Renewable Energy in Ontario:

An analysis of Ontario's proposed Feed-In Tariff program for promoting renewable energy development

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EXECUTIVE SUMMARY

Worldwide there has been a growing concern about sustainability, climate change and energy security. The promotion of electricity generated from renewable sources has been identified as a key means to reducing greenhouse gas emissions, moving renewable energy to the forefront of energy policy around the world. However, there continue to be significant cost, technological, legal, planning and siting barriers to renewable energy investment. To overcome these barriers, regulatory support mechanisms have been implemented in almost every industrialized country worldwide. The most dominant of these mechanisms is a feed-in tariff system that provides a fixed price for renewable energy for an assumed length of time.

This study is a comparative examination of the highly successful feed-in tariff program implemented in Germany and the Feed-In Tariff (FIT) program proposed in Ontario with the goal of identifying the successful design elements of Germany's program which could be applied in Ontario. This paper conducts a thorough review of the current body of literature regarding barriers to renewable energy investment, the use of taxes and subsidies to promote renewable energy, and dominant regulatory support mechanisms to promote renewable energy development. It then provides a review of renewable energy policy in Ontario and establishes a set of criteria that will be used to evaluate the effectiveness of renewable energy policy. A case study of Germany's renewable energy policy is used to evaluate the German feed-in tariff model and to identify policy design elements that have been effective in promoting renewable energy generation. An overview and evaluation of Ontario's proposed feed-in tariff program is then conducted, using Germany's experience as a basis for determining the potential effectiveness of Ontario's policy design. Based on this evaluation, recommendations are made to address areas where Ontario's policy can be improved.

There are five recommendations made for the FIT program and Renewable Energy Approval process that result from this study. The first recommendation is that Ontario needs to limit the Ontario Power Authority's right to cancel or suspend the FIT program at any time and should guarantee a minimum length of time that the FIT program will be operational for. The second recommendation is that the tariff level includes a differentiation in price based on location and/or resource efficiency. It is also recommends that a digression element be built into the tariffs to guarantee a consistent reduction in remuneration levels over time. The fourth recommendation is that the provincial content requirements for equipment be limited to a small percentage at the onset of the FIT program until the domestic manufacturing industry is able to supply all the necessary materials. Lastly, it is recommended that the Renewable Energy Approvals process include extensive municipal and public consultation requirements so that communities and municipalities feel engaged in the development process, in order to reduce opposition.

With a good policy design and proper implementation, the Feed-In Tariff program in Ontario could act as a model for renewable energy policy throughout North America, resulting in a significant growth in installed renewable energy capacity.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Increased environmental awareness in the 1960s stimulated the first wave of interest in generating electricity from renewable sources. This interest surged in the 1970s and 1980s as a result of the oil crisis and devastating nuclear accidents. However, it was not until the 1990s, when there began to be a widespread interest in sustainability and concern over climate change and energy security that renewable energy came to the forefront of energy policy around the world. A shift towards renewable energy generation and away from fossil fuels has been identified as a key element for reducing greenhouse gas emissions. Wind energy in particular has been recognized as playing an important role in achieving renewable energy capacity targets. Worldwide, wind energy capacity has been growing rapidly, with over 120,000 MW installed by 2008 (http://www.wwindea.org/home/index.php).

Germany has been seen as a pioneer in the renewable energy industry, becoming a world leader in renewable energy generation and equipment manufacturing. This success is often attributed to the implementation of a feed-in tariff model for procuring renewable energy in 1990. This model provides a fixed price for renewable electricity through a fixed, long-term contract. This has created a stable policy environment, increased investor certainty and encouraged technological innovation. Since 1990, countries throughout Europe have followed Germany's lead and implemented similar policies, resulting in a rapid growth in renewable energy generation throughout the continent.

Canada, however, has been lagging behind Europe, Asia and the US in the race to install renewable energy capacity. By the end of 2008, when excluding large hydropower, Canada had approximately 2.4 GW of installed renewable energy, compared to China with 76 GW, the US with 40 GW, Germany with 34 GW, Spain with 22 GW and India with 13 GW (REN21, 2009). Because of the significant cost, legal, planning and siting barriers that renewable energy projects face, regulatory support mechanisms (such as a feed-in tariff) are often required to stimulate rapid capacity installation. Ontario and Quebec, however, have become national leaders in renewable energy generation because they have recognized this need for support mechanisms and have implemented renewable energy policies. However, these policies have largely been in the form of a tendering system for renewable energy projects, where energy companies compete against each other to win contracts with the Ontario Power Authority, and the results to date have been relatively poor compared to countries such as Germany.

