mix, for safety reasons.

Thus, there was a significant split in opinion on the issue of nuclear as a barrier to RES and the role that this energy source should play in Ontario's long-term energy mix. This is not surprising, considering that nuclear is a highly complex issue, which has long been contentious in Canada and elsewhere. The issues and concerns raised by the experts mirror the debates in the literature on the comparative risks, benefits and costs of different energy systems, some of which were briefly discussed in Chapter 2. Several important observations can be made in relation to the issue of nuclear power in Ontario based on interviews with the RE experts. In the short-term, shutting down all nuclear power plants in Ontario is difficult; however, a 100% renewable energy system is perceived increasingly as feasible from a technical and economic standpoint over the long run. This suggests there is a need for a comprehensive, open and honest discussion about the costs and benefits of nuclear refurbishment in Ontario and the implications of continuing the nuclear path.

4.8 Improving Renewables Integration

The integration of RES in the electricity system emerged as another major challenge to the diffusion of RE in Ontario. Within the broader challenge of integration, interviewees identified three main issues: 1) limited transmission and distribution capability; 2) backup generation and storage; 3) the lack of integration in the energy sector between Ontario and neighbouring jurisdictions.

Transmission and distribution constraints were one of the most commonly reported barriers to RE expansion in the province. Access to transmission is particularly limited in remote northern communities of Ontario. The government's efforts to improve infrastructure were considered insufficient, suggesting that there needs to be an increased commitment on transmission accessibility, particularly in the remote areas. It was acknowledged that additional infrastructure is "an expensive thing", "a much bigger decision" and a challenge with "longer timelines".

The need for backup generating capacity and energy storage, arising as a result of the intermittent nature of RES, was considered another problematic issue affecting RE integration. One expert argued that renewables need a 100% backup, which means two separate systems will have to be built – the renewables system and the backup system - to ensure that power is "there when you need it". Among the potential backup generation and storage options that could be used to "do a totally renewable grid", most were not considered viable at present in Ontario. Nuclear does not maneuver very well; pumped hydraulic is expensive and the scope for reservoir hydropower systems is limited in Ontario. The use of storage technologies was described as "outrageously expensive", tripling the price of wind and quadrupling the price of solar. Putting in renewables with gas as backup drives the price of electricity up, because "you are taking a commodity that costs you 9 cents per kWh in terms of the fuel plus the environmental effects and you are exchanging that for wind at 11.5 cents or solar at 28 cents per kWh. The implication is that "you might as well let the gas plants run, because their value is already built into the system - you have already built the backup".

Although long-term storage was not considered economic in Ontario at present, better use of short-term distributed storage systems was suggested as an option to improve the potential for integration of RES. At a cost of about 2,000 dollars per kWh, small-scale storage technology, such as compressed gas, batteries or fly wheels are half the price of hydroelectric energy storage. By putting in a little bit of storage at each of the solar and wind farms, energy supply can be made more coincident with demand. One expert explained:

> If we store [energy] … we can use it the next day for wind or that same evening for solar, we smooth it out – just a couple of hours of storage for solar and maybe eight or ten hours for wind.

The expert noted that if storage systems could be installed locally where the energy is produced, then the extra cost of that storage could be justified by using that storage to also do other things, such as voltage regulation at the distribution level.

A number of experts considered whether there are opportunities for Ontario to address some of the challenges it faces with RES integration through greater cooperation in the power sectors between Ontario and neighbouring jurisdictions. Taking advantage of hydropower storage capacity in Quebec and Manitoba by transmitting surplus power to these provinces and getting it back when needed was identified as one of the most opportune situations. Experts' opinions on whether necessary agreements can be reached and implemented by the provinces were split. Several interviewees expressed scepticism in this regard, noting that "we have been trying for years" and that although greater integration sounds great conceptually, it is fraught with challenges from engineering, economic and social acceptance perspectives. In contrast, several other study participants were optimistic that these challenges can be overcome. One specific challenge is that, historically, markets have been designed in a way that trading is more advantageous for Quebec and Manitoba with the US, where the market is more welcoming due to higher prices and bigger demand. In the US, there are the energy market, the capacity market and a system of RE certificates, while in Ontario only electricity can be currently sold but not capacity or environmental attributes of RES-E. This is a disadvantage for Ontario which cannot reward hydro-electricity as much as New England or New York can. A further disadvantage arises from the fact that Ontario has low electricity demand with a lot of inflexible nuclear plants and a lot of unpredictable wind, which create a situation where very low and even negative electricity prices arise. These low prices do not justify exports from Quebec to Ontario. On the contrary, they justify imports from Ontario to Quebec. This implies that in order for Hydro Quebec to sell electricity to Ontario, energy prices in Ontario will have to increase. One expert suggested that if instead of refurbishing its nuclear power plants at a high cost of around 8.6 cents per kWh, Ontario would offer a contract to Hydro-Québec at 8 cents, the utility might consider selling power at this price to Ontario.

In addition, the challenges around necessary transfer capability would need to be addressed to enable large-scale trade of electricity. One expert noted that Ontario's total transfer capability of about 6,500 MW cannot be all used at the same time for electrical reasons. The realistic transfer capability, estimated at about 4,500 MW, was also not fully exploited at present due to different barriers and the way tariffs are set in Ontario. The experts focused on such questions as: the need for additional generating and transmission capacity and the cost of grid upgrades. In particular, one expert noted that in order for Quebec to send power to Ontario, expensive and extensive expansion of transmission capacity would be needed. It was claimed that Quebec would not be willing to cover the cost of the additional generating capacity and at that price Ontario can build its own generators. Noting that there is nothing more difficult to build than transmission corridors, the expert mentioned a study which found that to handle 10,000 MW of renewables, about 7,000 MW worth of transfer capability would be needed. Considering that current Québec to Ontario transfer capability is only around 2,000 MW, the expert highlighted the costs of building additional capacity:

> 5,200 MW is a transmission corridor the size of one going down the 407 … two sets of towers 500 kV … it is about 2-3 thousand kilometers at 5 million dollars a kilometer, that's 10 billion dollars.

It was further noted that these transmission lines are only moving energy around; they are not generating energy that could be sold to make money, so "you've got to add to the cost of power when you are putting in transmission". Thus, according to the expert, what has been stopping the agreement is not stupidity or the political rivalry, it is the economics: "They've told us what it costs to upgrade their grid to help us and we've said that it's too expensive".

In contrast, another interviewee disagreed that more infrastructure would be absolutely needed to facilitate greater market integration, noting that "some of it is already there and it is not fully being used". For example, the current power transfer capability of at least 2,000 MW from Quebec to Ontario is not currently used at more than 10 to 20%. The expert highlighted the opportunities to use the existing capacity more intensively:

> There could be within the existing infrastructure firm contract or some firm deliveries of electricity that could be much more than the current level, there could be 1,000 MW or 1,500 MW of power transmitted in addition to what is going through these lines currently.

Furthermore, it was noted that some additional transmission line construction is already going on and most of this transmission is considered in terms of costs. The expert acknowledged that in order to export more, more transmission would be needed and there is a cost to that. However, it was noted that when we look at cost differentials between alternative energy options in the long-run, at least some of transmission projects might be justified. Firstly, transmission facilities can be used for a long period of time, i.e. 40 years and more, as opposed to traditional thermal power plants which have a lifetime of 20-30 years. Secondly, the price of emissions from fossil fuel source should be included in the calculations, which would give transmission facilities further advantage over thermal power plants.

Costs and social acceptance issues were identified as big obstacles to grid expansion and greater integration of power sectors between the provinces. In particular, the electricity rates would have to go up in Quebec in order to increase the energy savings to free up some energy for export. However, this increase in energy bills can be justified on the basis that it promotes energy efficiency and that is something people are sensitive to. Any increase in the rates would also increase the profits of Hydro-Quebec and will eventually benefit the government, which fully owns the utility. In addition, a wealth redistribution scheme would be needed to address equity concerns and to protect the low income households.

Public opposition to transmission infrastructure is another challenge that would need to be addressed. One expert noted that there have been attempts in the past to expand transmission lines between Manitoba and Ontario. These lines were planned to come across First Nations' territories and, in part, as a result of the challenges that arose during negotiations with First Nations, the plans were abandoned. The deal with Manitoba was considered unlikely in the short-term because the government of Manitoba accepted requests by the First Nations that these plans would not go ahead. However, such arrangements might be feasible “more down the valley”. Another expert expressed scepticism that public acceptance can be secured for new transmission lines between Ontario and Quebec, noting that the chances of building another major transmission corridor the size of the 407 corridor from Toronto all the way up to Northern Quebec is next to zero, because people will not tolerate a major transmission facility going through their neighbourhood and the existing corridors are not big enough. In contrast, another interviewee was optimistic that the challenge of public opposition can be overcome. It was pointed out that there is always public opposition to some new forms of power plants. Noting that people “don’t want anything but they want electricity”, one expert highlighted the political dimension of the challenge, noting that politicians should explain the economic and environmental benefits of better solutions to the public in a transparent way:

> At one point some politicians have to decide and some costs have to be looked at … what is preferable some transmission lines or some local power plants that may not be as welcome as some people think … if people think that importing from other provinces is not acceptable, then just pay higher price and have your local electricity. The only thing that I’m trying to say is if people want to pay less and make some environmental improvements then that would be solutions.

Thus, the cost of greater integration in the electricity sector has to be considered and public opposition has to be dealt with, and strong political will is needed to undertake these tasks.

4.9 Information and Education

The lack of public awareness and understanding of issues surrounding RE has been identified as a major concern by an overwhelming majority of experts interviewed in this study. Many experts highlighted significant amount of misinformation about renewables and a very polarized nature of conversation on this topic in the province. In part, this was attributed to a very vocal, well-financed and well-resourced opposition driven largely by vested interests. One interviewee described the disinformation campaigns about RE as “something of the surreal attack that has created an emotional level response”. Wind turbines in particular are suffering from an enormous image problem according to the study participants. This irrational emotional response has manifested itself in the NIMBY attitudes, whereby “a lot of people have a narrow thought in their minds that they hate the look of a wind turbine somewhere near to their property”. Several experts noted that the media tends to report on the negative and the opposition to the projects, which contributed to the lack of understanding of the RE situation by the public.

In addition to the general lack of knowledge and understanding of RE, the public has an incomplete picture of the financial aspects of renewables and their contribution to the cost of electricity in Ontario. Several interviewees felt that people do not realize that all energy sources have received subsidies in Ontario and, in fact, traditional energy generation solutions have historically received more in government support than renewables. Another often overlooked issue is that some increase in electricity costs is related to the fact that “we have got aged and fully depreciated and inadequate in many respects infrastructure and distribution and transmission system”. A number of respondents expressed concern that the government did not “stand up and defend” the fact that FIT program is responsible for a relatively small increase in electricity rates in Ontario. One interviewee suggested that if the rates increase associated specifically with the community power as well as the benefits of community participation in RE development were communicated properly, the cost burden of supporting these projects would be more acceptable to the ratepayers. The lack of public understanding of issues around the cost of power has contributed to the perception that paying for renewables is unfair and is going to bankrupt the province.

The majority of interviewees stressed the importance of public outreach, education and provision of information as the policy answer to these issues and as a key condition to the successful development of renewables in Ontario. In particular, a lot of work needs to be done on educating the public on the real value of renewables though making stronger links between renewables and climate change, the economic upside of participating in the smart grid economy, the notion of equity and community benefits. "Massive education" and more transparency were needed around the costs of renewables as opposed to other electricity generation options. One interviewer felt that it is important to frame renewables as a long-term investment on a new vision, stating that although there are many issues associated with renewable implementation, all "these problems have solutions at some point but these solutions don't just come out of the sky if you wait, the solutions come when you start doing it". Another respondent noted that there needs to be some sort of capacity building or education to ensure a better understanding of what can be achieved considering the limitations of our electricity system and affordability, which has become an important issue in Ontario. Several interviewees highlighted the importance of providing access to factual and accurate information based on credible and recent research as well as through case studies of projects at the local level. For example, one interviewee noted that there are examples of projects that are already operating successfully and delivering benefits to local communities in Ontario. The concerns around wildlife and health effects have not materialized in these projects, which has helped quell some of the fears about the impacts of RES. Several experts argued that there is a need to create an emotional appeal to people but acknowledged that it is very difficult to do as a matter of public policy. Community power was suggested as one of the areas that could play a very significant role in this regard. There was a general consensus that better understanding and awareness can help improve the reputation of renewables and create stronger public support for this energy option. Several experts note that educating the public is the biggest thing that needs to change because “everything starts with public opinion”. The will of the people drives the political will and support needed to ensure that policies are implemented in favour of RE deployment.

4.10 Carbon Pricing Scheme

Carbon market and carbon prices have been other issues raised by the participants of this study. Several interviewees mentioned that Ontario currently does not have any kind of carbon price or carbon constraints in terms of emissions. One interviewee contrasted the Ontario situation with Quebec, New England and New York, all of which have cap and trade markets for electricity emissions. It was highlighted that electricity is a very important source of emissions; therefore, emissions have to be included in the integrated framework in the long-run. The interviewee stated: “As much as electricity markets have to be more integrated it wouldn’t make sense to not integrate a carbon market”. There should be a clear clear incentive and reward for non-emitting energy sources. The expert highlighted that this reward should be the same whether you are in Ontario, Quebec, New York or New England. The expert stated: “Without designing this in common, we would prepare much less optimal market for electricity”.

4.11 Summary of Experts' Views

One of the aims of this paper was to elicit the perspectives of RE experts regarding the performance of Ontario's support framework for renewable power; the barriers to renewables in the province; and policy options to address these barriers. The interviewees raised a range of issues and expressed differing points of view on these issues. Table 1 below provides an overview of the most important points discussed by the RE experts.

Table 1. Summary of Experts' Views

1. **The introduction of the GEGEA (2009) and the FIT program is a good first step towards building a foundation for renewable future but more action is needed to improve the program and to address wider barriers in the electricity sector;**

With the introduction of the GEGEA legislation and the FIT program, important progress has been made in establishing favourable policy environmental for RE developers in Ontario. These RE measures kick-started the RE development in the province. There have been a number of other positive developments, such as clean-tech innovation, emergence of a local RE industry and community power development. However, further policy action is needed to improve the FIT program and address wider problems and issues in the provincial energy sector (e.g. organizational inertia, lack of long-term energy planning), which have contributed to the failures in the Ontario's RE policy.

2. **Re-establish priorities with regards to FIT and ensure that specific FIT design elements are better tailored to these priorities;**

Minimizing FIT policy cost and ratepayer impact have become a huge priority in Ontario while other original goals of the program have become less important. The provisions of FIT policy are not necessarily achieving the goals that the province had set. The government should implement a policy framework that can reconcile multiple objectives and consider whether a wider range of policy goals can be explicitly targeted in the FIT policy (e.g. distributed generation and diversity of technology). The FIT design elements and regulations supporting the program should be better tailored to achieve policy priorities. At the same time, the complexity of the framework and the transaction costs should be minimized.

3. **Follow more closely best international practices in RE policy design and implementation;**

Many problems with Ontario's RE policy could have been avoided if the government had followed more closely the model implemented in leading RE jurisdictions such as Germany, Denmark and California. The experiences in these jurisdictions provide valuable evidence on effective policy solutions to RE-related problems. Going forward, Ontario RE policy-making should be routinely and effectively informed by the available evidence-based best practices on RE policy design and implementation. Policy actions that should be prioritized in this regard include incorporating a price digression mechanism into FIT design; simplifying costly and time-consuming permitting processes and updating connection rules for RE projects; and improving opportunities for public participation in RE development.

4. **Make a concentrated effort to change the organizational culture of the electricity sector to create a culture that is supportive of renewable energy technologies;**

The utilities and agencies responsible for RE implementation are not committed to supporting new energy technologies in the province. A traditional mind-set about centralized electricity system based on a large nuclear component presents a barrier to RES in Ontario. A concentrated effort is needed to address traditional attitudes and the organizational inertia in the electricity sector to create a culture supportive of RETs. Public agencies and utilities should be engaged on removing unnecessarily complicated requirements for RE developers, opening the grids up to renewables and adopting more transparent and inclusive decision-making practices.

5. **Take measures to de-politicize the energy sector, adopt a long-term perspective and an integrated approach to energy policy-making;**

The electricity sector and renewables are politicized in Ontario. The government's RE policy is driven by short-term political goals rather than a long-term vision of how Ontario can achieve a more sustainable energy system. Creating investor certainty and securing a social license for RES in such an environment is a challenge. The government needs to depoliticize the energy sector and adopt a long-term perspective and a new more comprehensive approach to energy planning, whereby renewable policy is viewed as a long-term investment on a new post-carbon vision and a broader range of issues is considered, not just renewables.

6. **Initiate a comprehensive, open and honest discussion about the costs and benefits of nuclear refurbishment and the long-term implications of continuing with the current nuclear path;**

The province of Ontario plans to refurbish its nuclear reactors although the business case for that decision has not been made and the long-term implications of continuing the reliance on nuclear plants have not been looked at. The province should initiative a comprehensive, open and honest discussion about the costs and benefits of nuclear refurbishment in Ontario and the implications of continuing with the current nuclear path. Consideration should be given to whether investing in modernizing the power system could be a more prudent decision in the long-term, considering the technological improvements and falling costs of RES and the declining electricity demand in the province.

7. **Strengthen measures to improve integration of RES into the grid;**

The integration of RES in the electricity system is a major barrier to the development of RE in Ontario. Within the broader challenge of integration, there are three main issues: 1) limited transmission and distribution capability; 2) the need for backup generation and storage; 3) the lack of integration in the energy sector between Ontario and neighbouring jurisdictions. The government should increase its commitment on transmission accessibility, particularly in the remote areas of Ontario. The use of short-term distributed storage systems should be encouraged to improve the integration of RES. The government should investigate options to foster greater cooperation in the power sectors between Ontario, Quebec and Manitoba, in order to take advantage of existing hydropower storage capacity in the neighbouring jurisdictions.

8. Support public outreach, education and provision of information on RE issues;

The lack of public awareness and understanding of issues surrounding RE is a major barrier to renewables in the province of Ontario. There is a significant amount of misinformation about renewables promoted by vested interest groups. The public has an incomplete picture of the financial aspects of renewables and their contribution to the cost of electricity in Ontario leading to a perception that paying for renewables is unfair and is going to bankrupt the province. The government should support public outreach, education and provision of information on RE issues. Politicians should explain the economic and environmental benefits of RE solutions to the public in a transparent way. Stronger links should be made between renewables and climate change, the economic upside of participating in the smart grid economy, realization of equity and community benefits. Better understanding and awareness can help improve the reputation of renewables and create stronger public support for this energy option.

4.11.1 Reflecting on Key Interview Points

A complete and thorough analysis of all the statements provided by the experts is beyond the scope of this paper. Instead, in this section, I offer my personal reflections on the most salient themes discussed by the experts interviewed as part of my research. It is important to note that a sample of 13 experts is very small and makes it impossible to generalize the findings of this study to a wider population of experts. Their opinions, nevertheless, provide an overview of views that are quite widespread in Ontario.

Firstly, experts' perceptions of political will and ambition raise a number of interesting observations. Many study participants did not generally consider lack of political will to be barrier to RES in Ontario. Instead, the experts highlighted the fact that it was existing political will what created the push for renewables in the province and maintained the commitment to RES in the current Long-term Energy Plan (LTEP), 2013. Ontario's current RE framework and achievements are indeed remarkable when compared to previous accomplishments. The province is also credited with implementing the most advanced RE policies by North American standards. However, when compared to leaders in the field, such as Germany and Denmark, Ontario's level of ambition is quite modest. In many respects, the government's RE policies fall short of its aspirations to become a leader in RES (see Appendix A). Nevertheless, the experts' perspectives highlight the importance of appreciating the economic and practical realities of Ontario's electricity system and the socio-political context that has fostered the development of Ontario RE policies. This notion can help make policy frameworks more realistic regarding the level of ambition that the Ontario government should aim for to achieve more success in widespread RES development.

Secondly, several interesting observations can be made around the experts' views on the role of nuclear plants in Ontario's energy system. Many experts did not perceive nuclear as a barrier to RES development in Ontario. In fact, some interviewees viewed nuclear and RE as complementary components of a balanced energy mix. A few people considered advanced thorium reactors or nuclear fusion to be attractive potential energy solutions in the long-term. While less damaging, these technologies would still be complex centralized power sources likely requiring large infrastructure and investment. Little attention was given to the value of an alternative option, which is a more democratic decentralized renewable power grid. The centralized system thinking and nuclear mind-set among some of the experts highlights the pervasiveness of such traditional attitudes in the province.

Short-term thinking about energy issues is another notable observation that I feel merits to be highlighted here. In discussing their perspectives on the nuclear question, many experts have focused on short-term concerns (such as the economic aspects of nuclear refurbishment). Few interviewees touched on longer-term implications, such as the technological "lock-in" that refurbishments will cause in Ontario. The tendency to think short-term about the energy system implies that other important opportunities to accelerate the transition towards a more environmentally sustainable and democratic energy future might be missed. It should be noted that several interviewees did highlight the need for a long-term vision for the energy sector and called for a new approach to energy policy-making, but provided little detail on what this approach should entail and what would be the government's role in implementing that type of vision. One approach that I find instructive in this regard is the transition management – a proactive strategy for tackling complex policy problems, such as energy. Transition management is based on long-term energy visions which function as a framework for formulating short-term objectives and evaluating existing policies (Rotmans *et al*., 2001). The key elements of this approach are as follows: long-term thinking (generally 50-100 years) as a framework for shaping short-term policy; thinking in terms of more than one domain and different actors at different scale levels; a special learning philosophy; fostering system innovation alongside system improvement; keeping a large number of options open. Transition management aims to achieve structural change by the gradual transformation of an existing system. This strategy implies refraining from large-scale investment in improvement options which only fit into the existing system, stimulating a `lock-in' situation as a result. A vision of a better future is crucial for realizing an effective transition. The government's role in in transition management is to assist in formulating a vision of energy development, mobilize other actors, stimulate learning processes about possible solutions; and contain negative effects (Rotmans *et al*., 2001). An examination of how the transition management strategy can be used in relation to energy policy in Ontario is a key suggestion for further research.

Chapter Five: Summary, Conclusions and Recommendations

The recent decades have witnessed a renewed interest in the use of modern, small-scale, low-impact renewable energy technologies RETs for electricity production. The primary motivations for the promotion of RE have been energy security, socio-economic development opportunities and the desire to address climate change and other environmental impacts associated with the use of conventional fuels.

Ontario is rich in RE resources that can be used to produce electricity. Expanding the share of RES in its electricity-supply mix has recently become the cornerstone of Ontario's energy policy. With the passage of GEGEA (2009), the provincial government has introduced a comprehensive set of RE support measures to foster the development of renewables and achieve a number of other policy goals.

As Ontario proceeds on its journey towards a greener economy and a more sustainable future, it is vital that it puts in place a robust support framework that can ensure successful RE implementation. This study aimed to contribute to discussions on how this can be achieved. The specific purpose of this investigation was to examine Ontario's current RE legal and policy support measures for renewable power and to develop policy recommendations for improving this framework, based on lessons learned in the leading RE jurisdictions of Germany and Denmark, and insights from RE experts. Pioneers in the field of renewables, Germany and Denmark have had over two decades of experience with RE policy. The RE support initiatives in these jurisdictions have been continuously refined and supplemented by additional legislative measures and policy actions, evolving into a comprehensive legal and regulatory support framework. Experiences from these countries can provide important lessons for effective RE policy implementation in Ontario.

The comparison of RE policies in Germany, Denmark and Ontario (see Appendix A) has revealed that Ontario's current support framework has a number of elements of successful programs. In particular, the Ontario's FIT program and the supporting regulations established by the GEGEA (2009) have proved to be effective at establishing very favourable conditions for RE investment through provisions such as: favourable feed-in tariffs; long-term contracts; streamlined single permitting process and incentives for community power development. Efforts have been made to foster domestic RE manufacturing capacity, stimulate clean-tech innovation and foster community power development. Ontario has also begun addressing challenges related to RE integration into the grid, such as transmission expansion and power system flexibility. There are, however, opportunities for further improvement in key RE policy areas. The specific lessons that leaders in the field Germany and Denmark provide for Ontario are present below.

In addition to comparing RE support policies in Germany, Denmark and Ontario, qualitative expert interviews were conducted in this study to elicit the perspectives of experts on the performance of Ontario's current RE programs, the various barriers to RE implementation and potential policy solutions to address these barriers. In line with the findings of policy evaluation exercise, the introduction of the GEGEA and the FIT program were generally considered a positive development in Ontario's RE policy. The experts identified a range of problems around renewables issue in Ontario, including a boom-bust cycle of RE development, huge amount of local community and municipal opposition to RE, and a perception that the RE policy costs are excessive. Some of these problems were partially attributed to shortcomings in the design of the RE legislation and the FIT and the ham-handed way that these measures have been implemented. In addition, the experts identified a number of wider problems and issues in the provincial energy sector, which have contributed to the failures in Ontario's RE policy. These include lack of long-term energy planning, organizational inertia about adopting change in the electricity sector; infrastructure constrains; and lack of public understanding and awareness of RE issues. The experts provided a range of suggestions for how Ontario's RE policy framework can be improved.

Drawing on lessons from the leading RE jurisdictions of Germany and Denmark, and insights from RE experts, a number of recommendations for improving Ontario's RE legal and policy framework have been developed. These are as follows:

1. Give higher priority to renewables in the energy planning and set RE targets with a longer time horizon (2050) and a step-wise progression every decade;

2. Implement a RE policy framework that can reconcile multiple energy objectives and consider whether a wider range of policy goals can be explicitly targeted in the FIT policy. The FIT design elements and regulations supporting the program should be better tailored to achieve policy priorities. At the same time, the complexity of the framework and the transaction costs should be minimized;

3. Routinely and effectively inform RE policy-making by the available evidence-based best practices on RE policy design and implementation;

4. Improve public engagement opportunities in the RE development process and enhance the direct financial benefits associated with RE projects for local communities;

5. Support Ontario's entrepreneurs and innovative companies through long-lived, well-financed and better targeted support for RE R&D&D, expanding financing options for RE projects and fostering opportunities to gain international competitive advantage in the RE sector;

6. Make a concentrated effort to change the current organizational culture of the electricity sector to create a culture that is supportive of renewable energy technologies;

7. Depoliticize the energy sector and adopt a long-term perspective and a new more comprehensive approach to energy planning, whereby renewable policy is viewed as a long-term investment on a new post-carbon vision and a broader range of issues is considered, not just renewables. Transition management strategy can be one approach to help Ontario accelerate the transition towards a more environmentally sustainable and democratic energy future;

8. Initiate a comprehensive, open and honest discussion about the costs and benefits of nuclear refurbishment in Ontario and the long-term implications of continuing with the current nuclear path;

9. Strengthen measures to improve integration of RES into the grid, particularly through expansion and modernization of necessary transmission; the use of short-term distributed storage; and greater integration with the power sectors of adjoining provinces;

10. Take on a leadership role and foster greater collaboration in climate change and RE field at the national level to start build the consensus necessary for the national energy policy development;

11. Support public outreach, education and provision of transparent, evidence-based information on RE issues.

Although these recommendations require additional research to ensure their validity, they are provided here as concluding comments aimed at starting a discussion on how to improve Ontario's renewable energy efforts and as indication of the type of analysis that other jurisdictions require to foster to increase their use of renewable energy.

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Appendices

Appendix A: Comparing Ontario's Renewable Energy (RE) Framework to Two World Class RE Leaders: Denmark and Germany

A.1 Germany

A.1.1 Background and Current Situation in Renewables Sector

Germany is the biggest European Union (EU) member state and Europe's largest economy and the largest consumer and producer of electricity (Beveridge and Kern, 2013). Germany's early interest in RE has been driven by security considerations following the oil crises of the 1970s and nation's disillusionment with nuclear power in the wake of Chernobyl nuclear accident of 1986 (Mendonça, 2007). Since the 1990s, RE deployment became a key element in the government's package of measures aiming to deliver national and international commitments on climate change. Over the years, the German government has launched a range of programs and policy measures to support RE. These initiatives have been continuously refined and supplemented by additional legislative measures and policy actions, evolving into a comprehensive legal and regulatory support framework. There are currently over 180 measures and policies supporting German transition towards a renewables based energy system (Jacobs, 2012b). Table 2 contains the key elements of German RE support framework.

Germany's RE policy efforts proved to be very successful in facilitating rapid RE deployment over the last few decades. Despite not very favourable natural conditions, Germany is widely considered as a frontrunner nation in renewable electricity (Zane *et al*., 2012). The nation started from a very low share of only 3.1 % of RES-E in 1990 and reached an impressive 20.3% of RES-E by 2011 (BMU, 2012; Zane *et al*., 2012). RE Deployment was particularly rapid from 2000 onwards, which has been attributed to favourable support conditions established by the Renewable Energy Sources Act (EEG) (and amendments) (Mendonça *et al*., 2010). Installed capacity for renewables-based electricity generation has increased from 24,007 MW in 2004 to 65,698 in 2011, a staggering increase of 174 % (BMU, 2012). The number of jobs in the RE sector has increased by 138% over the same period, reaching 381,600 direct and indirect jobs in 2011 (O'Sullivan *et al.*, 2012). German RE industry has provided a range of other important economic benefits, including avoided environmental damages worth EUR 8.0 billion; local added value of EUR 7.5 billion; energy-import savings (electricity) of EUR 2.9 billion, and a decline in electricity prices amounting to EUR 2.8 billion as a result of the so-called "merit order effect", i.e. the price decreasing effects of RE deployment on electricity prices (Morris, 2012). Germany has been a major contributor to the growth of the worldwide market for RETs and has maintained a strong position as global manufacturing center for several RETs, notably PV and wind energy technology (Lehr *et al.*, 2008; ISPRE, 2009; REN21, 2014).

The German government maintains its commitment to further development and expansion of RE and has recently launched a comprehensive program for a long-term transformation of energy system. The program contains a wide variety of specific measures to meet Germany's targets to phase out nuclear by 2022 and increase the share of RES in total electricity consumption to at least 80% of by 2050. Despite many challenges that have accompanied RE growth, the state is on track to achieving its ambitious renewable targets, which initially seemed an impossible goal (Hawley, 2012).

Table 2 RE Support Measures in Germany, Denmark and Ontario

General overview (2012)			
	Germany	Denmark	Ontario
Population (million)	81.8	5.6	13.4
GDP (billion CAD)	3858.26	356.59	674.49
Electricity production	618 TWh	30 TWh	152 TWh
Key renewable electricity policy measures (1990–2014)			
	Germany	Denmark	Ontario
RES-E targets	35% by 2020; 50% by 2030; 65% by 2040; 80% by 2050;	50% by 2020 (wind); 100% by 2050;	46% by 2025, of which - 21% hydro; - 15% wind; - 8% solar PV; - 2% bioenergy;
Nuclear & fossil fuels policy	Nuclear phase-out by 2022	Fossil fuels phase-out by 2050	Coal phase-out (2014)
Principal support	Fixed FIT and premium	Fixed FIT and premium	Fixed FIT
	R&D&D: grants; publicly funded laboratories and research institutes, higher education funding;	R&D&D: grants; publicly funded laboratories and research institutes, higher education funding;	R&D&D grants, publicly funded laboratories and research institutes, higher education funding; R&D tax credits;

Additional measures	Industry: investment subsidies; favourable customs duties, export credit assistance, quality certification, financial and tax incentives	Industry: investment subsidies; favourable customs duties, export credit assistance, quality certification, financial and tax incentives	Industry: local content requirements for wind and solar power (FIT 1 and 2), financial incentives
	Proactive participative planning; simplified permitting ("one stop shop")	Proactive participative planning; simplified permitting ("one stop shop")	Streamlined REA process ("one stop shop")
	Local RE ownership & benefits: long-term low-interest loan programs; favourable provisions for cooperatives; tax revenue allocation policy	Local RE ownership & benefits: long-term low-interest loan programs; favourable provisions for cooperatives; turbine ownership sale provisions, compensation for property value loss; subsidies	Local RE ownership and benefits: priority points system,, procurement targets and capacity set asides, price adders (FIT); favourable provisions for cooperatives
	Other: infrastructure upgrades and expansion, eco-tax	Other: infrastructure upgrades and expansion, tendering auctions or an open-door procedure for offshore wind, eco-tax, net-metering	Other: infrastructure upgrades and expansion; net-metering

Sources: IEA and IRENA, 2014a; IEA and IRENA, 2014b; IESO, 2014, Lewis and Wiser, 2005; Lipp, 2007; REN21, 2014; Statistics Canada, 2014; Trading Economics, 2014a; Trading Economics, 2014b; Trading Economics, 2014c; Trading Economics, 2014d; WNA, 2014a; WNA, 2014b

A.1.2 Renewable Policy Success Factors

A.1.2.1 International and European Obligations

Germany's national RE targets, policies and measures have been shaped by its international obligations and EU directives. At the global level, the Kyoto Protocol set binding obligations for industrialized countries to reduce their GHG emissions by 5.2% from 1990 levels in the 2008-2012. As a key player in the Kyoto Protocol, the EU adopted a more ambitious overall reduction target of 8% from 1990 levels (Fernández Fernández *et al*., 2013). RE deployment has become a major part of the EU strategy for meeting its climate change targets. The European Commission (EC) has been actively promoting the deployment of RETs across the union and has become progressively more ambitious in terms of the results desired. In 1997, it set the overall indicative objective of doubling the share of RES in the EU energy sector to 12% by 2010 (EC, 1997). In 2001, the EC set the target for renewable power to account for 21% of total electricity consumption by 2010 (Bruns *et al*., 2011). The RE Directive of 2009 aimed for the first time at legally binding targets for member states. Each member was required to prepare an action plan containing detailed roadmaps of how these targets will be reached (IEA, 2011).

A very influential EU member, Germany played a leadership role in pushing for stronger action on climate change and RE at the EU-level, with a willingness to accept a significant share of the efforts (Runci, 2005). The expectations for Germany as one of the largest and most technologically developed countries within the EU have been great (Runci, 2005). This is reflected in the fact that Germany has accepted some of the most stringent climate and energy targets among the EU member states: a 21% reduction in GHG emissions from 1990 levels by 2012 and an indicative target of 12.5% of electricity production from RES by 2010 (Runci, 2005). Under the 2009 Directive, Germany has taken on a binding national target to increase the share of RE in energy consumption from 5.8% in 2005 to 18% (Fernández Fernández *et al*., 2013) and meet 37% of electricity demand by RES-E in 2020 (IEA and IRENA, 2014b).

EU targets, policies and consultations have been important considerations for Germany in drafting the domestic laws, setting national RE targets and making other RE policy decisions (Reiche and Bechberger, 2004; Runci, 2005; Jacobs, 2012a). For example, the inclusion of offshore wind and geothermal energy technologies (in combination with increased FIT payment) has become necessary to comply with the targets established by the EU RE directives (Jacobs, 2012a). Compliance with EU climate and energy policies has been important to Germany, not least because it helped enhance Germany's international image as well as the legitimacy and prestige of the European Community (Runci, 2005). The nation has made impressive progress towards its RE targets and has surpassed them several years in advance. For example, Germany achieved its 2010 target of 12.5% RES-E in the electricity supply three years early in 2007 (14.7%) (IEA, 2008b). Germany has also been the only industrialized country (aside from the UK) to have surpassed its Kyoto target. Its emissions had gone down by 25.5% below the 1990 levels by 2012 (Morris, 2013). Although this achievement has been partly attributed to the closure of industrial plants in former East Germany, it contributed to Germany's image as a pacesetter in addressing climate change through incentives to promote RES (Bruns *et al*., 2011).

A.1.2.2 Nuclear Phase-out

A formal commitment to reduce the use of conventional energy sources has been an important political condition for the success of RE in Germany. Heavy reliance on fossil fuels and nuclear has long been a major barrier to RE development in the country (Laird and Stefes, 2009; Gerke, 2014; Kramm, 2012). Public and political support for conventional energy was undermined by security considerations following the oil crises of the 1970s; deep aversion to nuclear, particularly in the wake of the Chernobyl nuclear accident; and, more recently, growing concerns about climate change (Jacobsson and Lauber, 2006; Laird and Stefes, 2009). These factors contributed to important changes in German energy policy. In 1986, Social Democratic Party passed a resolution to abandon nuclear power (WNA, 2014b). In 2000, the phase-out agreement put a cap on lifetime production by all of the operating reactors, which was equivalent to an average lifetime of 32 years (WNA, 2014b). The nuclear phase-out plan was legislated in 2002 (NEA, 2013). A frontrunner on climate change policy, Germany set a target of 25% reduction in CO2 emissions by 2005 (relative to 1987 levels) in 1990 (Watanabe, 2011). The adoption of targets and timetables for a nuclear phase-out and GHG reduction put constraints on Germany's future energy options. In the light of these constraints, the adoption of policies and measures promoting RES became a necessity (Runci, 2005).

An exit from nuclear power had been an official German policy until 2010, when the government made a decision to extend the lifespan of Germany's 17 nuclear plants by an average of 12 years into the mid-2030 (Buchan, 2012). This nuclear compromise formed a key part of Germany's new energy strategy (Energy Concept), which considered nuclear a "bridging technology" on Germany's path towards the age of renewables (BMUB, 2010; Buchan, 2012). Thus, although the lifespan of nuclear was extended, it remained a temporary solution and there was a clear direction for energy policy towards nuclear phase-out (Glaser, 2011).

Germany reconsidered the role of nuclear in its energy mix following the Fukushima Daiichi nuclear accident in Japan in 2011. All nuclear power plants were subjected to a comprehensive safety and ethical review (Lang, 2011c). Based on the findings of these reviews, the government announced a plan to shut all of its nuclear reactors between 2015 and 2022, with a specified date for each plant (Jacobs, 2012b). A cross party consensus on a nuclear phase-out contributed to the adoption of a second package of measures to accelerate Germany's transition to a renewables-based energy system (Jacobs, 2012b; Buchan, 2012).

Germany's nuclear decision has been controversial, causing mixed responses worldwide (Kramm, 2012). Germany is the first country with a position as Europe's industrial powerhouse and a significant nuclear capacity that aims to reduce the use of fossil fuels while abandoning nuclear power and seeking to ensure continued economic growth (Beveridge and Kern, 2013). Some experts argue that this phase-out agreement was not an *ad hoc* decision or unique overreaction to the Fukushima nuclear disaster (Jacobs, 2012b; Kramm, 2012). Rather, it reflects long-lasting scepticism about the safety and controllability of nuclear power plants (Kramm, 2012). Although special national and historical circumstances that allowed Germany to achieve this decision might be unique to Germany (Kramm, 2012; Beveridge and Kern, 2013), other jurisdictions can draw valuable lessons from Germany's experience. A formal decision to phase out nuclear power was vital to Germany's stronger commitment to RES and policy efforts to scale up the use of renewables.