Ontario has recently made the decision to draw upon the success of the feed-in tariff system implemented in Germany and elsewhere. On May 14, 2009, the Ontario Legislature passed *Bill 150: the Green Energy and Green Economy Act, 2009.* This Act places a priority on the use of clean and renewable sources of energy and includes an advanced feed-in tariff (FIT) system for renewable energy, based on the German and French models. A second important element of the Act is the creation of a Renewable Energy Approval (REA) process, which is aimed at streamlining the permitting process for renewable energy projects and significantly reducing project development timelines. If designed effectively, the combination of the FIT program and the REA process could be groundbreaking for Ontario, resulting in a rapid growth in renewable energy generation for the province.

1.2 Purpose of the Study

Germany’s renewable energy policy since 1990 has been so successful in increasing the amount of installed renewable energy capacity in the country, stimulating new markets in technology development and manufacturing, and creating new jobs that it has become a world leader in the renewable energy industry. Much of this success has been attributed to its implementation of a feed-in tariff model for renewable energy generation.

The purpose of this study is to evaluate Germany’s renewable energy policy and identify its successful elements. These elements can then be used to assess Ontario’s proposed Feed-In Tariff program in order to predict how effective it will be in achieving its policy targets. The analysis can also identify policy design elements of Ontario’s FIT program that can be improved. From this evaluation, recommendations can be made to make the policy more effective.

Choosing the most effective renewable energy policy in Ontario can result in a significant increase in renewable energy generation, a reduction in greenhouse gas emissions and the promotion of a new ‘green economy’ that creates jobs and stimulates investment in the province. Therefore, it is important that regulatory support mechanisms implemented to promote the renewable energy industry are designed to be as effective as possible. Drawing upon the past successes of countries such as Germany, Ontario should be able to design a successful renewable energy policy that could act as a model for provinces and states throughout North America.

1.3 Methodology

This study is based on the collection and review of primary and secondary sources. The primary sources include interviews with an experienced renewable energy project developer, attendance at stakeholder consultation sessions held by the Ontario Power Authority to review and comment on the proposed Feed-In Tariff system, attendance at a multi-sector workshop held by the Ontario Ministry of the Environment to discuss provincial requirements for the proposed Renewable Energy Approval process, and discussions with wind energy project developers as a member of the Canadian Wind Energy Association subcommittee that was formed to examine and discuss issues related to the new FIT program and REA process. The secondary sources for this study include books, journal articles, government documents and websites.

This study first conducts a thorough review of the current body of literature regarding barriers to renewable energy investment, the use of taxes and subsidies to promote renewable energy, and dominant renewable energy policy strategies. It then provides a review of renewable energy policy in Ontario from 2003 to 2009 and establishes a set of criteria that will be used to evaluate the effectiveness of renewable energy policy, based on past research. A case study of Germany’s renewable energy policy is used to evaluate the German feed-in tariff model and to identify policy design elements that have been effective in promoting renewable energy generation. An overview and evaluation of Ontario's proposed feed-in tariff program is then conducted, using Germany's experience as a basis for determining the potential effectiveness of Ontario's policy design. Based on this evaluation, recommendations are made to address areas where Ontario's policy can be improved.

CHAPTER 2: BACKGROUND

2.1 Definition of Renewable Energy Sources and Technologies

Renewable refers to an energy source's potential to be managed so that average annual energy output levels can be sustained indefinitely (Kozloff and Dower, 1993). According to Kozloff and Dower, "a renewable energy technology is the process whereby a renewable energy flow is converted into useful work of a specific thermodynamic quality," (Kozloff and Dower, 1993, p. 2). The renewable energy sources used in renewable energy technologies have been defined in the EU Directive 2001/77/EC1 as the following, non-fossil energy sources (Klein et al., 2008):

- Wind power
- Solar power (photovoltaics and solar thermal electricity)
- Geothermal power
- Hydro power
- Wave power
- Tidal power
- Biomass
- Biogas

These sources primarily draw energy from the sun, unlike fossil fuel and fission technologies, which are based on finite resource stocks. These resources are replaced rapidly by natural processes and do not have a limited supply. Renewable energy is also considered clean energy, because it does not produce toxins or pollutants that are harmful to the environment in the same manner that non-renewable energy does.

2.2 Why Renewable Energy?

The promotion of electricity generation from renewable energy sources has been a high priority in the energy policy strategy of the EU for decades and is now moving to the forefront of energy policy in North America and worldwide. This policy shift from supporting fossil fuel and nuclear power to renewable energy has been largely motivated by environmental and economic concerns (Mendonca, 2007).