A.1.2.3 Renewables Prioritization in Policy Documents and RE Targets

RE prioritization in official energy policy documents has been another important condition to the successful RE development in Germany (Meyer, 2007). RE policy in Germany began in the 1974 and consisted almost exclusively of limited spending on R&D for over a decade

(Lauber and Mez, 2004). Over time, the government's objectives for RE development became progressively more ambitious, which is reflected in the choice of long-term quantitative RE targets and the range of legislation, policies and programs implemented to promote RES. In the late 1980s and early 1990s, a number of measures were adopted to create markets for RETs and establish favourable conditions for RE investors. The Renewable Energy Sources Act (EEG) of 2000 (and amendments) has become the central piece of Germany's energy legislation and the most important RES promotion measure (Bechberger and Reiche, 2004; Lauber and Mez, 2004). The EEG, 2000 aimed to contribute to the EU goal of 12.5% of RES-E by 2010 as well as more ambitious and long-term national target of 50% renewable power by 2050, with the goal of 20% by 2020 added in 2004 (Bechberger and Reiche, 2004; Lauber and Mez, 2004). In many respects, the EEG improved the legal and economic conditions for RE generators, driving rapid deployment of RES (see Section 4.1.2.5).

Further progress in the field of RE policy came with the package of initiatives adopted under the Integrated Climate Change and Energy Programme 2007/8. The document identified the expansion of RES as one of the principal means to achieve Germany's climate targets, setting the goal to triple the share of RES in primary energy consumption to 20% by 2020, especially through subsidising offshore wind (IEA and IRENA, 2014b). The revised EEG of 2009 set a new a target to increase the share of RES in electricity supply to at least 30% by 2020 (Fulton *et al*., 2012).

In 2010, Germany made a fundamental policy decision to move towards a sustainable energy supply with the launch of a new long-term comprehensive energy strategy known as the Energy Concept (Buchan, 2012; IEA, 2013). The Concept established RE as the cornerstone of Germany's future energy supply, setting out ambitious RE targets with a long time horizon and a step-wise progression every decade (BMUB, 2010; IEA, 2013). More specifically, the document set the minimum renewable share requirements to at least 35% of gross electricity consumption by 2020, 50% by 2030, 65% by 2040, and 80% by 2050 (BMWi and BMU, 2010). Renewables deployment will help Germany achieve its equally ambitious climate protection targets of 80% - 95% cut in GHG emissions by 2050 (relative to 1990 levels) (BMWi and BMU, 2010). As the first step towards the implementation of Energy Concept, the government adopted an immediate action program consisting of ten especially urgent measures, focusing on areas such as offshore wind power development and grid expansion (Lang, 2010a).

German energy policy took another important turn in 2011, when the government made a bold decision to phase out nuclear power and move more rapidly towards a low-carbon energy system (Jacobs, 2012b). The government introduced a legislative package, the so-called Energy Package, which supplements the measures of the Energy Concept and completes what is known as *Energiewende*, i.e. the transformation of Germany's energy system from a fossil and nuclear-based energy system to one based on RE and energy efficiency (Jacobs, 2012b; Beveridge and Kern, 2013). RES deployment is a central component of the *Energiewende*, which encompassed a series of bold RE measures, focusing on areas such as grid modernization; opportunities for RE use in cities and municipalities; and funding the energy transition (Buchan, 2012; Jacobs, 2012b; Kramm, 2012). Most recently, the amended EEG 2014 established the following legally binding corridors for RE expansion: 40% to 45% of the RES-E share in the gross electricity consumption by 2025; 55% to 60% by 2035 and confirmed the long-term target of 80% by 2050 (Lang and Mutschler, 2014).

It remains to be seen whether Germany's energy transition will be a successful example that will inspire other nations (Kramm, 2012; Beveridge and Kern, 2013). The circumstances which led to *Energiewende* are uniquely German. The implementation of Germany's energy transition presents a range of technological, environmental, social, economic and political challenges (Buchan, 2012; Spiegel, 2013a; Spiegel, 2013b; Beveridge and Kern, 2013). However, many of the challenges facing Germany in its transition to a low-carbon economy can be seen as universal and some elements of German solutions can be transferred to other countries (Kramm, 2012). One important lesson that can be learned from German experiences is that nations which institute an important place for renewables in their national energy policies and adopt ambitious RE targets are likely to achieve greater success in RE implementation (ECOTEC and Mourelatou, 2001; Meyer, 2007). National policies prioritizing RES endorse support for establishing favourable conditions for RE development, such as frameworks for access to energy markets, grid access and price support mechanisms (ECOTEC and Mourelatou, 2001). RE targets play an important role as a sign of government's orientation and willingness to implement RES, triggering the adoption of appropriately ambitious RE support policies and measures, which deliver impressive progress on the targets (Meyer, 2007).

A.1.2.4 Research, Development and Demonstration

Public support for research, development and demonstration (R&D&D) of RETs has been another key contributory factor towards Germany's success in RE development. The formation of publicly funded RE R&D programme began in the 1970s, within the context of "Energy research framework program" (Bruns *et al*., 2011). Early R&D (1980s – 1990s) focused on the development of wind and solar technologies and the exploration of different related issues (Bechberger and Reiche 2004; Klaassen *et al*., 2005; Jacobsson and Lauber, 2006). The RE R&D

funds were raised to a significant level—not as significant per capita as in some other countries but larger in total amount (Jacobsson and Lauber 2006). This funding was sufficient to attract the attention of universities, research institutes, and start-up companies, fostering opportunities for experimentation and learning and the creation of research networks (Jacobsson and Lauber, 2006; Laird and Stefes 2009). A set of demonstration programmes became a part of the R&D policy in the 1980s, enhancing the knowledge base with respect to application knowledge (Jacobsson and Lauber, 2006). Small niche markets were formed and a set of firms began the production of RETs, enabling the subsequent diffusion of these technologies. Throughout the 1990s and in subsequent years, public support for RE R&D&D continued although the government's financial commitment to RE R&D has been volatile (Witte, 2009).

Support for R&D&D remains a key part of government's efforts to achieve Germany's current RE goals. This is evident from Germany's 6th Energy Research Programme (2011-2020), which identifies RES as one of the areas of major strategic importance for the transformation of Germany's energy supply (BMWi, 2011). The government's budget for energy research reflects its commitment in this regard. Around EUR 1.6 billion was allocated for R&D specifically in the field of RE for the period 2010 – 2014 (BMWi, 2011). The R&D&D funds are managed by dedicated offices on behalf of the respective ministries (ERKC, 2014b). The Agency for Renewable Resources (FNR) is a central agency coordinating R&D&D projects in the field of RES (ERKC, 2014b). Good co-operation exists among academic and industrial groups (ISPRE, 2009). The activities of the 6th Energy Research Programme are supplemented by measures of several nationally focused research institutions. For example, Fraunhofer-Gesellschaft is a very strong applied research organization with more than 67 research units across the country (ERKC, 2014b; Fraunhofer-Gesellschaft, 2014). The networks of institutions such as Fraunhofer-

Gesellschaft include institutes focused specifically on wind, solar and bioenergy systems (IRENA, 2013b). In addition, there are institutes with a strong regional focus forming a part of an industry cluster (IRENA, 2013b). Continuous public support for RE R&D&D helped Germany maintain its competitive advantage in RETs; become major exporter of these technologies; and ensure an appropriate supply of qualified workers (Cedefop, 2010). German case study thus highlights the importance of long-term, well-funded and targeted support for RE R&D&D to encourage innovation and gain competitive advantage in RE-related technologies.

Patent data is one comprehensive quantitative metric that reflects Germany's strong performance in developing RETs. A patent represents a successful new invention, and therefore the volume of patents relating to a given technology is a reasonable proxy for research outcomes (Cosman, 2012). The Clean Energy Patent Growth Index (CEPGI), which measures all patents in the clean energy field registered in the U.S. since 2002, shows that patent applicants from Germany accounted for 8% (227) of all U.S. patents in the clean energy field as of 2012, putting Germany in third place by measure of its clean energy inventions between 2002-2012 (HRFM, 2013). Germany was in second spot with 17% of all wind patents and third place with 6% of all solar patents registered in the U.S over this period.

A.1.2.5 Feed-in Tariffs and Supporting Regulations

The rapid deployment of RES in Germany has been attributed in large part to the passage of progressive and targeted electricity feed-in laws (Runci, 2005). The Electricity Feed-in Law of 1990 established German's first FIT, putting an obligation on utilities to connect and purchase RES-E from eligible producers at fixed rates (feed-in tariffs) on a priority basis (Held *et al.*, 2010; IRENA and GWEC, 2013). The law kick-started the growth of wind and hydropower sectors (Mendonça *et al*., 2010; IEA and IRENA, 2014b). In 2000, the law was replaced by the Renewable Energy Sources Act (EEG), which further improved conditions for RE projects. FITs were calculated based on the actual generation costs of each particular technology, which improved tariff differentiation and ensured that all technologies received sufficiently high payments to encourage investment (Mendonça *et al*., 2010).

Since 2000, the EEG was amended a number of times and increased in complexity but the basic structure of FIT was maintained. The amendments aimed to adapt the FIT to new policy developments, technological advancements and market conditions (Held *et al*., 2010). One of the more sophisticated elements introduced to the German FIT was tariff degression, which enables FIT rates to be reduced over time. This allowed incorporating technological learning into the policy, reducing the risk of overcompensation (Klein *et al*., 2010; Couture *et al*., 2010). Provisions were made for the regular review of FITs (Mendonça *et al*., 2010). In 2004, the revised law adjusted the tariffs to better reflect the cost situation of RETs. For example, wind tariffs for installations at locations with very high yield were reduced and PV tariffs were further differentiated depending on the application, i.e. roof-top and wall-mounted (Held *et al*., 2010). Bonus payments were introduced to encourage certain technologies and applications, such as wind turbine repowering; utilization of highly efficient conversion technologies; and production of biogas (Fulton *et al*., 2012). Overall, the German FIT regime remained stable and transparent between 2000 and 2009, providing certainty to investors (Fulton *et al*., 2012).

The next major EEG revision led to the EEG 2012. The revisions aim to contain the costs of the scheme to ratepayers, improve grid integration of RES and enhance the global competitiveness of the sector. For example, the revised law reduced payments and accelerated degression schedules for solar PV and onshore wind (Fulton *et al*., 2012). In addition, the law introduced market premium for producers who directly sell RES-E on the spot market, and the flexibility premium if plants can be configured to be dispatchable during the period of peak demand (Fulton *et al.*, 2012). To accelerate the deployment of offshore wind, "sprinter premium" was added to the initial tariff and the start of tariff degression was delayed until 2018 for this technology (IRENA and GWEC, 2013). Additional changes were introduced to the PV portion of the EEG 2012, including the 52 GW capacity threshold and limits on the amount of electricity that PV generators can export (Fulton *et al*., 2012). According to Fulton *et al.* (2012), German FIT has been evolving towards a "grid parity" future where policy is more flexible and may offer less transparency, longevity and certainty to investors.

The latest amendments to the EEG were introduced in 2014. The amended law maintained the basic principles of the EEG, namely priority purchase obligation and grid access, statutory feed-in compensation, and a long-term guaranteed price for RE developers. An important development was the introduction of specific growth corridor targets for different technologies and "breathing caps" to ensure compliance (Lang and Mutschler, 2014). The breathing cap concept adjusts the feed-in tariffs depending on the extent to which newly installed capacity is in line with the corridors (Lang and Mutschler, 2014). The policy of direct marketing of RES-E, whereby the operator sells RES-E directly and receives a market premium from the grid operator on top of the market price, became compulsory (WFW, 2014; Lang and Mutschler, 2014). Small RE plants with a capacity under 500 kW are excepted from the direct marketing rule, i.e. they will continue to receive FIT (Lang and Mutschler, 2014), although the relevant capacity threshold will gradually be lowered to encourage market integration of smaller plants (WFW, 2014). Starting in 2017, the financial support for all forms of renewable energy plants will be determined by means of competitive tendering (WFW, 2014; Lang and Mutschler, 2014). According to WFW, 2014, while EEG 2014 still implies a political commitment to ambitious energy transition, it reflects government's intention to make RE support mechanisms more complex, market‐oriented and cost-effective (WFW, 2014:8).

Long-established and progressive electricity feed-in laws have been the main driving force behind RE expansion in Germany. German FIT is regarded globally as a very successful policy instrument to deploy renewables and is credited with driving the development of one of the world's largest RE markets (Farrell, 2009). German experience with FIT policy provides a number of valuable lessons for other countries in how to design successful FIT regimes. It shows that FIT payments need to be sufficiently attractive to stimulate substantial RE development. Long-term, stable support scheme provides certainty and security for investors. However, flexibility is needed in the system to respond to new technological and price developments.

A.1.2.6 Locational Planning and Permitting Procedures

Germany amended its planning law and other relevant regulations to improve conditions for the authorisation of RE projects. In 1997, wind and hydropower plants were included to the catalogue of privileged projects, i.e. their development is generally permissible in the outlying areas, provided there are no conflicting interests, such as nature conservation (Bechberger and Reiche 2004; Bowyer *et al*., 2009; Gutermuth, 2009; IEA and IRENA, 2014b). These provisions were particularly favourable for wind power plants, which were normally prohibited in building zones (Gutermuth, 2009). In addition, Germany amended regional planning legislation to include a new zoning category, the "appropriate area" for RE projects in the planning legislation, which created the basis for determining areas eligible for the sitting of RE projects (Bruns *et al*., 2011). Relevant local authorities were allowed to counter the general privilege of RE projects by applying proactive locational planning. In particular, relevant authorities have the right to determine priority areas for wind farms in regional plans or delineate preference zones in land use plans. In these areas, development is considered "privileged" and proactively supported. In addition, local authorities can determine areas where development may be possible but in a restricted way (based on clear criteria) as well as complete exclusion zones for onshore wind. This approach allows local authorities to decide for themselves where to build wind power installations and guides potential applicants away from unsuitable areas (Bechberger and Reiche 2004; Bowyer *et al*., 2009). In 2004, the existing privileges were extended to biogas plants with a capacity of up to 500 kW (Bruns *et al*., 2011). The new legislative provisions significantly accelerated the procedures for granting building permits for RE projects while helping ensure a balance between the desire of the public to have RE and the interest of protecting the local landscape (Gutermuth, 2009). German proactive planning approach contributed to successful RE expansion while helping avoid uncontrolled growth of RE projects.

As the majority of the best RE resources have been developed, further policy measures were introduced to improve the site designation process for the development of RES. The "Government-Länder Initiative on Wind Energy" aims to improve cooperation between federal government, Länder (subordinate states) and local authorities in search for additional onshore wind resources (BMWi and BMU, 2010; Cochran *et al*., 2012). The initiative includes an analysis of wind energy potential and is an important tool in the ongoing process of designating suitable new sites for onshore wind.

Germany has established clear and inclusive permitting process for RE projects, which proved to be highly effective in most cases (ECORYS, 2010). For large installations, the authorisation procedure is rather complex but it has the so-called “concentration effect”, i.e. it includes most necessary authorizations (ECORYS, 2010). One central agency is assigned with the task of coordinating the authorisation procedures and providing assistance to the applicants (ECORYS, 2010; Müller *et al.*, 2011). This so-called one-stop shopping approach makes the authorization procedure very effective (ECORYS, 2010). There are opportunities for the public to file objections against the project within a defined period of time (ECORYS, 2010). The permit authorities have no discretionary power in the authorization process, which means that the permission is granted if the requirements for the building permission are met. The German judicial system provides for a broad range of legal remedies and independent courts in case of rejection (ECORYS, 2010). No authorisation is required for many small systems, such as most of roof top PV systems (ECORYS, 2010), which has given way to widespread adoption of solar energy (Jackson, 2012). The efficiency of administrative procedures in Germany is ensured through the application of several principles, such as the principle of expedition of proceedings, which states that “administrative proceedings should take place swift and without wilful delay” (ECORYS, 2010:33).

Germany has been recognized as a global leader when it comes to implementing a positive framework in terms of spatial planning and permitting procedures for RE projects (ECORYS, 2010). It has been effective at increasing legal certainty for the project developers, reducing administrative delays and facilitating renewables growth that is sensitive to environmental and social considerations (Bowyer *et al*., 2009).

A.1.2.7 Local Ownership and Benefits

The RE situation in Germany is characterized by high levels of community ownership of RE plants, which has been identified as one of the key contributory factors towards achieving success in RE deployment (Bowyer *et al*., 2009). There is a broad array of different ownership and participation models. Two citizen ownership models have proved particularly successful and spread out considerably: citizen owned wind farms (Bürgerwindparks) and citizen power plants organized as cooperatives (Schreuer, 2012). Several policy drivers have contributed to the active local engagement in and ownership of RE projects in Germany. The FIT law has been the most important driver (Schreuer, 2012). Although it has not been targeted specifically at encouraging local RE ownership, the law provided financial security that is crucial for independent power producers. Germany has also implemented a number of policies specifically aimed at creating favourable framework conditions for citizen-led RE installations (Bolinger, 2001; Schreuer, 2012). Government-owned bank KfW has offered long-term low-interest loan programs for local citizens and organizations seeking to invest in RES (KPMG, 2013; KfW, 2014). The law regulating cooperatives was amended in 2006 to established favourable conditions for cooperative development (Janzing, 2012). For example, the number of persons required to found a cooperative was reduced from seven to three people (Janzing, 2012).

Citizen ownership of renewable electricity power plants has made a significant contribution to the diffusion of RETs in Germany. As much as one-third of the nation's wind capacity has been built by associations of local landowners and residents and about 200,000 of Germans own a share of a local wind turbine (Pahl, 2007). Private citizens and farmers own a remarkable 50.7% of total renewable power installed capacity (Trend:research, 2011 as cited by Schreuer, 2012). Although most are active in solar PV, cooperatives exist in the areas of wind power and bioenergy (Janzing, 2012; Schreuer, 2012). Community ownership of wind farms has been particularly successful in the windy coastal regions of northern Germany (IEA Wind, 2013). The ownership of the existing plants by members of local communities increased their interest and support for additional installations when all the areas designated for wind development had been exploited. This suggests that community ownership is likely to be particularly successful in regions where reliable and profitable RE resources are present (IEA Wind, 2013).

Germany has recently implemented additional measures to maximize financial benefits associated with RE projects for local communities. As available land diminished and turbines have grown larger, local ownership of wind projects has become less attractive and opposition to RE has increased (IEA Wind, 2013). In 2009, the government reformed the trade tax law to require at least 70% of the trade tax revenue from wind farms to go to the host community (IEA Wind, 2013). Local municipalities can apply to retain up to 100% of this trade tax, which is now a common practice (BWE, 2012). Trade tax is a considerable source of revenue for the local government. In 2009, wind power provided EUR 213 million in revenue from trade tax and the local share of income tax (BWE, 2012). The tax allocation policy ensures an immediate benefit for the local communities and provides a form of direct compensation for localized nuisances, helping secure social acceptance of larger RE projects among local decision-makers and citizens (IEA Wind, 2013). German case shows that local groups and individuals are more likely to accept RE development when they can access economic benefits associated with these projects (Mendonça *et al*., 2009). High level of local ownership of RE projects has been a crucial driver of social acceptance of RES and an important feature of German RE expansion. RE policies should, thus, incentivize host community ownership of RE installations and maximize other benefits associated with these projects at the local level.

A.1.2.8 RE Industry and Jobs Creation

Fostering local RETs manufacturing industry has been an important RE policy goal in Germany. The government promoted the localization of RETs manufacturing through a combination of direct and indirect measures. Long-term national RE strategy, coupled with favourable FITs has created a stable and sizable market for renewable power utilization, fostering the development of local manufacturing base (Lewis and Wiser, 2005). Policy measures specifically targeting RE industry have included R&D support, financial incentives, favourable customs duties, export credit assistance and quality certification (Lewis and Wiser, 2005). Federal R&D&D program enabled experimentation in RETs and the consequent accumulation of knowledge and competence, which was exploited commercially by German RETs suppliers (Bergek and Jacobsson, 2003). Preference for local content and local manufacturing was encouraged through the use of financial incentives (Lewis and Wiser, 2005). For example, the 100/250 MW Wind Programme (1990-1995), which offered grants for the installation of wind turbines (IEA and IRENA, 2014b), gave preference to German firms. Over two-thirds of the total project funding for this subsidy went to projects using German-built turbines (Bergek and Jacobsson, 2003; Lewis and Wiser, 2005). Another policy that may have preferentially supported German turbine technology was the large-scale provision of loans with below market interest rates (soft loans) for wind energy projects with significant local content (Lewis and Wiser, 2005). Germany put in place customs duties that favored imports of components over fully assembled wind turbines, thus supporting local turbine manufacturing (Lewis and Wiser, 2005). An export market for domestic technologies was created by providing export credit assistance and development aid loans to less developed countries purchasing German RETs (Lewis and Wiser, 2005). In 2002, Germany launched Renewable Energies

Export Initiative, which showcases German's technical expertise in RE field and provides support to local RE businesses that seek to expand into foreign markets (BMWi, n.d.) These strategies have encouraged the dissemination of German technologies around the world.

With the help of its stable and supportive policy mechanisms, Germany has built up a very competitive industry for a number of RETs and developed a first mover advantage in these technologies (Liveris, 2011; Van Mark and Nick-Leptin, 2012; IRENA and GWEC, 2013). The manufacturing boom spurred by RE policies helped recover from the recent global economic recession earlier and more fully than its neighbours in the Euro zone (Liveris, 2011). Germany’s share of global RETs production has declined over time as a result of international competition (Cedefop, 2010; Schultz, 2012; Wrede, 2012). For example, German share of the global solar PV business declined from 69% to 20% over the period 2004-2011 (Neubacher, 2012). Despite this, Germany remains one of the leading producers of RETs with rather high market shares for several RETs. The wind sector in particular makes a major contribution to the German national economy (BWE, 2013; BWE, 2014). Major German-based turbine manufacturers Siemens Wind Power and Enercon captured 17% of the global market for wind power technologies in 2013 (REN21, 2014). The RE sector provided 381,600 (direct and indirect) jobs in 2011, a staggering 138% increase since 2004 (O’Sullivan *et al.,* 2012). More Germans are currently employed in the RE industry than in the coal and nuclear sectors combined (Liveris, 2011). The creation of 500,000 to 600,000 jobs in the RE sector is considered feasible by 2030 (O’Sullivan *et al.*, 2012). The net economic effect of RE promotion in Germany has been debated (see, for example, Blazejczak *et al.,* 2011; Hillebrand *et al.* 2006; Frondel *et al*., 2010; Lehr *et al*., 2012). A comprehensive recent study by Lehr *et al* (2012) records a large positive net employment effect of about 150,000 jobs in the scenario with renewables deployment by 2030.

A.1.2.9 Information, Education and Research on RE Issues

Public awareness and information dissemination have been an important element of German efforts to secure acceptance of RE development, helping ensure the success of RE deployment. Preparing public opinion to accept the impacts of large-scale RE expansion has been an increasingly important issue in Germany, particularly since the government began implementing its ambitious energy transition program (ECORYS, 2010; Cochran *et al*., 2012). Public opposition to RE infrastructure has been on the rise in the country, driven by concerns about the potential impacts of RES expansion on natural values as well as energy costs for ratepayers (Hope, 2013; Spiegel, 2013a; Spiegel, 2013b; Fuchs, 2014).

German public authorities have supported energy agencies and associations that offer technical and practical advice for local politicians, professional target groups and citizens regarding the opportunities for the use of RES (ECOTEC and Mourelatou, 2001; ECORYS, 2010; Vasi, 2011). One example is the "Kommunal-Erneuerbar" of the German Renewable Energies Agency (AAE), a non-profit organisation that works throughout Germany on a cross-party and cross-society basis and is jointly funded by industry and the government (Bridle *et al*., 2013; AEE, 2014). The "Kommunal-Erneuerbar" project targeted primarily local politicians and aimed to share best practice examples from existing communities on how and why to make a transition to renewables (Bridle *et al*., 2013). AEE developed innovative tools, such as Renewable Energy Value Creation Calculator which allowed decision-makers to input local data and create graphs illustrating local economic impacts of RES implementation over time. In addition, AEE published an annual magazine; provided information about energy cooperatives and offered tours to RE powered communities (Bridle *et al*., 2013).

The German government has also supported industry groups that organize awareness raising campaigns targeted at broader public. One example is "Week of the sun" (WdS) – a large annual national solar campaign aimed at raising awareness and educating people about solar energy. In 2011, the WdS conducted around 5,600 events which attracted 400,000 visitors (Knaack, 2012). The initiative involves a range of activities, such as distributing promotional materials and bike tours to solar sites (Knaack, 2012). Another example is an exhibition ship touring at the German coasts of the North and the Baltic Seas. This innovative project aimed at fostering public acceptance of offshore wind energy. A "sailing" exhibition was installed on the museum ship and contained audio-visual presentations and interactive exhibits, such as maps of offshore wind farms and a touch-screen terminal (Albrecht *et al*., 2013). The initiative targeted the residents of coastal regions, schools, decision-makers in politics and industry and the general public. The exhibition was visited by almost 86,000 people in over 40 harbours, helping provide direct experiences with offshore wind, dismantle prejudices of projects, and contribute to a more positive perception of offshore energy (Albrecht *et al*., 2013).

According to a recent study by ECORYS (2010), Germany presents a best practice example in terms of the accessibility of the information on RE support measures and the effectiveness of its public awareness raising campaigns. Relevant information is easily accessible and widely available at national and regional level, both for professional target groups and for citizens. Well-funded and designed public awareness campaigns have been carried out in Germany for many years, with a clearly positive influence on the public opinion (ECORYS, 2010). The German experiences highlight the importance of an early support for innovative information and education initiatives that help improve understanding, acceptance and involvement in RE development by local decision-makers, professional groups and the public.

Germany has also taken deliberate steps to obtain information about social acceptance barriers to RES. Since 2004, the government has funded an on-going research program on broad-based socioeconomic impacts from RES (IEA Wind, 2013). This program has provided insights on the nature of social acceptance challenges, such as public perceptions with respect to new transmission development and the impacts of nuisance variables on human health, helping identify policy options to resolve these challenges (IEA Wind, 2013).

A.1.2.10 Grid Integration

The need to manage large number of smaller geographically dispersed power plants with variable output has created many challenges for Germany’s electricity system (Bayar, 2013; Cochran *et al*., 2012; Zane *et al*., 2012). The nation has been implementing a range of measures to manage these complexities and enable RE integration.

Transmission expansion and modernization has been a key challenge to scaling up RE in Germany (Cochran *et al*., 2012). The government agencies took a number of early measures to accelerate and coordinate the grid upgrades and expansion. In 2005, the German Energy Agency identified the need to build 850 km of new transmission lines and upgrade 400 km of existing lines (Pfaffel *et al*., 2012). A second study (2010) identified the need for 3,600 km of new transmission and reorganization of 5,700 km of existing lines by 2020 (Pfaffel *et al*., 2012). Progress with the grid expansion has been slow due to complicated permitting procedures, public opposition and investment conditions (Lang, 2011a; Zane *et al*., 2012). Germany introduced several new laws and amended a number of others in order to accelerate realization of high-priority grid expansion and modernization projects; shorten planning procedures, consolidate responsibilities for spatial planning; and allow for early public involvement to speed up grid expansion (Kühne, 2012; Cochran *et al*., 2012; Schäfer, 2013). A 10-year Grid Development Plan will be developed and updated annually to identify grid development projects for the next few years. The plan will serve as the basis for a legally binding Federal Requirement Plan for Transmission Networks (Lang, 2011b; Schäfer, 2013). The scenarios for future grid expansion have been published on a special website for consultation and public comments (Lang, 2011b). Several options are considered to increase the transfer capability of the transmission lines in order to reduce visual impact of grid updates (Cochran *et al*., 2012). Under the Energy Concept, the government has begun holistically plan the evolution of its entire energy system, taking into consideration the transmission needs of the whole power sector (Cochran *et al.*, 2012).

Germany implemented a range of measures to increase power system flexibility, enhance energy management system and improve power market design, enhancing its ability to integrate variable RES. For example, EUR 200 million was allocated for R&D in energy storage (ERKC, 2014a). The government has been involved in the development of a virtual power plant concept, which involves a portfolio of dispersed RETs operated as a unified and flexible resource by a central control entity (Cochran *et al*., 2012; Bayar, 2013). The use of advanced forecasting techniques helps reduce the uncertainty in the amount of generation that is available to the system. The curtailment of variable power plants is another system management tool, although it has a "last resort" status in Germany (Cochran *et al*., 2012). RE plants are required to comply with grid integration requirements, collectively known as the "grid code" and provide certain ancillary services to support the power system (Cochran *et al*., 2012).

Germany's ability to integrate RES has been greatly enhanced by its transmission links to the neighbouring markets. Since 2010, Germany has been an integral part of a single electricity market in the Central Western Europe (CWE) region through a process known as “market-coupling”, whereby the corresponding interconnector capacity is traded “implicitly” via the energy trading process (Lang, 2010b). Market consolidation helps reduce the time required to initiate international trades and allows trading RE over larger areas, enabling greater complementarity of variable RE outputs from different sources (Cochran *et al*., 2012).

Significant challenges of integrating RES remain for Germany. The nation has not developed grid infrastructure needed to transfer the large amount of wind power output from northern states to southern Germany where the demand is concentrated. This has led to frequent unplanned power flows through the grids of Germany's neighbours and then back into southern Germany (Morecroft, 2012). These so-called loop flows have threatened the stability of power grids in the neighbouring jurisdictions (Strzelecki, 2012). Germany and the EU are exploring options to improve energy interconnections and boost grid security in the region (Morecroft, 2012; Groebel, 2012; Strzelecki, 2012). Despite these challenges, Germany has made significant strides in optimising the integration of RES in its power grid. German experience highlights the importance of implementing quick, proactive and innovative measures to manage complexities associated with the presence of variable generation.

A.2 Denmark

A.2.1 Background and Current Situation in Renewables Sector

Denmark has pursued an active energy policy since the oil crises of the 1970s (Meyer, 2004). The overall goals of the Danish official energy policy have evolved over time, in response to national and international developments and issues. National energy plans (1976, 1981, 1990,

1996) were developed with energy security, self-sufficiency, efficiency, employment and later GHG reductions as principal objectives (Meyer, 2004; Meyer, 2007; Mendonça *et al.*, 2009). Wind power has become the main element in Danish RE policy, although other RETs have also received public support and achieved market penetration (Meyer, 2004). The uptake of RE in Denmark has been promoted through a broad array of policy initiatives (see Table 2).

Denmark stands out as a lead nation based on its experiences and achievements in the field of wind energy development. The nation is widely regarded as a pioneer in the application of wind power. From 1993 to 2004, Danish wind power capacity grew from 500 MW to over 3,000 MW (Farrell, 2009). It reached 4,163 MW in 2012 (DEA, 2014). Wind power generation accounted for 29.8% of domestic electricity supply in 2012, compared with only 1.9% in 1990 (DEA, 2014). Overall, production of RES-E increased from 6.3 PJ in 1994 to 53.4 PJ in 2014, a staggering increase of 751% (DEA, 2014). In 2012, a total of 43% of Danish electricity was generated with RES; wind and biomass made the greatest contributions (DEA, 2014). Wind industry has emerged as an important sector of Danish economy and a major player on the global market for wind power technologies. In 2012, Danish wind industry sector generated EUR 10.9 billion in revenues, with an export share of total sales exceeding 60% (DWEA, 2013). The sector has made an important contribution in terms of employment, accounting for 28,459 jobs in 2012 (DWEA, 2013).

Denmark has maintained its commitment to further expansion of RE. The nation has recently adopted new ambitious RE targets and substantially strengthened RE initiatives to speed up implementation. The aim is to supply 35% of total energy from renewables and cover 50 % of electricity consumption by wind power, by 2020. The long-term goal is to deliver 100% of electricity from renewables by 2050 (IEA Wind, 2012). Widely recognized for its remarkable past achievements in RE development and its new ambitious commitments, the nation sets an example of leadership, demonstrating ways to realize the potential for long-term sustainable growth through the development of renewable energy (WWF, 2013).

A.2.2 Renewable Policy Success Factors

A.2.2.1 International and European Obligations

RE developments in Denmark have been influenced by its international climate commitments and the obligations set out by the EU directives. As in the case of Germany, Denmark has historically been strongly involved in global environmental issues, promoting international environmental co-operation and environmentally sustainable development (OECD, 1999; OECD, 2007). The country played an influential environmental leadership role in a number of regional and international climate negotiations (Hayden, 2011; IEA, 2011). The nation has been particularly active within the EU context, driving European policies towards sustainable development and influencing EU position in global environmental negotiations (OECD, 1999). Denmark took an ambitious stance on climate change, not only accepting the science of climate change but also recognizing significant opportunities from strong climate policy for important sectors of the domestic economy, such as wind industry (Hayden, 2011). As in the case of Germany, Denmark was willing to commit to significant emission reduction and RE targets. In particular, Denmark agreed to a demanding national target of 21% reduction in GHG emissions from the 1990 levels by 2012 and an indicative target of 29% electricity production from RES by 2010 (IEA, 2011; Reiche and Bechberger 2004). In 2009, the European

RE Directive set a binding target for Denmark to increase the share of RE energy in energy consumption to 30% and meet 52% of electricity demand by RES-E, by 2020 (IRENA and GWEC, 2013; IEA and IRENA, 2014a). Complying with the EU requirements has been important for Denmark's international image. These requirements provided "reference values for RES-development" and have been challenging even for such a forerunner as Denmark (Reiche and Berberger, 2004:845).

A.2.2.2 Nuclear and Fossil Fuels Phase-out

A formal commitment to phase-out conventional energy sources has been an important political condition for the success of RES in Denmark. As in the case of Germany, conventional energy has been the primary rival of renewables in Denmark. High dependence on imported fossil fuels led to significant economic difficulties following the oil crises of the 1970s (Meyer, 2004; DEA, 2012). The government initially responded to these challenges by increasing its support for nuclear energy. Although Denmark had no nuclear power plants at the time, the government announced that it was speeding up nuclear development (Vasi, 2011). However, strong anti-nuclear and alternative energy movement led to the resolution in 1985 that nuclear power plants would not be built in the country (Meyer, 2004). There is currently no move to reverse this situation (WNA, 2014a). The nuclear decision was an important political condition for the success of RES in Denmark. It opened a window of opportunity for policy change in favour of RE, driving the adoption of ambitious RE support policies and measures.

Denmark has recently made a bold commitment to become entirely independent of fossil fuels through the deployment of RETs and energy savings (IEA and IRENA, 2014a)**.** In 2007, the Danish government presented this long-term vision in a comprehensive energy proposal, which set an interim target to reduce the use of fossil fuels by at least 15% by 2025 compared to 2007 (DEA, 2007). In 2012, the government adopted historic "Energy Strategy 2050", which set the ambitious target date of 2050 for achieving the goal of 100% independence from fossil fuels in the national energy mix and set a more demanding interim target of reducing the consumption of oil, gas and coal by 33% between 2009 and 2020 (DEA, 2012). The efforts to procure RE have been broadened and ramped up to help achieve the ambitious goal of fossil fuel-free economy. Denmark's experiences highlight the importance of a formal political commitment to phase-out fossil fuels for stronger action on RE. Such decision puts constrains on future energy options. In the light of these constraints, the adoption of policies spurring the diffusion of RETs becomes a necessity.

A.2.2.3 Renewables Prioritization in Policy Documents and RE Targets

RE prioritization in official energy policy documents has been another important condition to successful RE implementation in Denmark (Meyer, 2007). The development of Danish RE policy began in the 1970s, although government's support for renewables at the political level was not widespread until the 1990s, when sustainable energy system and GHG emission reductions became the principle objectives of Danish official energy policy (Meyer, 2004). The energy plans of 1990 and 1996 strongly promoted the development of RES, progressively raising the RE targets (Meyer, 2004). The plans set specific targets for RES to provide 12–14% of total energy consumption by 2005, and 35% by 2030 (IRENA and GWEC, 2013). Wind power was given an important role in the plans as reflected in the following technology-specific targets:

1,500 MW of installed capacity by 2005 and 5,500 MW by 2030, corresponding to 10% and up to 50% of total electricity consumption, respectively (Meyer, 2004). The 2030 target included 4,000 MW of offshore wind capacity (Meyer, 2004). Quite ambitious at the time, the 2005 target was exceeded by a factor of two by 2003, with installed wind power capacity of around 3,000 MW (Meyer, 2004).

In the early 2000s, the new conservative government initiated a shift towards a more market-oriented support system for RE and cut public funding for RES (Meyer, 2004; Mayer, 2007). According to Meyer (2004), these developments indicate that RE was given lower priority while short-term economic considerations had higher priority. The government's market-oriented energy policy created uncertainty for private investors and RE development stagnated (Meyer, 2004; IRENA and GWEC, 2013).

In recent years, the Danish government has released a number of policy documents which reflect its long-term commitment towards reviving domestic deployment of RETs. With a view to realizing its long-term vision of a 100% renewably-powered nation, the government set the target in its energy proposal of 2007 to increase the use of RE to at least 30% of energy consumption, by 2025 (DEA, 2007). Specific initiatives in the electricity sector include doubling publicly funded R&D&D of energy technology; improving onshore wind turbine planning; elaborating an infrastructure plan for offshore wind; and improving exploitation of energy from waste (DEA, 2007; IEA and IRENA, 2014a). Danish RE policy continued to develop with the Energy Agreement for 2008-2011, which set the short-term target for renewables to cover 20% of Denmark's energy consumption by 2011 (EREC, 2009; Sperling *et al*., 2009). The historic energy agreement of 2012 set new and more aggressive targets to supply 35% of total energy from renewables and cover 50 % of electricity consumption by wind power, by 2020 (DEA, 2012). RE policies and measures were strengthened and expanded, including tenders for 1,500 MW of offshore wind power; new planning tools for onshore wind; and incentives for wind turbine repowering (DEA, 2012; DMCEB, 2012).

Danish experiences highlight the importance of government's commitment towards developing RE and the prioritization of RE in the official policy documents as a reflection of this commitment. Long-term, formal commitment towards RES contributes to establishing stable conditions for RE development by underpinning investor incentive and security (Lipp, 2007). Demanding RE targets trigger sufficiently ambitious RE support policies and measures, helping deliver impressive results (Lipp, 2007).

A.2.2.4 Research, Development and Demonstration

Consistent and prolonged public support for RE research, development and demonstration (R&D&D) has been an important contributing factor towards Denmark's success in wind power development, playing a critical role in the advancement of innovative technologies and the development of local manufacturing base (Mitchell *et al*., 2011; NER, 2012).

A notable feature of Danish early RE R&D is its 'safe' technical path, whereby turbine size was gradually increased based on improvements of the same basic design (Meyer, 2004). Market credibility was established through machine-testing program and a formal certification procedure at Risø National Laboratory. This approach prevented sub-standard technologies from entering the market (Meyer 2004). After the technological niche was developed, subsidies successfully paved the way for a market niche (Klaassen *et al*., 2005). Danish R&D capacity helped domestic companies gain a strong commercial advantage in wind technology and become major exporters of these technologies (Deloitte, 2012). The success of Danish R&D programs for wind technology is more related to the effective allocation of funding rather than the total amount of funding (Lewis and Wiser, 2005).

Denmark currently spends around 3 % of GDP for public R&D&D programmes, with a recent surge in energy funds by 65 % (NER, 2013). The nation is the fourth largest investor in energy-technology R&D&D (IEA Wind, 2012). About EUR 100 million a year is spent on clean energy R&D&D (NER, 2013). Energy-technology R&D&D in Denmark is related to the subjects defined in the national energy policy. Bioenergy represents 26 % of the energy R&D budget, 17 % is for wind energy, and 18% is spent on other technologies including solar, wave, and geothermal (ERKC, 2014a). Public funds are allocated via a range of ministries and institutions covering the entire innovation chain (ERKC, 2014a). Funding is prioritized on the basis of strategies devised jointly between industry, research communities and public authorities (IEA Wind, 2012).