Compared to other energy sources, renewables generate fewer air emissions and other environmental impacts throughout their life cycle (Kozloff and Dower, 1993). With increasing concern about global warming, climate change and the introduction of the Kyoto Protocol, promoting electricity produced by renewable sources has been identified as an important way to reduce greenhouse gas emissions emissions (Mendonca, 2007). Evidence has shown that in countries where renewable energy production has been well supported, carbon dioxide emissions have been saved in vast quantities (Mendonca, 2007). In addition to reducing air emissions, renewable energy production also reduces some of the environmental damages associated with the extraction and transport of fossil fuels (Kozloff and Dower, 1993). However, the intermittent and unreliable nature of some renewable energy sources, most notably wind, makes it more challenging for countries to meet a large percentage of their energy needs with renewable sources.

There are also large potential economic advantages of quickly developing existing renewable energy markets or creating new industries. The renewable energy industry has created hundreds of thousands of jobs. First movers, such as Germany, have taken huge market share in terms of technology development, manufacture and supply (Mendonca, 2007). The sector is growing rapidly, leaving enormous scope for others to take advantage of the opportunities in all parts of the supply chain (Mendonca, 2007).

The wind power industry in particular has seen a dramatic boom in the last two decades. Since the early 1990s, the wind power industry has shown exponential growth and often represents a large percentage share of new renewable energy generation worldwide

(Rechsteiner, 2008). It is for these reasons that, while this paper examines generation from all renewable energy sources, there will be a focus on the development of the wind industry.

2.3 Barriers to Renewable Energy Investment

Although wind energy has proven to have numerous environmental and economic benefits, there has been a slow transition to an economy based on renewable energy as opposed to fossil fuels or nuclear. This is largely due to the cost, technological, legal, siting and planning barriers that the wind industry faces.

2.3.1 Cost Barriers

Cost barriers to renewable energy include the large public subsidies for conventional energy such as fossil fuel and nuclear, high initial capital costs, larger transaction costs than conventional power plants, and environmental externalities of conventional energy that are largely ignored by investors (Mendonca, 2007).

Historically, governments have intervened in the energy markets, providing large subsidies for production and consumption that have favoured nonrenewable energy sources (Mendonca, 2007). These large public subsidies for energy can distort investment cost decisions and can make conventional energy appear to be more cost effective than renewable energy. Public subsidies can include direct budgetary transfers, tax incentives, research and development spending, liability insurance, leases, land rights of way, waste disposal and guarantees to mitigate project financing or fuel price risks.

Renewable energy also tends to have high initial capital costs compared to conventional energy, but lower fuel and operating costs over time (Mendonca, 2007). Thus, although renewable energy might be cost-competitive with conventional energy on a life-cycle basis, renewable energy investment will generally require higher amounts of financing for the same capacity compared to a conventional energy project. This can make it more difficult for renewable energy projects to get off the ground.

In addition to high initial capital costs, many renewable energy projects often face larger transaction costs on a per-kW capacity basis than conventional power plants (Mendonca, 2007). Transaction costs refer to the outlay in time and money to obtain agreements, get approvals, make decisions, arrange financing, and other similar activities required to get a project operational (Mirza et al., 2009). These transaction costs are a strong barrier to renewable energy development because renewable energy projects are typically smaller than fossil fuel projects and many transaction costs are essentially “fixed”, meaning they are roughly the same for a small project as they are for a large project (Mirza et al., 2009). Therefore, transaction cost per unit of energy produced from renewable energy projects is typically much higher than that from fossil plants, creating a competitive disadvantage. Secondly, renewable energy projects are typically more complex than fossil fuel projects. They require agreements among more parties, involve either multiple products or are fueled with by-products, and have broader connections with other aspects of community economic, social and development affairs, so they often involve more complex analyses and negotiations (Mirza et al., 2009). These higher transaction costs often make renewable energy projects much more costly to develop and build.

The final cost barrier that renewable energy projects face is that the environmental costs that fossil fuels incur are rarely included by investors in the bottom line used to make decisions (Mendonca, 2007). If externalities were factored in, some renewables, particularly wind power, would be less expensive than conventional energy sources.

2.3.2 Technological Barriers

Renewable Energy also faces many technological barriers. These barriers include the high capital cost and low capacity factor for many renewable energy sources in comparison to conventional power-production options, which results in overall higher costs. There is also often a non-availability of physical infrastructure, and transmission and distribution networks in site that have strong renewable resources, which leads to low exploitation of their potential. This is especially true in the case with wind energy and hydropower, where the best resources are often located in areas of the country with little or no transmission capabilities (Mirza et al., 2009). The intermittent nature of wind and solar energy result in low peak coincidence factors, making them unreliable sources for power supply during peak periods (Mirza et al., 2009). This makes it much more challenging for a country to rely heavily on wind and solar for a large percentage of their energy supply.