A number of targeted R&D&D programmes have been established to support the long-term Energy Strategy 2050. For example, the focus of Energy Technology Development and Demonstration Programme is the development of new climate-friendly energy technologies and their introduction to the global market (ERKC, 2014a). Green Labs DK supports the establishment of large test facilities and demonstration of new climate and energy technologies (ERAWATCH, 2012; ERKC, 2014a). Strategic Research in Sustainable Energy and Environment supports research activities within the area of sustainable energy and environment. Dissemination of Minor Renewable Energy Technologies program focuses on R&D in bio-gasification, solar PV and wave power (ERKC, 2014a).

As discussed earlier, the granting of patents is often cited as a measure of the inventive activity and evidence of the effectiveness of R&D investments (HRFM, 2013). The Clean Energy Patent Growth Index (CEPGI) reflects Denmark's strong performance in wind technology. In 2012 Denmark held 10% (76) of all U.S. patents in the wind energy field, which put the nation in third place by measure of its clean energy inventions between 2002-2012 (HRFM, 2013). Danish experiences suggest that effective policy framework for supporting innovation in RE technologies involves consistent, long-term, well-financed, targeted programs and dedicated institutions.

A.2.2.5 Feed-in Tariffs and Supporting Regulations

FIT scheme has played a key role in driving rapid and large-scale deployment of RE in Denmark. The nation took its first steps towards FIT in 1988, when it introduced an obligation for power suppliers to interconnect and purchase power from renewables generation at a "fair price" (Christianson, 2005; Farrell, 2009). The Danish FIT was formally established in 1993 (Farrell, 2009). For wind power generators, the rate was fixed at 85% of the utility production and distribution costs (Bolinger, 2001; De Lovinfosse, 2008). In 1998, the pricing mechanism was slightly changed: the utilities were required to buy wind power at 85 % of the consumer electricity price (Farrell, 2009). These costs were largely borne by the utilities, who received a payment to offset their costs. Turbine operators were responsible for the initial grid connection and utilities covered any additional costs (Helby, 1997; Farrell, 2009). These rules limited utilities' ability to delay projects with complicated negotiations about prices and grid connection. RE developers were able to produce accurate estimates of the project return, which increased transparency in the system (Helby, 1997). Onshore wind power has experienced particularly strong growth throughout the 1990s (Farrell, 2009).

In 1999, the Danish government made a decision to replace the FIT program with renewable portfolio standard (RPS) and a system of tradable green certificates (TGC) (Bolinger, 2001). However, due to a number of complications the new system has not been implemented and a complicated set of rules was introduced as a transitional solution (Meyer, 2004; Mendonça *et al.*, 2009, see EREC 2009 for more detail). Conditions for wind turbines installed before 2003 were relatively favourable (Mendonça *et al*., 2009). Wind turbines received a fixed price for the first 22,000 ‘‘full production hours’’ and an additional payment for CO2 free electricity and repowering. Onshore wind turbine installed between 2003 and 2007 received the Nordpool market price plus a premium until the turbine was 20 years old. The total payment was capped, setting a maximum price that energy generators could receive (Mendonça *et al.*, 2009). In 2005, the cap was abolished in response to stagnating wind development and the premium was paid independently from the electricity market price (Mendonça *et al.*, 2009). Despite this measure, the downward trend in new wind installations continued in subsequent years (Mendonça *et al.*, 2009). The net increase in wind power capacity was less than 25 MW between 2004 and 2007 (Farrell, 2009). Although wind energy development was modest, the increased use of biomass maintained the overall growth in RE since 2001 (Maegaard, 2009).

Danish RES-E support instruments were amended again in 2008, but the support principles remained the same as previously (Winkel *et al*., 2011). RE producers currently receive support in the form of a premium that is given on top of the market price and is capped at a maximum amount, or as a fixed FIT for 20 years. For most technologies, plants of different sizes are eligible. There is no cap on the annually available budget or the volume of new installations

(Winkel *et al.,* 2011). Owners of old wind turbines are eligible for extra price supplement for repowering (IEA and IRENA, 2014a). Despite challenges with RE development in recent years, Danish FIT policy has been central to the widespread diffusion of wind power in Denmark (Lewis and Wiser, 2005; Farrell, 2009). As in the case of Germany, Danish experiences highlight the importance of a stable and predictable FIT policy which creates secure and stable investment conditions.

A.2.2.6 Locational Planning and Permitting Procedures

Favourable planning and permitting procedures have contributed to the successful expansion of RES in Denmark. In contrast to the German system, Danish approach to setting out localities for RE development is highly prescriptive (Bowyer *et al*., 2009). Greater emphasis is placed upon municipalities to define indicative areas that would be considered appropriate for the development of onshore wind. The broader categories of restriction or exclusion do not apply (Bowyer *et al*., 2009). Wind energy projects must be located in accordance with the Planning Act, the regional plans, and the municipal plans. The planning law contains different provisions about establishing local plans, consultation procedures, and environmental impact assessments. The regional plans provide general conditions for wind development and guidelines for integrating wind turbines with other land-uses (Bowyer *et al.* 2009). The municipal plans can include targets related to wind energy and specific conditions to be met regarding turbine location, number, height and appearance, distance to settlements and landscape features (Bowyer *et al*., 2009). A thorough and long-life planning for wind turbines is facilitated by the fact that a municipal plan determines the municipality's overall goals and guidelines for the development over the next 12 years and the technical lifetime of a turbine is around 20 years (WTOA, 2009). Danish planning regulations provide for early public participation in the planning and siting processes for wind energy. These provisions help ensure that there are adequate opportunities for public input on RE siting, which has contributed to better decisions and greater support for RES (Bowyer *et al*., 2009; IEA Wind, 2011).

The Danish local authorities are currently looking at whether additional sites can be allocated for the development of wind power without significant impacts (Bowyer *et al*., 2009). Due to the rapid uptake of onshore wind during the 1990s, all the viable sites were developed and the deployment slowed down (Bowyer *et al*., 2009). With the recent adoption of new ambitious RE targets, the Danish government has ordered municipalities to revise their spatial plans and modify existing guidelines for wind projects to provide additional development sites (Bowyer *et al*., 2009; IEA Wind, 2013). The Danish Wind Turbine Secretariat was established in 2008 to assist local authorities with this process (IEA Wind, 2013). The Secretariat provides assistance to local officials around wind energy planning, such as locating potential areas for wind development, providing advice on the planning process, sharing examples from other municipalities, assisting dialogue with government authorities (IEA Wind, 2013). Evidence suggests that the municipalities have been following the general trend towards concentrating large turbines on fewer sites (Sperling *et al*., 2009). The advantage of this approach is that impacts from wind power developments can be limited to only a few carefully chosen sites rather than having large turbines spread across the whole municipality. The disadvantage is that planning for fewer sites increases the risk that national RE goals will not be reached (Sperling *et al*., 2009). The Danish case highlights the importance of engaging local officials and the public early in the planning and siting process for RE developments as well as ensuring that there are plentiful and meaningful opportunities for local stakeholders to provide input throughout the siting process.

A.2.2.7 Local Ownership and Benefits

Strong local participation in wind development has been an important feature of Denmark's wind power expansion. Since the early days of RE development, wind projects have been initiated from the bottom-up through citizen-led initiatives (Reiche and Bechberger, 2004; Schreuer and Weismeier-Sammer, 2010). These bottom–up efforts were accompanied by gradually emerging and continuously adapted policy support in the form of feed-in regulation, tax advantages, ownership criteria, and favourable financing opportunities, fostering cooperative ownership of RE projects (Bolinger, 2001; Bowyer *et al*., 2009; Schreuer and Weismeier-Sammer, 2010). Tax exemption on revenue from cooperative wind enterprises made cooperative investments very attractive, essential doubling the income from a project (Farrell, 2009). Many financing options for RE projects have been available to small business owners (Bolinger, 2001). Danish banks have been very flexible in the terms of the loans they have offered to RE developers (Helby, 1998).

Different distributed ownership models, including farmers and cooperatives, have played an important role in Danish wind energy development (Schreuer and Weismeier-Sammer, 2010). For wind power, cooperatives became a critical form of ownership from the 1970s until the beginning of the 21st century (Mendonça *et al*., 2009). By 2004, there were more than 3000 co-operative wind turbines and between 100,000 and 150,000 owners of them. By 2007, around one-fourth of installed capacity was owned by cooperatives (Mendonça *et al*., 2009). An additional 65% of capacity was installed by farmers (Pahl, 2007). Local ownership has ensured that Danish residents and communities directly benefitted from wind power development (IRENA and GWEC, 2013). Local entrepreneurship and cooperative ownership of wind turbines helped secure public support and acceptance of wind power, which has become a “popular” technology (Sperling *et al*., 2009).

In recent years, local engagement in wind power development began to decrease and local support for RE projects has become more difficult to secure. Since the end of the 1990s, there has been a shift away from small-scale locally owned wind power projects towards fewer larger-scale wind farms owned by energy companies and professional investors (Nielsen, 2011; Bowyer *et al*., 2009). This shift has been driven by the reconsideration of appropriate localities for development following the establishment of new RE targets, the redesign of the RE support scheme and re-powering initiatives (Bowyer *et al*., 2009). Due to high costs of building large turbines, local engagement in wind power development began to decline (Sperling *et al*., 2009). As a consequence, the opposition to wind power in Denmark has been growing, causing delays in RE implementation (Nielsen, 2011).

In response to these developments, the government implemented several measures to maximize benefits associated with RE projects for local communities. More specifically, Denmark’s Promotion of Renewable Energy Act, 2009 established four schemes that apply to onshore turbines over 25 m high and offshore turbines. The “option-to-purchase scheme” requires the developer to offer at least 20% of the turbines ownership shares for sale to local residents (DEA, 2009; Sperling *et al.*, 2009). A new guarantee fund helps local groups and associations to finance preliminary investigations for wind turbine projects (DEA, 2009). A “green scheme” offers subsidies to municipalities for projects that enhance local scenery and recreational opportunities in areas where wind turbines are erected (DEA, 2009). Finally, a "loss of value scheme" provides clarification regarding payment for property value losses caused by the erection of a wind turbine (DEA, 2009). Through these initiatives, the government aims to promote local commitment to wind turbine planning and facilitate greater support of wind energy at the local level (Sperling *et al*., 2009; DEA, 2009; IEA Wind, 2013). The schemes helped maintain the continued growth in wind power installations in recent years (IEA Wind, 2013). Danish case thus highlights the importance of encouraging local RE ownership for the continued development of RES. Innovative policies and measures are required to increase benefits associated with large-scale projects at the local level.

A.2.2.8 Industry and Jobs Creation

Denmark's policy efforts in fostering local RE industry have been an important aspect of nation's renewable "success story". As in the case of Germany, Denmark has supported local wind industry development through a combination of direct and indirect policies. FIT policy was instrumental at creating sizable and stable market for wind power, especially during the 1990s (Lewis and Wiser, 2005). A committed public R&D&D support allowed Danish turbine manufacturers to develop units with improved efficiencies and reliability, supporting the continued expansion of RE industry and enhancing its international competitiveness. Denmark was the first country to promote aggressive quality certification and standardization programs in wind turbine technology, which ensured the quality and credibility of the emerging technologies (Lewis and Wiser, 2005). Danish standards for wind turbine technology gained international recognition, helping build consumer confidence in otherwise unfamiliar products and contributing to the international competitiveness of Danish companies (Lewis and Wiser, 2005). Denmark has encouraged preference for local content and local manufacturing through the use of financial incentives. For example, Danish Wind Turbine Guarantee program offered long-term financing of large projects using Danish-made turbines and guaranteed the loans for those projects, significantly reducing the risk involved in selecting Danish turbines (Lewis and Wiser, 2005). The dissemination of Danish technologies abroad was encouraged through the extensive use of export credit assistance and development aid loans tied to the use of domestic wind power technology (Lewis and Wiser, 2005; SP, 2010).

Supported by favourable policies, Danish wind industry has emerged as an important sector of the Danish economy, a significant domestic employer and a major player on the global market for wind power technologies. In 2010, wind energy sector – both directly and indirectly – contributed DKK[2] 25.33 billion to the Danish GDP, which is more than 1% of the Danish total GDP for that year (Deloitte, 2012). The total number of employees in the wind industry increased from 14,000 to 28,459 between 1999 and 2012 (DWIA, 2010; DWEA, 2013). Some of the most important wind turbine manufacturers with a prominent position at international level are based in Denmark (Deloitte, 2012). For example, Vestas had been the world's largest wind turbine manufacturer since 2000 and until 2012, when it came second with the global market share of 13% (REN21, 2014). As in the case of their German counterparts, the global market share of Danish wind companieshas declined as a result of international competition (Gallucci, 2012). Despite this, exports of Danish wind industry have grown more than 19% per year during 2000s, currently accounting for approximately 8.5% of total Danish exports (DWIA, 2011).

[2] Currency unit: 1 Danish Krone (DKK) = approx. 0.19 Canadian dollar (CAD)

A.2.2.9 Information, Education and Research on RE Issues

Support for information and education initiatives has been an important component of Danish government's RE promotion policies (ECORYS, 2010), contributing to the success of RE implementation. As in the case of Germany, Danish public awareness raising campaigns and information dissemination activities have been carefully designed, sufficiently funded and carried out professionally to reach the target groups, with a clearly positive impact on public opinion and on the motivation of the targeted professional groups (ECORYS, 2010).

Denmark took deliberate steps to analyse social acceptance issues and to develop strategies to increase public support for RES. For example, the Danish Energy Agency funded a multi-year study on Low Frequency Noise from Wind Turbines. The study was initiated as a result of the growing public anxiety that new large wind turbines might have a larger impact on the environment than existing smaller turbines (Delta, 2010; IEA Wind, 2013).

Securing public acceptance has become a major issue for the future success of Danish RE expansion. Local resistance against wind turbines has been growing, fuelled by concerns over landscape impacts, health effects, rising electricity bills and impacts on property values (Gilligan, 2010; Energinet, 2009b; IEA Wind, 2011; Tesnière *et al*., 2014). The Danish government's recent strategy to address public acceptance issues has prioritized creating a sense of economic ownership in RE projects over general communications campaigns on RE (Bridle *et al*., 2013). This is reflected in the provisions of the Promotion of Renewable Energy Act, 2009, which encourages local residents to purchase shares in wind turbines (Bridle *et al*., 2013). Siting strategy has been the preferred approach to address aesthetic concerns around the new infrastructure projects. This is reflected in the trend towards placing wind turbines father offshore and out of sight, as well as the plans to bury sections of the transmission grid underground (Energinet, 2009a; IEA Wind, 2013). While these efforts have shown to improve public acceptance (Tesnière *et al*., 2014), these measures may not be sufficient due to the presence of highly-organized and influential protest groups (Bridle et al., 2013). Some of these groups have an ideologically driven objection to RE and have been very successful at spreading misleading information about RES. The lack of information available to local politicians on the benefits of wind energy for their communities has been identified as another relevant issue (Bridle *et al*., 2013). Several leading Danish wind energy associations have launched the "Knowledge about Wind" campaign in 2011 to address these challenges. The initiative targets local politicians and the broader public and aims to communicate the benefits of wind energy and disseminate information about government's support schemes for wind power (Bridle *et al*., 2013). The campaign maintains a comprehensive website, which provides information on wind-related topics; funds research on the effects of living near wind turbines; and organizes trips to wind parks for representatives of communities considering wind projects in their own area (Bridle *et al*., 2013). According to Bridle *et al*. (2013), the existence of "Knowledge about Wind" campaign demonstrates that creating a sense of ownership alone is not sufficient to reduce opposition to RES. Inaccurate portrayals of RES can increase resistance to its deployment (Bridle *et al*., 2013), therefore communicating facts relating to RETs is increasingly important in order to foster a fact-based and well-informed public debate on RES.

A.2.2.10 Grid Integration

Denmark has pioneered practices to manage complexities associated with the large additions of variable wind to its power system and enable effective wind integration into the grid (Cochran *et al*., 2012; LCTU, 2012). From the point of view of RE integration, new transmission is less of a challenge in Denmark than it is in Germany (Cochran *et al*., 2012). Long-term system planning has been an important aspect of the Danish RE case, which ensured timely and relevant investments in the power system (LCTU, 2012). Denmark has a strong transmission grid that is maintained by the government-owned transmission system operator (TSO) Energinet (Cochran *et al*., 2012). Energinet has been a key driver of effective wind power integration and management. The TSO developed a holistic plan for a complete overhaul of the high-voltage grid to enable significant future RE expansion (Energinet, 2009a; Cochran *et al*., 2012). About 3,200 kilometers of line will be replaced and about 2,900 kilometers of new cables will be built. To secure public support for the new infrastructure, the plan includes the undergrounding the entire 132-kV to 150-kV grid, which will take about 30 years to implement and cost DKK 14.5 billion (Energinet, 2009a; Cochran *et al*., 2012). Energinet is also involved in the planning of the first offshore electricity grid in the Kriegers Flak area in the Baltic Sea, which will connect a cluster of offshore wind farms to an external power system (Cochran *et al*., 2012; Energinet, 2013).

Denmark has enhanced its power system flexibility with more flexible operation of CHP plants, plans for electric vehicles, and large-scale deployment of smart meters. Denmark is the most advanced country in terms of including CHP in delivering ancillary system services and balancing tasks to support the power system (COSPP, 2011; Cochran *et al*., 2012). The nation is also a pioneer in the application of multiple, advanced forecasting tools to plan system operation and day-ahead congestion management (Cochran *et al*., 2012; LCTU, 2012). As in the case of Germany, wind curtailment is a measure of last resort in Denmark and is required relatively rarely at present (Cochran *et al*., 2012). Danish wind turbine owners should comply with the

Nordel Grid Code and domestic grid code requirements, helping support the security of supply (LCTU, 2012).

Denmark's integration efforts have benefited greatly from its participation in the larger Nordic power market. During the 1990s, the Nordic countries have implemented far-reaching reforms and established a common market for electricity, within which they have harmonized the laws structuring the electricity sector (Bergman, 2003; Kauppi and Liski, 2008; Glachant and Leveque, 2009; Pineau, 2012). These integration initiatives enhanced market resilience to supply and demand shocks and increased productivity, while helping support Denmark's growing fleet of wind power generators. The Nordic system's balancing area allows flexible hydropower in Norway, Sweden and elsewhere to accommodate the variability of wind in Denmark (Cochran *et al*., 2012; LCTU, 2012). Efforts are currently underway to reinforce Denmark's position in the Nordic power market by expanding Danish electrical linkages to the neighbouring markets. These links will help spread wind power production more widely, increasing its value (Cochran *et al*., 2012). Danish case highlight the need for a range of mechanisms to accommodate high penetrations of RE, including long-term strategic planning of the power grid, timely and relevant investments in the power system, well-functioning electricity market, the use of innovative technologies and robust interconnections to neighbouring countries.

A.3 Ontario

A.3.1 National and Regional Obligations

The experience of Ontario stands in stark contrast to Germany and Denmark in terms of its national and international obligations with regard to climate change and RE. The Canadian federal government has impeded progress towards more ambitious action internationally and has been slow to act on climate change domestically (Marshall, 2009). Although Canada ratified the Kyoto Protocol in 1992, taking on a target to cut GHG emissions to 6% below 1990 levels by 2012, little policy development or intergovernmental collaboration came out of the Kyoto commitment (Gibbins, 2010a). In 2009, the Canadian government signed onto the Copenhagen Accord, which is not legally binding, and aligned its climate target with that of the US, pledging to reduce GHG emissions by 17% below 2005 levels by 2020. This target is equivalent to 3% increase in emissions above 1990 levels, making Canada the only country that weakened its ambition and effectively argued for an increase of 2020 emission allowances above its Kyoto target (Rogelj *et al*., 2010). In 2011, Canada became the first country to formally withdraw from the Kyoto Protocol, reinforcing its international reputation as a laggard on climate change (Ljunggren and Palmer, 2011).

As in the case of climate change issue, Canada has not provided leadership in national or international negotiations and commitments on RE related issues, consistently arguing for a "balanced approach" to all energy mixes (CanREA, 2006). The federal government has also been unwilling to take a leadership role in establishing a national RE target or developing an integrated national energy policy aimed at clean energy development, leaving it to the provinces to adopt their own limited patchwork of RE policies (Hayden, 2011). Achieving consensus on a national energy policy is complicated by a range of factors, including the constitutional division of powers which underpins Canada's federal system and the potential for differential regional economic impacts that might result from strong action on RE (Valentine, 2010; CBoC, 2010; Pineau , 2012).). The Canadian experience stands in stark contrast to the European Union, another multi-level political entity, which has been able on more than one occasion to reach agreement on key climate and energy initiatives, despite considerable challenges in reconciling differences among member states (Hayden, 2011). As discussed earlier, progressively demanding RE targets and policies at the European level have been important considerations for Denmark and Germany in making their own policy decisions.

In addition to pursuing their own climate change and RE initiatives, Canadian provinces have fostered diverse and active sub-national intergovernmental cooperation in these policy areas. Ontario participates in a number of such initiatives, including Climate Registry, which aims to develop common GHG emissions reporting system; North America 2050, a forum for stakeholders to identify leadership opportunities in climate and clean energy initiatives; and Western Climate Initiative aimed at developing cap-and-trade program to reduce GHG emissions (Climate Group, 2012). While these regionally inspired initiatives are important, they do not allow utilizing the regional strengths to the full extent and maximizing the return on Canada's diverse energy sector (Gass and Drexhage, 2010). Each region promotes its own energy development strategy, resulting in a series of ad hoc, regionally inspired energy policies reacting to climate policy pressures (Gass and Drexhage, 2010; Hayden, 2011). Without a coherent national approach to energy development and an overarching vision of how Canadian jurisdictions can work together, the chance of meeting national and international climate change commitments is greatly reduced (Gass and Drexhage, 2010; Gibbons, 2010). A long-term national energy strategy can generate many win/win opportunities for all parties, such as improving access to renewable resources, reducing the environmental footprint of energy production and consumption, and developing innovative low-carbon technologies and services (CBoC, 2010; Gass and Drexhage, 2010). The province of Ontario in particular would greatly benefit from the adoption of national energy plan with bold climate and RE targets. A RE target at the national level would ensure continued commitment to RES at the provincial level. Greater integration and cooperation in the energy sector between Ontario and neighbouring provinces could help remove barriers to new markets for Ontario's RE developers, and help more effectively address the challenges of RES integration, in particular, the issues of backup power and surplus generation (see Section A.3.10), enabling Ontario to realize the full potential of its RES and meet its climate commitments.

The experiences from Germany and Denmark suggest that there are opportunities for Ontario to take on a leadership role and start building the consensus necessary for the national energy policy development. In the European case, the existence of powerful lead states, such as Germany and Denmark, which have shown a desire to reach a deal and a willingness to accept a significant share of the effort, has been a critical factor enabling a successful agreement at the supra-national level (Hayden, 2011). By taking the lead in the efforts to make the case for a national energy policy and foster greater collaboration in climate change and RE field at the national level, Ontario can speed up the development of a national energy policy and capture the associated benefits.

A.3.2 Nuclear and Fossil Fuels Policy

As in the case of Germany and Denmark, nuclear and coal have historically been major sources of electricity in Ontario. The commitment to phase out coal, unique in North America (Stokes, 2013), has become a key element of Ontario's energy policy in the early 1990s. This critical decision reoriented Ontario's policy landscape towards greater emphasis on renewables (Stokes, 2013). All of the province's major political parties have committed to a coal phase-out over various timelines, principally due to the public health and climate change impacts of coal use (Winfield *et al*., 2010). In 2003, the new Liberal government made an ambitious political commitment to close the province's coal-fired power stations by 2007 (OCAA, 2006). The targeted closure was eventually postponed to 2009, and then again, to 2014 (OCAA, 2006; Miller, 2008). The commitment was formalized by the Cessation of Coal Use regulation and confirmed by Bill 138, Ending Coal for Cleaner Air Act, 2013, which prohibited new stand-alone coal-fired generating facilities (Miller, 2008). The phase-out commitment was fulfilled in the early 2014, making Ontario the first jurisdiction in North America to fully eliminate the use of coal for electricity production (OME, 2014b). Considering that coal accounted for 25% of electricity generation in 2003 (OME, 2010), this is a significant accomplishment.

While Ontario's coal consumption has been declining, the use of natural gas for electricity production has been on the rise. Natural gas-fired capacity has increased from 4,364 MW in 2003 to 9,424 MW in 2010 (OME, 2010). Projections in the LTEP, 2013 indicate that gas-fired generation will remain at similar levels to today, accounting for 23% of total installed capacity in 2025 and 10% of total energy production in 2032 (OME, 2013a). Ontario's commitment to natural gas stands in stark contrast to Denmark's long-term goal to achieve a fossil free energy system by 2050.

Furthermore, unlike Denmark and Germany, both of which have made a decision that nuclear will not be a part of national energy mix, the Ontario government's commitment to nuclear energy remains an important aspect of the provincial energy policy landscape. Nuclear has long been a favoured energy generation technology in Ontario. The province's nuclear generating stations at Darlington, Bruce and Pickering have historically provided about half of the province's electricity supply (OME, 2013a). The government's recent long-term energy plans confirm that nuclear will continue to be the backbone of Ontario's electricity system. The 2010 LTEP called for building two nuclear units at the Darlington Generating Station and refurbishing the remaining nuclear capacity of 10,000 MW at Darlington and Bruce (OME, 2010). However, due to lower projected electricity demand growth than previously forecast, the updated LTEP, 2013 cancelled the construction of two new nuclear reactors at the Darlington site and announced the shutdown of Pickering units by 2020. The Darlington and Bruce nuclear units will be refurbished starting in 2016 (OME, 2013a). The updated LTEP, 2013 states that nuclear will represent 20% of installed capacity and account of 42% of total energy production in 2025 (OME, 2013a). Although the plan reduced the role of nuclear power in Ontario, this fuel source will still, arguably, make a very high level of contribution to the electricity supply. Combined with the increased reliance on natural gas and a high share of conventional hydropower, Ontario's commitment to maintain its nuclear capacity leaves very little room for the development of new, low-impact RES. The decision to refurbish nuclear power means that Ontario's energy system will continue to be based on a large nuclear component and locked into that specific design for several generations (Etcheverry *et al*., 2009). Allowing high dependency on a predominantly nuclear system compromises the development and implementation of new technological alternatives and grid innovations (Etcheverry *et al*., 2009), an area where Ontario can gain significant competitive advantage. As demonstrated by Danish and German experiences, a formal commitment to phase out nuclear/fossil fuels will open the door to more renewables in the province and lead to stronger commitment to and action on RE, helping establish Ontario's position on the forefront of innovation in RETs.

A.3.3 Renewables Prioritization in Policy Documents and RE Targets

Compared to RE policy pioneers Germany and Denmark, Ontario is a late entrant into the renewable development field. Ontario's first RE targets were established through ministerial public announcements in 2003, when the government made a commitment to develop 5% of the province's electricity capacity (1,350 MW) through renewable electricity by 2007, and 10% (2,700 MW) by 2010 (Rowlands, 2007; Holburn *et al*., 2010). At the time, the so-called new renewables were virtually non-existent in Ontario. In contrast to Germany and Denmark, where RE targets have been "hard wired" into legislation or energy plans and hence remained relatively stable over time, Ontario's RE targets have been subject to frequent revisions (Holburn *et al*., 2010). The provincial long-term RE planning has proceeded in a more piecemeal, unpredictable fashion (Holburn *et al*., 2010). In 2006, the Ontario Ministry of Energy (OME) issued a Supply-Mix Directive (SMD) which maintained the 2010 RE target (2,700 MW) and set a new long-term target of 15,700 MW of total RES installed capacity by 2025 (Duncan, 2006). The 2007 target was thus effectively dropped (Holburn *et al*., 2010). The SMD targets formed the basis for the 20-year Integrated Power System Plan (IPSP) submitted by OPA for approval in 2007 (Holburn *et al*., 2010; OME, 2010) but the process was suspended in 2008 and the OPA was ordered to recommend new RE targets. According to Holburn *et al*., (2010), these developments show clearly that RE targets have been short-term rather than long-term planning goals in Ontario.

In terms of the progress against its RE commitments, Ontario performed rather poorly. As of January 2008, only 522 MW of renewable capacity was operational, which means the government's original 2007 target (1,350 MW) was missed by a large margin (OPA, 2008). As of January 2011, the new post-2003 renewable capacity in commercial operation amounted to 2,035 MW (OPA, 2011), falling short of the government's target of 2,700 MW increase by 2010.

The recent developments in Ontario's RE policy suggest that Ontario's RE goals continue to be short-term. Ontario's new RE targets were introduced in the Long-Term Energy Plan (LTEP) of 2010 and confirmed by the revised Supply Mix Directive (SMD) of 2011. In terms of installed capacity, the documents set the target to achieve 9,000 MW of hydropower and 10,700 of wind, solar, and bioenergy combined, by 2018. In terms of generation, the renewable share requirement was set to 20-25% of total for hydro and 10-15% for non-hydro by 2018 (OME, 2010; Duguid, 2011). Importantly, LTEP, 2010 projects that the share of non-hydro renewables in Ontario's supply mix will actually decline in 2030, accounting for only 13% of power generation in 2030. These observations highlight the lack of long-term energy planning in Ontario and a vision of how Ontario power system could evolve beyond 2018 to accommodate a large share of modern low-impact renewable fuels. The Ontario's RE targets were revised again in the recently updated LTEP, 2013, which lays out the government's current overall vision for Ontario's energy goals to 2030 and articulates the role for renewables in the electricity-supply mix. The government states that LTEP, 2013 takes a pragmatic and flexible approach and is designed to balance the following five principles: cost-effectiveness, reliability, clean energy, community engagement and an emphasis on conservation and demand management before building new generation (OME, 2013a). The plan recognizes renewables as important contributors to a cleaner, more flexible and secure supply mix and acknowledges their role in creating employment opportunities (OME, 2013a). However, in line with the previous energy policy documents, LTEP, 2013 discusses nuclear energy option before it considers renewables (OME, 2013a). The RES will also be phased in over a longer time period than contemplated in the LTEP, 2010. The existing target of 10,700 MW for wind, solar, and bioenergy was extended from 2018 to 2021; the hydro target was expanded to 9,300 MW by 2025. The government projects 20,000 MW of

RE online by 2025 (OME, 2013a). Although RE will represent about half of Ontario's installed capacity in 2025, almost half of it will still come from hydro power (21%). In 2025, bioenergy will remain nearly absent (2%) from the generation mix, while wind and solar will make rather modest contributions by international standards, with shares of 15% and 8%, respectively. This is, arguably, deeply unambitious, considering the potential of Ontario's RE resources, the ongoing technological improvements, falling capital costs and future transmission system expansion, which will open up capacity to accommodate more low-impact renewable generation in Ontario. This suggests that although the Ontario government recognizes renewables as important sources of energy, renewables are not prioritized over conventional energy sources in Ontario's energy policy. The overall RE planning lacks a long-term perspective, which has been a key element of renewable "success" stories in Germany and Denmark. Ontario's current RE targets are also quite modest and short-term when compared to commitments and achievements made in the leading RE jurisdictions Germany and Denmark. As discussed previously, both countries have adopted ambitious long-term policy targets out to and beyond 2030. Denmark aims to supply 100% of electricity from renewables by 2050 (IEA Wind, 2012), while Germany set the target for RES to account for 80% of gross electricity consumption by 2050 (BMWi and BMU, 2010). Achieving these targets will put Germany and Denmark in the "high renewables" domain by 2050 (REN21, 2013). According to GEAA and SOA (2011), Ontario must strive for a non-hydroelectric renewable target of 30% to 35% by 2020, in order to compete internationally, or even within North America. Lessons from Germany and Denmark suggest that by adopting more aggressive RE targets with a longer time horizon and a step-wise progression every decade, Ontario government will trigger the adoption of appropriately ambitious RE support measures and establish stable conditions for RE development by indicating its long-term commitment to RE.

A.3.4 Research, Development and Demonstration

The Ontario government has supported RE-related R&D&D through a mix of policies and measures, such as R&D grants, publicly funded laboratories and research institutes, funding for higher education and R&D tax credits (Khanberg and Joshi, 2012). Public funds have been allocated via a range of ministries, agencies and institutions (Stasko, 2010). Notable provincial programs include a CAD 250-million five-year Ontario Emerging Technologies Fund (OETF), established in 2009 to increase the pool of early stage capital available to innovative Ontario companies; and the Innovation Demonstration Fund (IDF), which received a four-year, CAD 50-million boost in the 2009 Ontario budget to help companies find commercial uses for emerging technologies (preferably in biofuels and alternative energy) (MaRS; 2009; MaRS, 2010). The province is well-known for strong higher education sector, performing high quality energy-related R&D (Khanberg and Joshi, 2012). The Ontario Centres of Excellence (OCE) program facilitates collaboration on energy projects between industry and academia and co-invests to commercialize new technologies developed in Ontario's colleges, universities and research institutions (OCE, 2014). As part of the OCE program, the Ontario Centre of Excellence for Energy was established in 2005 with a focus on energy-related projects and technologies (OBR, 2012). In addition, Ontario supports innovative companies and clean R&D initiatives through R&D tax incentive programs, such as 4.5% non-refundable Ontario R&D tax credit (ORDTC); a 20% refundable Ontario Business Research Institute tax credit (OBRITC); and a 10% refundable

Ontario Innovation Tax Credit (OITC) (OITC, 2011). Through these initiatives, the government aims to create a collaborative atmosphere and favourable funding environment for R&D&D in RETs, fostering technology innovation activities in the province.

Compared to Germany and Denmark, Ontario lacks long-term R&D support initiatives that are explicitly focused on RES. A recent study by Khanberg and Joshi (2012) has found that the Ontario's support framework for energy R&D has been dominated by a mix of standalone, short-term, limited funds and overlapping boutique energy research programs (Khanberg and Joshi, 2012). With the exception of one centre of excellence devoted to energy, none of government's R&D support initiatives are explicitly targeted at RES. Compared to federal R&D funds, the provincial contribution has been disproportionately low (Khanberg and Joshi, 2012). In contrast to the Ontario situation, Germany and Denmark have established sizable, long-lived and well-funded RE related R&D&D programs and institutions, which have played a key role in the advancement of innovative technologies. These observations suggest that although Ontario government's support measures will likely foster, to varying degrees, RE related R&D&D activities in Ontario, these efforts might be insufficient to support Ontario's aspirations to become a leader in clean energy technologies (Khanberg and Joshi, 2012).

Experiences from Germany and Denmark show that strong performance in RETs innovation can be achieved by implementing long-term, well-funded and targeted support for R&D&D in the field of RES. This suggests that Ontario can improve its R&D&D support system for RES through a long-term, comprehensive and sustained commitment of resources and political will (Khanberg and Joshi, 2012). Increasing its funding commitments and setting long-term R&D&D intensity targets (R&D expenditure as a percentage of GDP) will demonstrate government's commitment to promoting RE R&D activities (Khanberg and Joshi, 2012). Creating a smaller suite of long-lived programs can help improve the delivery of R&D&D support, track progress and ensure continued improvement of the programs (Khanberg and Joshi, 2012). Establishing a central agency to stimulate and coordinate R&D&D projects in the field of RES can help strengthen Ontario's RE innovation performance. German Agency for Renewable Resources (FNR) can provide an instructive case study. The FNR provides support in planning and implementing various programs and disseminates scientific insights on RETs (ERA-NET Bioenergy, n.d.; ERKC, 2014b). These measures can help Ontario achieve leadership in RETs innovation.

A.3.5 Feed-in Tariffs and Supporting Regulations

Ontario's FIT program, established by the GEGEA, is the primary mechanism stimulating the deployment of RE in the province. Described as the "first modern system of advanced renewable tariffs in North America" (Gipe, 2009), Ontario's FIT is modeled after German program (Stokes, 2013). When introduced in 2009, Ontario's FIT program offered to pay among the highest prices in the world for solar and wind energy (D'Aliesio, 2012), eliciting a very strong supply response (Stokes, 2013)

The provincial FIT program has evolved since its launch, as regulators assessed market response and worked through operational challenges (Timmins *et al*., 2011). The tariffs for solar PV, wind and biogas were revised downwards to reflect rapidly falling technology costs. The tariffs for waterpower, biomass, and biogas were increased, likely reflecting the poor uptake of these technologies under the previous program (Gipe, 2013). Initially, Ontario did not have administrative cap on its program. With few exceptions, there were also no project size limitations (Gipe 2010). However, the government has recently removed large projects (over 500 kW) from the program and set annual procurement targets for small FIT and micro-FIT projects. Starting in 2014, annual procurement targets are set at 150 MW for small FIT and 50 MW for microFIT projects (10 kW or less) (Chiarelli, 2013). Other important changes have included the reduction of FIT prices for wind and solar projects on an annual basis instead of two years and removal of offshore wind from the program.

Ontario's FIT is still very comparable to German program, although there are some important differences. The provincial program shares several key elements of successful FIT programs: the right to connect and obligation to purchase; tariffs based on the costs of generation plus a reasonable rate of return; long contract terms; and tariff differentiation by project size, technology and application (del Franco, 2009; Gipe 2010; OPA, 2013a). Both Germany and Ontario use bonus payments to encourage particular technologies and applications, helping achieve policy goals beyond the total amount of new installed capacity. For example, Germany uses bonus payments to encourage repowering, high efficiency systems, the use of innovative technologies, and the use of specific waste streams (Fulton *et al*., 2012). Ontario employs bonus payments to advance certain ownership structures. Non-intermittent RE generators (bioenergy and waterpower) receive higher payments during peak hours and lower payments during off-peak hours, which encourage energy production during periods of peak demand (OPA, 2014c). German experience suggests that Ontario can increase the effectiveness of its FIT program by targeting a more diverse array of policy goals through broader use of its bonus system. For example, Ontario may consider targeting particular waste streams or encourage innovation in particular technologies. Another valuable option suggested in the literature is offering a bonus payment for the production of solar energy on brownfield sites (GEAA and SOA, 2011).

There are a number of important differences between German, Danish and Ontario's FIT. German and Danish programs include a more diverse portfolio of RETs than Ontario. Less developed RETs, such as wave, geothermal and thermal solar are not eligible for FIT payments in the province. Developing a diversity of local RES can increase the reliability and flexibility of Ontario's energy system and ensure that jobs and manufacturing opportunities are created in several RE sectors (Couture et al, 2010). The FIT program in Germany has a more complex structure when compared to other jurisdictions. German FIT payments have a higher level of differentiation by technology type, project size, the resource quality and the specific location of projects. This approach has a number of benefits. Differentiating FIT payments by project size can help capture the benefits of both large- and small-scale deployment by enabling deployment to occur at both scales (Couture *et al.*, 2010). Smaller projects can provide a number of distributed benefits, such as deferring the need for new grid upgrades and contributing to peak shaving (Couture *et al.*, 2010). Larger projects can play a greater role in altering the overall generation mix, and may displace conventional generation, reducing carbon emissions (Couture *et al.*, 2010). In addition, high level of differentiation ensures that tariffs are more closely tailored to actual costs of generation, minimizing overall burden on ratepayers (Gipe, 2010). These considerations suggest that Ontario can achieve additional benefits by moving single onshore wind energy tariff to a system of tariffs differentiated by wind resource intensity, and expanding the scope of eligible technologies, as found in the successful German program.