2.3.3 Legal Barriers

There are also legal and regulatory barriers faced by the renewable energy industry. In general, there is a lack of a legal framework in many countries for independent power producers. Often, power utilities still control a monopoly on electricity production and distribution and utilities may negotiate power purchase agreements on a project-by-project basis, making it difficult for project developers to plan and finance projects on the basis of known and consistent rules (Mendonca, 2007).

Utilities may also not allow favourable transmission access to renewable energy producers (Mendonca, 2007). Transmission access is necessary because some renewable energy resources, such as wind power, may be located far from population centres and would require new transmission access. This access may be blocked by transmission access ruling or right of way disputes.

2.3.4 Planning and Siting Barriers

Renewable energy projects also often face many siting and planning barriers. These can include a lack of coordination and cooperation within and between various ministries,

agencies, institutes and other stakeholder delays, which can delay the progress in renewable energy development and commercialization (Mirza et al., 2009).
The level of institutional capacity can also cause siting and planning barriers. For example, in the Netherlands, the utilities hold a dominant position, which creates little institutional capacity for successful siting of wind power facilities (Wolsink, 1999). In Germany, however, the 'electricity feed –in law' has stimulated parties other than the electricity utilities to invest in wind turbines, which has resulted in an impressive growth in wind power capacity (Wolsink, 1999).

Another barrier faced by renewable energy developers is a lack of a municipal or regional plan for renewable energy projects. Without a plan that expresses a political intention about the suitability of different geographical areas, the outcome of each application is uncertain and it often takes a municipality or region years to actually work out a plan that supports wind power development (Wolsink, 1999).

Renewable energy developers also often face restrictions on siting and construction, such as building restrictions based on height, aesthetics, noise or safety and competition for land use with agricultural, recreational, scenic or development interests. Wind, solar and biomass combustion facilities in particular have had to deal with these restrictions.

Opposition groups can also create planning and siting barriers for renewable energy projects, particularly for wind energy projects. Wind energy projects often face opposition due to concerns over noise pollution, visual impacts, and environmental impact, particularly on the bird and bat populations (Wolsink, 1999). Opposition groups can cause delays at the local and regional level by placing pressure on government officials and agencies to not grant project approvals and permits. The opposition to renewable energy facilities is often equated with the Not-In-My-Back-Yard (NIMBY) attitude (Wolsink 1999).

It is the combination of the above barriers, amongst others, that have made it difficult for renewable energy to compete with conventional energy sources. Regulatory support mechanisms are required to support renewable energy so that they may overcome these barriers to meet the growing targets for renewable energy generation worldwide. One of the most widely implemented policy instruments used to promote renewable energy generation in Europe is a feed-in tariff. The feed-in tariff model is considered to be the most successful scheme in use today for the development of electricity from renewable energy sources (Klein et al., 2008).

CHAPTER 3: POLICY INSTRUMENTS FOR RENEWABLE ENERGY

3.1 Taxes vs. Subsidies for Encouraging the Renewable Energy Sector

As mentioned previously, renewable energy faces cost barriers to investment because the environmental costs, also called ‘externalities’, of conventional energy sources such as fossil fuels, are rarely included by investors in the bottom line used to make decisions. To account for these externalities, decision makers will often use either a tax on polluters or a subsidy for clean energy producers. This allows for a more level playing field between energy technologies, making renewable energy generation more competitive with conventional sources.

3.1.1 Externalities

Environmental damages are costs that are borne by the public rather than exclusively by the producers and consumers of electricity themselves. They can also represent internal costs borne either in the present or in the future. These damages are known as ‘externalities’ in the economic literature (Redlinger, 2002). More formally, externalities are defined as benefits or costs generated as an unintended by-product of an economic activity that do not accrue to the parties involved in the activity and where no compensation takes place (Owen, 2004). Also, they are called ‘externalities’ because these impacts are not reflected in the market prices. Traditional energy planning has largely ignored the environmental externalities of power production, which has not discouraged technologies with high environmental impacts and discriminated against more environmentally benign technologies (Redlinger, 2002). Since the ultimate consumer of electricity generated from sources that have high environmental impacts does not pay these environmental costs, nor compensates people for harm done to them as a result of this form of electricity generation, they do not face the full cost of the services they purchase (Owen, 2004). This can result in an inefficient allocation of resources.