In Ontario, tariffs are revised directly and capacity caps are used to control market growth. In contrast, Germany uses degression of tariffs based on RE growth corridors as a tariff revision mechanism. German FIT rates are adjusted downwards each year by a pre-set amount to reflect on-going improvements in technology (Klein *et al*., 2010). This "responsive degression" varies by the amount of capacity installed that is above or below the desired target. This approach keeps the prices paid for RE more closely linked to actual market prices, and avoids overpayment (GEAA and SOA, 2011). This mechanism is considered a more effective approach to control growth than Ontario's approach of limiting the amount of annual installations to a certain capacity and an annual review of FIT rates (Klein *et al*., 2010; Prest, 2012). The reason is that caps introduce an element of uncertainty for investors, discouraging businesses from making the long-term investments necessary to drive rapid development and cost reductions (Gipe, 2010). Likewise, a discretionary annual review of tariffs introduces some risk for developers because it "leaves the outcome of the FIT level subject to a negotiation involving a variety of stakeholders" (SP, 2010:11). The advantage of flexible degression is that it is highly transparent and "it implicitly responds to developments in the market by adjusting the tariffs to the learning rate of the technology" (Klein *et al*., 2010:23). The ineffectiveness of Ontario's periodic tariff revision and adjustment is also evident from the fact that despite solar tariff cuts, solar PV tariffs in Ontario remained too high by international standards (Gipe, 2013). These developments support the argument that a targeted digression based on a German model could improve the design and operation of Ontario's FIT program.

Thus, the comparison of German FIT with those in Germany and Denmark suggests that further improvements can be made to ensure the continued success of the provincial FIT program. In particular, the government should consider expanding the scope of eligible technologies and undertaking further differentiation of tariff level within each technology; replacing program caps and discretionary reviews of FIT prices with a flexible degression as a tariff revision mechanism; and facilitate greater use of the bonus system to achieve particular policy goals. These changes will make Ontario's FIT more transparent, flexible and effective, helping ensure the sustainability of the program.

A.2.6 Locational Planning and Permitting Procedures

Prior to 2009, the process to gain the approvals for a RE project in Ontario was often complex, expensive and time-consuming (Miller, 2010a; Deveaux, 2010). Two key hurdles existed at the provincial level. For most renewable electricity projects, proponents were required to undergo an Environmental Screening Process (ESP) set out under the Environmental Assessment Act (EAA), as well as to obtain a certificate of approval under the Environmental Protection Act (EPA) (Miller, 2010a). Projects were also subject to sometimes onerous land use planning controls.

With the passage of the GEGEA, 2009, Ontario established a new approach for approving and siting RE facilities. The cornerstone of the province's framework is the Renewable Energy Approvals (REA) Regulation, which integrated all former approval requirements into a single streamlined process based on a "one window, one permit" approach (Miller, 2010a). The REA process has replaced the need for provincial environmental assessments, certificates of approval, and permits to take water. RE projects are also no longer subject to most local land use planning instruments, including local official plans and zoning by-laws (Miller, 2010a; OMMAH, 2010). The new arrangements restrict RE development on prime agricultural lands and protect water bodies and significant natural features by setbacks and prohibitions on development (REFO, 2012).

As part of the REA process, the proponent is required to consult with appropriate stakeholders, assess the impacts of the project on the environment; conduct appropriate studies; outline measures to mitigate significant negative effects; and produce REA report (MOE, 2012). The public involvement requirements within the REA process include sending a written request to potentially affected or interested Aboriginal communities for a written assessment of the potential adverse impacts of the project on the community or surrounding environment; and conducting at least two community consultation meetings. The municipal involvement in the development of RE facilities is limited to the requirement for consultation with municipal governments (Spina and McClenaghan, 2012).

The REA process applies to most wind, solar, and bioenergy facilities. Certain projects are exempt from REA, including small-scale wind and solar installations, rooftop or wall mounted solar facilities of any size, and certain farm-based bioenergy facilities (MOE, 2012). The Class Environmental Assessment (EA) is the permitting framework for the development of small to medium scale waterpower projects (less than 200 MW in size) in Ontario. In 2008, the Class EA replaced the generic ESP for waterpower projects, streamlining the previously complicated permitting process for these facilities (Deveaux, 2010; MOECC, 2014).

Ontario is similar to Germany and Denmark in that it implemented one-stop shopping approach to permitting arrangements, which made it easier to bring new RE capacity online. This is an improvement on the prior approval process. However, compared to Germany and Denmark, Ontario's approach to RE planning and siting is much less proactive and participative. By eliminating municipal planning jurisdiction over RE projects, the provincial government limited opportunities for local stakeholders to participate early in the decisions that affect them. The REA process is fundamentally proponent-led, creating a risk that developers will be able to take too much control of the terms under which they will accept community involvement in a project (Spina and McClenaghan, 2012). Another problematic aspect is that current timelines and procedures of the REA process do not ensure meaningful opportunities – early and throughout the process - for stakeholders to engage in the process (Spina and McClenaghan, 2012). For example, the timeframes for making comments and filing appeals on a project decision are too limited and the consultation style does not allow for adequate engagement and input (Spina and McClenaghan, 2012). According to Spina and McClenaghan, (2012), current provisions create the risk that local stakeholders will not be able to provide informed comments and gain an adequate understanding of the project, which increases the potential for social conflict. In fact, the perception of Ontario's RE siting provisions as "undemocratic and a formality" (O'Flanagan; 2012) has already contributed to public and municipal opposition to new RE developments in the province. In contrast, German and Danish approaches have allowed local authorities to decide for themselves where to build RE installations and provided meaningful opportunities for the public to get involved early in the planning process. As a result, these jurisdictions were able to expand RE generation while avoiding uncontrolled growth.

The Ontario government has recently introduced a number of measures in an attempt to address the situation. Large projects (over 500 kW) were removed from the FIT program. The new procurement process for large-scale RE plants will require developers to work with municipalities, Aboriginal communities and other stakeholders on suitable locations and site requirements for the new installations (Morden, 2013). In addition, Municipal Energy Plan (MEP) and Aboriginal Community Energy Plan (ACEP) programs were launched to help small and medium-sized municipalities and Aboriginal communities develop energy plans and identify the best energy infrastructure options for a community, including options for local renewable power generation (OME, 2014c; OPA, 2014e). The introduction of MEP and ACEP programs is a positive step towards giving local residents and municipalities more control over what is being developed in their communities. However, the government should consider whether some of the elements of a German highly considered, spatially explicit and indicative planning process for RE can be adopted in Ontario. Allowing municipalities and communities to determine in the planning documents where RE developments might be possible and introducing a system based on the categories of priority areas, restricted areas and exclusion zones would give citizens and municipalities more control over local development and will likely reduce opposition to RES in the province. Improving public engagement opportunities in the REA process, for example, by adding the requirement of multiple consultation meetings throughout the planning stages of the project application and lengthening the timelines for providing comments and filing appeals on REA decisions, will help improve opportunities for community members to share concerns, ideas for improvement and other comments (Spina and McClenaghan, 2012).

A.2.7 Local Ownership and Benefits

Community participation in RE development has been an important policy goal in Ontario. The government has implemented a number of targeted, unique to Ontario, policy mechanisms to encourage local ownership of and participation in RE development. The original FIT program offered bonus payments to community and Aboriginal-based projects. In addition, the GEGEA amended the Co-operative Corporations Act, authorizing the incorporation of RE co-operatives (Smitherman, 2009). The Act exempted RE co-operatives from the “business with members” rule, which requires a co-operative to conduct 50% of its business with members. As a consequence, RE co-ops can now generate and sell as much electricity as they are able to the grid, regardless of the amount of electricity consumed by their members. In addition, several programs were launched to help local groups access capital and build capacity to develop RE projects. The Community Energy Partnership Program (CEPP) offers financial assistance to community groups, including co-ops, non-profit groups and local partnerships, to help cover the costs of RE project planning, environmental and engineering studies (OME, 2009a). The Aboriginal Energy Partnerships Program (AEPP) supports Aboriginal participation by providing assistance with community energy plans, funding and the development of an Aboriginal Renewable Energy Network, a web-based resource for sharing best practices regarding RE projects (OME, 2009b). The AEPP is complemented by the Aboriginal Loan Guarantee Program, which aims to facilitate Aboriginal participation in RE infrastructure projects by improving access to affordable capital (OFA, 2012).

Despite the government's efforts to boost local ownership of RE projects, the Ontario's RE sector has been dominated by big industrial players, such as utilities and large foreign-owned companies. This trend has been attributed to the fact that professional investors are better prepared than community groups to put the projects together, raise capital, take the associated risks and overcome various barriers (Blackwell, 2013). The Ontario's situation might also reflect the fact that the government's incentives to encourage local ownership and participation in the RE development have been insufficient. The takeover of the business by commercial developers has contributed to the backlash against the installation of large turbines, particularly if they are near recreational property or agricultural communities (Blackwell, 2013). The developments in Ontario can be contrasted with the situation in Denmark and Germany, where local ownership has historically played an important role for renewable power implementation and local resistance against RE projects has been, until recently, visible at a relatively low level.

The Ontario government introduced a number of measures to address these issues. In addition to the removal of large-scale projects from the FIT, the program was updated to include a new system of price adders to the standard FIT pricing, priority points system, procurement targets and capacity set asides, all of which favour projects partnered or led by Aboriginal groups, communities, municipalities, or broader public sector (e.g. publicly funded universities, hospitals, and transit services) (Vellone and Freitag, 2013). In addition, the OPA launched Education and Capacity Building (ECB) program to provide support for diverse education and capacity-building initiatives, and facilitate knowledge-sharing and the participation of various target audiences in the Ontario's RE sector (OPA, 2014b). These provisions aim to create a level playing field for groups which may overwise be excluded from developing RE projects (OPA, 2014d).

The reaction among developers and community organizations to the latest RE policy developments in the province has been mixed (Kishewitsch and Brooks, 2013). The proportion of projects with community participation has increased dramatically under FIT 2 (APPrO, 2013). At the beginning of January 2012, Ontario had only 20 established or emerging RE co-ops (Lipp *et al*., 2012). As of 2013, this number increased to 77 (APPrO, 20130). Some co-ops develop and own projects; others take the form of umbrella organizations involved in advocacy work, education and assistance in the development of community power sector (APPrO, 2013). Alongside these positive developments, a number of issues and concerns have emerged. The creation of the so-called “co-ops of convenience”, whereby a co-op is initiated and financed by commercial developers in order to take advantage of the extra community participation points, has been controversial. The “grassroots” co-op model provides the greatest opportunity for direct community participation in the form of investment and also a democratic organizational structure. However, this model is also more cumbersome and costly to implement, which gives advantage to “co-ops of convenience” (Kishewitsch and Brooks, 2013). The complexities involved in adding community and Aboriginal partners to the application has been another problematic aspect of the new policy, highlighting the need for guidance and clarity on the new rules under the updated FIT program (Baker, 2013). Concerns have also been raised that the new competitive tender process for large RE projects may not benefit communities, suggesting that more clarity is needed on how the new system will be structured to ensure that it is favourable to the communities (Kishewitsch and Brooks, 2013).

The issues arising in Ontario are not unique. Similar problems are unfolding in Germany and Denmark. Although FIT has proved to be an effective and equitable policy for RE procurement enabling broad participation in these jurisdictions (Kishewitsch and Brooks, 2013), local opposition against large RE projects has been growing in recent years, challenging the suitability of FIT as a policy that can deliver the benefits of RE projects to local communities. As discussed earlier, Germany and Denmark have employed different mechanisms to enhance the direct financial benefits associated with RE projects for local communities. These mechanisms have been “hard wired” into legislation, making them mandatory for the developers. The experiences in Germany and Denmark highlight the importance of sharing the benefits of RE projects at the local level and provide examples of policies that Ontario government may consider in developing a new procurement process for large RE projects.

A.3.8 Industry and Jobs Creation

Economic and industrial development objectives have been at the centre of the government's efforts to encourage RETs uptake in Ontario. Through its RE initiatives, the government aims to stimulate clean-tech innovation, foster domestic RE manufacturing capacity and create jobs, helping the province overcome the economic challenges associated with the continuing decline of its manufacturing sector and the impacts of the recent economic crisis (Duncan, 2009). With the passage of the GEGEA, 2009 the government projected the creation of 50,000 new direct and indirect jobs, of which 40,000 jobs would be related to RE, by 2012 (AGO, 2011). As in the case of Germany and Denmark, Ontario has supported domestic RE companies and jobs through a combination of direct and indirect measures. FIT policy fosters local RE industry by driving the demand for RETs. A distinctive feature of the Ontario's original FIT program was the domestic content requirement (DCR) for wind and solar power generation facilities, i.e. the requirement for project developers to source a certain percentage of project parts and labour from Ontario. DCR was the government's key policy to directly support local RETs manufacturing by ensuring that demand for RETs translated into demand for Ontario-made products and jobs (Brooks, 2013). In addition, the government supports RE businesses and jobs through five-year Next Generation of Jobs Fund (NGOJF), which helps businesses advance environmentally-friendly projects and support job creation in several focus areas, including clean technology (OMEDT, 2008). The Fund includes the Strategic Opportunities Program (SOP), which provides support for seed investments, and the Jobs & Investment Program (J&IP), which supports business expansion/retention and attracts foreign investment. In order to be considered for J&IP funding, the developer must invest CAD 25 million or create/retain 100 high value jobs within five years (OMEDT, 2008). Ontario has also made progress in building the skilled workforce needed to meet the demand for clean energy jobs. Ontario's universities and colleges have been expanding educational and training programs relevant to RE (NWPB, 2010; MaRS, 2010). The Greater Toronto Area in particular has a strong student base in wind and solar sector, offering over 100 solar-related and 45 wind-related university programs (MaRS, 2010). Overall, more than 225,000 students are enrolled in Southern Ontario universities and colleges in green energy-related programs (MaRS, 2010). The Ontario government committed CAD 5 million in investment to develop the Green Jobs Skills Strategy that responds to labour demand in the emerging green energy sector, including electricity (MTCU, 2010).

The economic impacts of Ontario's RE subsidies have been a subject of debate. The government claims that its RE initiatives have been a success, attracting more than CAD 27 billion in private sector investment and creating more than 31,000 jobs and over 30 clean energy companies (BGC, 2012; OME, 2012; OME, 2013c). In its FIT review report of 2012, the government states that Ontario is on track to creating more than 50,000 jobs, although there is no longer any time frame given on when those jobs will be created. In contrast, Bohringer *et al*. (2012) have found that Ontario's current FIT policy is likely to generate roughly 12,400 new jobs in the RE generation and manufacturing sectors, suggesting that the government's claims about the significant contribution of RE to employment may be an overstatement.

Several recent developments in the provincial RE policy and the international markets for RETs have created uncertainty about the future growth of Ontario's clean-energy industry and the jobs it supports. The tight administrative caps on the FIT program and project size may have created uncertainty in the market, discouraging future investment (Gipe, 2010). Furthermore, DCR was removed from the FIT program, following the WTO's ruling that these provisions discriminate against foreign suppliers and, therefore, contravene with international guidelines

(OPA, 2014g; Babbage, 2013). This has led to concerns that the gradual scaling down of the RE manufacturing sector and job losses may follow (Walker, 2013). Further uncertainty stems from the fact that many jurisdictions are currently seeking to develop an internationally competitive RE industry, which is key to long-term manufacturing jobs. An emerging player in the international market, Ontario faces stiff competition from well-established technology exporters, such as Denmark and Germany, as well as emerging actors, such as China, whose cheap goods have already had a devastating impact on US and EU manufacturers (Gallucci, 2012). These global developments in the RE sector might be foreclosing some of the policy options for promoting local manufacturing industry in Ontario.

Despite these developments, there are still opportunities for Ontario to learn from German and Danish experiences with regard to policies fostering RE industry. These leading RE jurisdictions have created an internationally competitive RE industry and long-term employment in the sector without the DCR policy. As discussed previously (please see Appendix A), Germany and Denmark have established a favourable framework for RE industry through long-term national RE strategy, coupled with favourable FITs, targeted support for RE R&D&D, large-scale provision of soft loans for RE projects and strategies to encourage the dissemination of domestically manufactured RETs around the world. Lessons from these jurisdictions suggest that by adopting long-term RE targets and loosing tight caps on the FIT program size Ontario can create more certainty and stability in the market, encouraging local technology manufacturing. Continuous, better targeted and more coordinated support for RE R&D&D can help local companies gain competitive advantage in RETs by improving technology performance, reducing costs and ensuring the supply of qualified workers (GEAA and SOA, 2011). In the long run, dedicated resources should be allocated toward researching potential foreign markets and facilitating relationships between domestic companies and foreign agencies responsible for RE procurement to help Ontario-based companies compete for global markets (GEAA and SOA, 2011). Ontario has made a positive step in this direction by launching the new Advanced Energy Centre (AEC) at Toronto's MaRS Discovery District. The AEC aims to foster the adoption of innovative energy technologies, such as those in the energy data, distributed generation and energy storage, and help develop international market opportunities for domestic innovations (MaRS, 2014). Ontario is contributing CAD 5 million over three years towards the centre (OP, 2014).

A shortage of competitive equity and debt financing options available to RE projects has been identified as another relevant issue in Ontario (GEAA and SOA, 2011; Cameron, 2011). Although some of the province’s financial institutions offer special financial packages for the development of RE projects, Canadian banks still perceive RE projects to be relatively high-risk and have not yet developed a significant presence in the RE sector. The majority of Canada’s major FIT supported RE projects have been financed with debt from German banks, which have developed expertise in the sector and a comfort level with RE (Cameron, 2011). In order to foster RE projects in Ontario, it will be necessary for the province’s financial institutions and insurers to develop a strong base of expertise in the sector (Cameron, 2011). There are opoortunitues fir the Ontario government to expand financing options for RE projects, for example, by engaging with domestic financing institutions on the viability of offering competitive financing options and allowing foreign institutions greater access to the Ontario’s RE market (GEAA and SOA, 2011; Cameron, 2011).

More effort is needed to sustain RE education and training programs to adequately meet the workforce needs of the rapidly growing RE industry (ESC, 2009; Etcheverry *et al*., 2009).

Comprehensive RET-related training is still fairly limited across the province (Etcheverry *et al.*, 2009). The lack of funding remains one of the significant barriers to the delivery of relevant programming (ESC, 2009). More funding is required to support academic research, internship opportunities and scholarships for students and academic chairs (ESC, 2009). In Ontario, most developers are not yet ready to provide sponsorship for such initiatives "as they themselves are just getting their first projects off the ground" (Etcheverry *et al.*, 2009:18). This suggests that the provincial government should play a more active role in assisting providers of RE-relevant training. Collaborative efforts between government, industry, training institutions and other stakeholders can help facilitate effective implementation of skills initiatives (Cedefop, 2010; ILO, 2011).

A large-scale shift from conventional energy sources to renewables in the electricity sector will likely create job losses in other sectors of the economy (Bohringer *et al*. 2012). This highlights the need to ensure a just transition to RES for those working in the declining sectors. The government should consider developing an overarching provincial action plan targeting specifically skills development and other forms of assistance for displaced workers.

A.3.9 Information, Education and Research on Impacts

In contrast to Germany and Denmark, which were relatively successful in securing local support for RE development for many years, the Ontario government's FIT policy has met with increasing opposition over time. While many factors have contributed to this situation, the lack of effective education and communication of RE-related topics is, arguably, one of the most important. Renewables is still a relatively new sector in the province and there is a lack of knowledge and experience with RETs (Etcheverry *et al*., 2009). There are also many myths and misconceptions around RE benefits, impacts and costs, often formed by special interest groups opposing RE expansion (Etcheverry *et al*., 2009).

The Ontario government has launched a number of measures and initiatives to address public concerns about RES. For example, the Education and Capacity Building (ECB) Program supports education initiatives in the RE sector (OPA, 2014a). Several government agencies and departments have supported studies to better understand the potential effects of RETs on human well-being and the environment (see for example, CMOH, 2010). These research projects can help determine if policy updates are needed with regard to RE siting and operation.

While there have been valuable initiatives to research and communicate RE-related topics, the government's efforts in this area have often been delayed, inconsistent and piece-meal. There has been a lack of empirical research on the effects of RETs within Ontario as well as the socio-economic impacts of the provincial RE promotion policies. The lack of evidence-based information on these issues has a number of important implications, which can be exemplified by discussions surrounding the employment impacts of Ontario's FIT policy. The government reported in 2013 that 31,000 jobs were created in RE sector (OME, 2013c) but provided no details about the nature or distribution of these jobs or the economy-wide employment effects associated with RE expansion. When such information is not available, it is difficult for the public to form a well-informed opinion and engage in a balanced and nuanced debate about RES and it is easier for vested interest groups to influence public discussion by presenting only one side of the story. The government, thus, should take a more active role in fostering a fact-based public debate on the socio-economic impacts of RES by supporting empirical research into these issues and disseminating evidence-based information. As demonstrated by the example of

Germany, such efforts can help better understand the causes of public opposition to RES in the province.

While strategic and targeted research is needed to fill the gaps in our knowledge about the effects of RES, it is also important to ensure that scientific uncertainty is not used to delay RE development and justify decisions already made. The Ontario government's moratorium on off-shore wind developments in the Great Lakes provides an instructive case study. The basis for that 2011 decision was limited experience and knowledge with the technology, despite previous claims that enough information was collected to make informed decisions on offshore wind (Taylor, 2011). Since 2011, the government also published three reports examining the impacts of off-shore wind farms, which again call for more studies (Spears, 2013). There are criticisms that scientific uncertainty is used by the government to delay RE development and justify decisions already made (Taylor, 2011).

The costs of RE support are a key area where more effective communication is required in Ontario. An important condition to securing sustained public support for RE policy is that public perceives RE costs as acceptable (Stokes, 2013). While the contribution of RE costs to rising energy bills has been much publicized (see for example AGO, 2011, OSPE, 2012), the rising costs of other components of the electricity system as well as historical subsides to conventional power have received less attention in the debates on the cost of RES-E support in Ontario. This may have contributed to the public perception that Ontario's RE subsidies are unnecessarily generous and that they place an unfair burden on ratepayers (Stokes, 2013), driving opposition to RE. These observations suggest that the government should think very carefully about how the costs of RES support are communicated to the ratepayers and the public (Stokes, 2013). Putting the costs of RES support in the context of other electricity system costs can help create a more informed opinion about these costs, making them more acceptable for ratepayers. The rise in electricity costs in the province has been driven by a combination of factors, including the costs of nuclear refurbishment, infrastructure upgrades, new gas power plants coming into service as well as the introduction of RES (ED, 2014). In addition, putting RE subsidies in their historical context can help the public understand the importance of early government's investments in developing new energy sources. All energy generation technologies have been historically funded for their strategic role in the economy (Portillo *et al*., 2009; Lauber, 2013). Although lately funding has been oriented to the support of RES, historically, the vast majority of energy subsidies have been allocated to fossil fuels and nuclear energies. The subsidies and aids received by fossil fuels and nuclear energy should be considered in the discussions of the "extra" costs of different energy options. The German and Danish case studies have shown that building support for RE through education and information dissemination activities for professional target groups and ordinary citizens can help create a more positive perception of RE, suggesting that this policy area should be prioritized in Ontario.

A.3.10 Grid Integration

With the passage of GEGEA, 2009, the Ontario government has implemented a range of initiatives to enable the expansion and reinforcement of transmission and distribution (T&D) systems to accommodate new RES. The Economic Connection Test (ECT) was established as part of the Feed-in Tariff (FIT) program to identify economically justifiable transmission expansion projects (OPA, 2010a). As part of the Test, a threshold of CAD 500/kW was set as a screening tool to initiate the development of new transmission capability (APPrO, 2010). In addition, the GEGEA introduced a requirement for electricity distributors and transmitters to provide proactive plans for system expansion and grid infrastructure modernization necessary to accommodate RE growth (Norman, 2011). A smart grid policy has been an important component of the government's efforts to enable more effective integration of RES into the grid (ECO, 2010b). In 2009, the government allocated CAD 50 million for the creation of a five-year Smart Grid Fund to support the advancement of smart grid technologies through research, capital, and demonstration projects (MOF, 2009).

Despite government's efforts to ensure timely and adequate grid expansion, the lack of T&D capacity has been a major obstacle preventing new renewable generation from coming online in Ontario. The FIT program has produced a much higher level of interest than could be accommodated by the electricity grid. Many new points of generation were created in northern Ontario and there was insufficient grid capacity to connect new generation from numerous remote and widely dispersed generators (AGO, 2011). The ECT process was taking too long, discouraging investment (GEAA and SOA, 2011). The lack of grid capacity contributed to long grid connection queues, as many projects were waiting for T&D lines to be built (AGO, 2011).

The government has implemented a number of important measures to address RE integration challenges. The ECT was abandoned. Instead, the government committed to invest about CAD 2 billion into five priority transmission projects in its LTEP, 2010. The projects have been selected in large part on the basis of their ability to allow greater renewable connection and should be completed by 2017. Together with various other system upgrades, these priority projects will enable connection of approximately 4,000 MW of renewable generation (OME, 2010). The updated LTEP, 2013 confirmed government's commitment to transmission investment for the purposes of RES integration. The plan identifies connecting remote northwestern First Nation communities as a priority for Ontario. The move toward a cleaner supply of power in these remote communities has been identified as one of the drivers for this project (OME, 2013a). These developments suggest that the government's approach to grid expansion planning has been evolving from a reactive approach, where expansion projects are initiated when demand for new connections is in place, to a more proactive and integrated approach, whereby transmission investments are planned in anticipation of generation investments (Norman, 2011).

Despite some progress, a number of grid-related challenges to RES integration remain in Ontario. In particular, the RE industry representatives claim that state-owned provincial utility Hydro One and local distribution companies place onerous and costly interconnection requirements on FIT projects and adhere to archaic rules which significantly reduce the interconnection capacity available for micro-scale systems (GEA and SOA, 2011; CanSIA, 2012). In particular, Hydro One's technical limit for connecting micro-sized projects to its distribution system, known as the 7% interconnection rule, is remarkably low, unduly constraining the ability of many micro-FIT projects to connect to the distribution systems (CanSIA, 2012; Farrell, 2013). The experiences in Germany and Denmark suggest that the integration of FIT projects will likely proceed much quicker with supportive utilities and agencies. This suggests that Ontario should encourage utilities to be more accommodating towards renewables, for example, by requiring them to use evidence-based practices for interconnecting projects and simplify interconnection requirements (GEA and SOA, 2011; Farrell, 2013).

Providing backup to variable RES has been another key challenge of integrating RES into the provincial grid, intensified by the electricity oversupply problem (OSPE, 2012). The province currently relies on nuclear, natural gas, and hydraulic plants to produce base load electricity and provide backup for renewables (OSPE, 2012). Due to limited maneuvering capability of hydraulic and nuclear generation, the periods of surplus base load generation have led to an increase in the shutdown of nuclear plants, hydraulic spills and electricity exports at low, sometimes at negative prices (OSPE, 2012). These costly methods of managing surplus generation have contributed to the rising electricity prices (OSPE, 2012), and, as a consequence, rising sentiment against renewables.

The Independent Electricity System Operator (IESO), which manages the reliability of Ontario's power system, has been incorporating new technologies, processes and rules in its system to enable more effective RE integration into the electricity system and market operations. For example, the IESO's Renewable Integration Initiative (RII) focuses on three main areas: forecast, visibility and dispatch of RES. Within each of these areas the IESO is implementing specialized tools and procedures, such as centralized forecasting for RES and dispatch of variable RES (IESO, 2010). The new dispatch rules allow curtailing wind and solar output in times of surplus supply, providing the system operator with increased flexibility (Bailey, 2013). There is, however, a negative consequence: frequent curtailment of RE generation decreases the environmental benefits of renewable power while increasing its costs (OSPE, 2012).

Greater integration and cooperation in the energy sector between Ontario and neighbouring provinces/states can help more effectively address Ontario's backup and surplus supply challenges while also delivering additional economic and environmental benefits for all parties. Ontario has interconnections to electrical grids in Manitoba, Minnesota, Michigan, New York and Quebec, with about 4,800 MW of transfer capability to these 5 adjoining grids (OSPE, 2012). The power systems in these jurisdictions can be viewed as a single large-scale power system, which could in principle be operated as a single entity (Ring *et al.*, 2008). Hydro power from provinces and states with abundant water resources, such as Manitoba and Quebec, could, in theory, provide Ontario with important “firming” support for its growing fleet of renewable power generators. In turn, Ontario could export zero GHG emitting electricity to neighbouring provinces (Gibbons and Guilbeault 2009). There are currently many obstacles to implementing these arrangements. One key barrier is the Ontario government’s commitment to complex and polluting conventional energy sources (Pineau, 2012). Political commitment to nuclear energy and natural gas remains an important aspect of Ontario’s energy policy landscape. Due to this commitment, there is currently limited interest in improving interprovincial cooperation in the energy sector. As discussed earlier, continued reliance on these resources is inefficient, costly and environmentally unsound. The dependence on natural gas is problematic due to its contribution to GHG emissions, price volatility and future availability concerns (AGO, 2011; OSPE, 2012). Nuclear power is a high-risk option, both economically and environmentally (Winfield, 2006). Projects to build and refurbish nuclear reactors have been late and significantly over budget in Ontario (OCAA, 2010; Weis *et al*., 2010). These observations highlight the need to reconsider the role of nuclear and natural gas as a backup capacity for RE and explore options for achieving greater integration and cooperation in the energy sector between Ontario and neighbouring provinces and states.

The piecemeal organization of North American electricity sectors, Canadian in particular, is another key barrier to greater collaboration in the electricity sector (Pineau, 2012). Ontario and neighbouring provinces/states operate their electricity sectors independently with their own market rules, operational procedures and electricity export policies (Ring *et al*., 2008). Regional trade is limited due to a host of constrains, including the absence for coordinated regional transmission planning, differing pricing methods and transmission cost recovery mechanisms, divergent tax regimes, the application of different regulatory and compliance requirements in different markets, complexity and lack of transparency in the system (Ring *et al*., 2008; Pineau, 2012). The Ontario's experience stands in stark contrast to Germany and Denmark, which have been able to expand their electrical linkages to markets in the neighbouring jurisdictions and reach a series of agreements between regulators and transmission system operators in the participating jurisdictions. These arrangements allowed Denmark and Germany to handle a large amount of renewable power on their systems. The experiences of these jurisdictions suggest that challenges to greater integration can be overcome. According to Pineau (2012), the integration of electricity sectors between Canadian provinces does not require constitutional change or creation of new pan-Canadian structures. The essential prerequisites are harmonizing rate and trade principles between the provinces, permitting greater coherence in the planning, and construction of electricity infrastructure (Pineau, 2012). These observations support strongly the argument that Ontario should consider the opportunities to increase integration of Ontario's electricity sector with sectors in neighbouring provinces/states. Greater integration can help more effectively address Ontario's backup and surplus supply challenges while also delivering additional economic and environmental benefits for all parties

Appendix B. Ontario Renewable Energy Potential

Resource	Potential installed capacity (electricity generation)	Comments	Source
Hydro	1,000 MW	Achievable potential (2004-2020); refurbishment & small low-impact hydro;	Etcheverry *et al.* (2004)
	1,000 MW	Probable, committed and practical projects under 100 MW	Hatch Acres Report 2005
	3,699 MW	Projects under 50 MW	CHA (2008)
Wind	8,000 MW (45 TWh/year)	Acceptable resource (achievable contribution by 2012)	Etcheverry *et al.* (2004)
	628,067 MW (1,711 TWh/year), of this 598,884 MW (1,632 TWh/year); 29,183 MW (79 TWh/year) 46,827 MW (128 TWh/year)	Technical potential; projects over 10 MW; across entire province (onshore) North of 50th Parallel; South of 50th Parallel; Offshore potential in the Great Lakes	Helimax Energy Inc. (2005) cited in Peters *et al.*, (2007).
	8,727 MW (21,000 MWh/year)		AWS Truewind (2005) cited in Peters *et al.*, (2007).
Biomass	68.9 Mt, primary energy, or 2,450 MW (14.7 TW/h/year)	Available resource Achievable contribution (2010-2020);	Etcheverry *et al.*, 2004
	62.8 Mt dry biomass/year (86.54 TW/h/year)	Available resource	Layzell *et al.*, 2006
	15.69 Mt dry biomass/year (1.87 TWh/year)	Available resource	Khan (2009)
Solar	1263 MW (1,263 GWh/year)	Achievable PV contribution (2025); plus 113.1 PJ/year (2025) thermal contribution PJ/Year	Etcheverry *et al.* (2004)

	5.74 GW peak power output (6,909 GWh/year)	Rooftop PV in the south eastern region of Ontario	Wiginton *et al* (2010)
	90,000 MW (108,000 GWh/year)	Solar farms in south eastern Ontario	Nguyen and Pearce (2010)

Appendix C. An Overview of Main Potential Benefits, Challenges and Impacts for Major Renewable Technologies

RE technology	Potential benefits	Potential challenges and impacts
Bioenergy	• **Social:** improve resource utilization; employment and economic development • **Environmental and health:** low life-cycle emissions, low pollution; low impacts on other environmental values; related health benefits • **System-related, cost, technological:** Predictable and dispatchable electricity generation	• **Social and economic:** land use conflicts • **Environmental:** high life-cycle GHG emissions; impacts on water use, soil quality and quantity, biodiversity conservation and air quality; • **Technological and cost:** project costs; low conversion efficiency; feedstock availability;
Hydroelectric power	• **Social:** improve resource utilization; employment and economic development; a cost-competitive option for remote and rural communities; • **Environmental and health:** low life-cycle emissions, low pollution; low impacts on other	• **Social and economic:** loss of land and the displacement of populations • **Technological and cost:** upfront capital; seasonal constraints on availability;

	environmental values; related health benefits • **System-related, cost, technological:** efficiency, flexibility and reliability; storage capacity;	
Solar energy	• **Social:** improve resource utilization; make use of empty rooftops and barren land; employment and economic development; • **Environmental and health:** low life-cycle emissions, low pollution; low impacts on other environmental values; related health benefits • **System-related, cost, technological:** free fuel;	• **Social and economic:** visual impact; land requirements; • **Environmental:** toxic substances used in the manufacture of some PV systems • **Technological and cost:** limited capacity factors; the need for advanced grid management and energy storage;
Wind energy	• **Social and economic:** improve resource utilization; employment and economic development; • **Environmental and health:**	• **Social:** nuisance from noise and flickering; high land use per unit of produced electricity; • **System-related, cost,**

	low life-cycle emissions, low pollution; low impacts on other environmental values; related health benefits • **System-related, cost, technological:** free fuel; low operating costs; relatively mature technology	**technological:** high capital costs; low capacity factors; complex to build and maintain (offshore); the need for advanced grid management and energy storage to manage variability;

Sources: FAO, 2007; IEA, 2007; Brown *et al*., 2011; IEA, 2010; IRENA, 2012a; IRENA, 2012b; IRENA, 2012c; Freris and Infield, 2008; IEA-ETSAP and IRENA, 2013; Sathaye *et al*., 2011; Müller *et al*., 2011

Appendix D: Interview Guideline

In this study, I aim to evaluate Ontario's current legal and policy framework for renewable energy (RE) – focusing in the power sector and on the development of policy ideas for improving this framework. I have examined Ontario's RE policies in terms of such themes as RE prioritization in official energy policy documents; research programs, development and demonstration (R&D&D); economic support schemes; planning and siting provisions; local participation in project development; support for local manufacturing; and grid integration initiatives. These themes are based on a detailed examination of policy parameters that have proved to be crucial for the successful development of the RE sector in leading jurisdictions such as Germany and Denmark. To better understand how Ontario's RE support framework can be improved, I am seeking the perspectives of experts, such as yourself, particularly regarding key policy options for strengthening Ontario's RE legal and policy framework.

You will be kindly asked to share your professional views on the main barriers to renewable energy deployment in Ontario and to highlight your view on how to overcome these barriers. Please note that all the information that you provide will be kept confidential. The results of the study will be published only in aggregate form and your identity will not be revealed.

The type of information I am most interested in includes:

A: Strong political support for RE has been an important condition to successful renewables development in Germany and Denmark, which has been demonstrated through the prioritization of RE in official energy policy documents, ambitious RE targets, phase-out of nuclear/fossil fuels, adoption of policies in favour of RE, funding provision etc.

In your opinion, to what extent political will represents a significant barrier to RE development in Ontario? What action should Ontario decision-makers/political leaders take to ensure that Ontario can become a leader in renewable energy?

B: Ontario's FIT program is a key mechanism for achieving RE development. In your opinion, what are the key weaknesses of the FIT? How should the FIT policy evolve over time to ensure maximum effectiveness and to avoid any perverse impacts?

C: Why opposition to certain renewables is becoming such a problem in Ontario and what should be done to foster greater public acceptance of RE in the province?

D: In our opinion, what are other major barriers (e.g. legislative, regulatory, market, financial, administrative, technological environmental and/or infrastructure) to renewable energy in Ontario?

Thank you for your time.

In your opinion, what are the key objectives that Ontario's FIT policy should promote and how does it deliver on its objectives?

Objective	Level of importance on a scale of 1 to 5: ***5 – very important;*** ***4 – important;*** ***3 – somewhat important;*** ***2 – somewhat unimportant;*** ***1 – not important at all;***	Ontario's FIT 3 success in delivering on these objectives: ***5 – very successful;*** ***4 – somewhat successful;*** ***3 – neither successful nor failure;*** ***2 – somewhat failure;*** ***1 – completely failure;***
Rapid renewables development to meet long-term RE targets		
Greenhouse gas reduction		
Increased economic and export market opportunities		
Localization of RETs manufacturing		
Sustainable job creation		
Minimize policy costs and ratepayer impact/ cost-efficient RE promotion		
Overall transparency in RE policy for developers, manufacturers and the public		
Innovation and early adoption of innovative technologies		
Displace base-load capacity (e.g. displace conventional base-load technologies)		
Encourage peak shaving		
Target distributed generation		
Encourage diversity in technologies, project sizes, and locations		
Promote local and community ownership		
Maximize project benefits for host communities		
Encourage use of specific waste streams (e.g. farm wastes, municipal wastes)		
Encourage high efficiency systems (e.g. cogeneration, repowering)		
Other		

Which elements of Ontario's FIT design should be improved to ensure that the program delivers on its objectives?

Design element	Ontario's FIT 3 design	Can be improved? How?
Eligibility	**Technologies**: solar PV, **on-shore wind, hydropower, biogas, biomass and landfill gas** **Project size**: up to 500 kW **Project owner type**: individuals, farmers, communities, local distribution companies, municipalities, broader public sector, non-profits, business owners	
Type of support	fixed rate	
Contract terms	20 years; 40 for hydro	
Tariff differentiation	Some differentiation by project size, location and/or application	
Tariff calculation method	Based on costs specific to each technology plus a profit	
Distribution of program costs	Equal burden sharing	
Tariff adjustment and program revision	Annual review of FIT prices; Capacity caps; Periodic program review; Inflation adjustment as measured by CPI (20% wind and hydro; 50% bioenergy; 0% solar PV)	
Bonuses and adders	Aboriginal groups, co-ops, municipalities, broader public sector	
Domestic content requirement	20% for on-shore wind; 19%-22% for solar PV	
Cost allocation for grid connection	Mixed connection charging: generator responsible for connection costs + shares the costs of required upgrades with grid operator	
Queuing procedures	Projects ordered based on priority points and time stamp	
Approval procedures	Single streamlined approval framework (REA process)	
Other		