In principle, any targeted ratio between dirty and green energy can be achieved either by taxing the dirty sector, by subsidizing the green sector of the industry or both (Droge and Schroder, 2005). Market based tools such as taxes and subsidies are considered superior in terms of economic efficiency if they address environmental externalities in perfect competition (Droge and Schroder, 2005).

3.1.2 Taxes

In order to correct market imperfections caused by externalities, many economists recommend implementing an optimum environmental tax as the most efficient solution for re-establishing fair competition between power generation technologies (Menanteau, Finon and Lamy, 2003). Price increases will stimulate conservation measures, energy efficient investments, fuel and product switching and create changes in the economy's production and consumption structures that will better favour renewable energy technologies (Menanteau et al., 2003). However, taxes are faced with problems. These include difficulty achieving political acceptability and the inability to efficiently measure marginal social damage.

Taxes on nonrenewable energy sources can risk significantly reducing economic activity among energy intensive sectors, making this market based tool less appealing to governments (Fischer and Newell, 2004). It is also difficult to establish the proper tax level upon the activity of the generator of an externality. The tax should be equal to the marginal net damage produced by the activity (Baumol and Oates, 1971). However, it is not easy to obtain a reasonable estimate of the monetary value of the marginal damage. As such, the negative externalities stemming from the consumption of polluting energies are reflected imperfectly in energy prices. This leads policymakers to instead opt for the creation of incentives for electricity producers to adopt renewable energy technologies in the form of subsidies (Fischer and Newell, 2004).

3.1.3 Subsidies

Historically, the fossil fuel industry has received significant subsidies to encourage industry growth (European Environmental Agency, 2004). However, as the negative environmental impacts of fossil fuel have come to the forefront of energy policy, support for renewable energy has begun to increase steadily through the introduction of regulatory support mechanisms. These mechanisms, which act as subsidies, are necessary to attempt to correct the market imperfections caused by fossil fuel subsidies and the negative environmental externalities caused by polluting energy sectors.

Energy subsidies can come in many forms, including cash transfers paid directly to producers, consumers and related bodies, as well as transparent support mechanisms, such as tax exemptions and rebates, price controls, trade restrictions, planning consent and limits on market access (European Environmental Agency, 2004). The OECD defines subsidies as: ‘any measure that keeps prices for consumers below market levels, or for producers above market levels or that reduces costs for consumers and producers.’ (OECD, 1998). These subsidies can be broken down into ‘on-budget subsidies’, which are cash transfers paid directly to industrial producers, consumers and other related bodies, and ‘off-budget subsidies’, which are typically transfers to energy producers and consumers that do not appear on national accounts as government expenditure (European Environmental Agency, 2004). These may include tax exemptions, credits, deferrals, rebates, and regulatory support mechanisms (European Environmental Agency, 2004). Regulatory support mechanisms are a significant area of off-budget support for the energy sector. These mechanisms most commonly include price guarantees (such as a feed-in tariff) and demand quotas for specific energy sources.

The following section will examine regulatory support mechanisms for renewable energy, including quota systems, feed-in tariffs and investment and production incentives, in greater detail.

3.2 Policy Strategies for the Promotion Renewable Energy Generation

Due to the many barriers that renewable energy generation faces, it has been recognized that policy instruments are required for renewable energy generation to grow rapidly. Worldwide, governments have used both quantity-driven and price-driven promotion strategies to achieve the wider deployment of renewable energy capacities in their respective countries. In general, the objectives of these policies have been: to trigger investment in new renewable energy capacity; maintain, upgrade, and improve existing capacities; stimulate technological progress; trigger learning effects with respect to investment costs; minimize administration and transaction costs; and maintain or improve public acceptance regarding renewable energy technologies (Haas et al., 2004).

Quantity-driven regulatory strategies have included quota systems such as obligation/certificate systems and tendering systems. Price-driven regulatory strategies have included feed-in tariffs, investment incentives and production tax incentives. Voluntary strategies have also been implemented in some countries, such as shareholder programs, contribution programs and green tariffs; however, these have been far less successful in promoting electricity from renewable sources (Ragwitz et al., 2006). For this reason, this paper will focus on regulatory support mechanisms for renewable energy generation.

3.2.1 Quota System

Quota systems are generation-based, quantity-driven instruments. Under a quota strategy, a target in terms of a certain percentage of contribution (quota) from renewables in the electricity supply is set, usually through legislation (Enzensberger et al., 2002). A designated member of the electricity supply-chain is then held responsible for meeting this target. The target is often increased over time, with a specific final target and end-date (Mendonca, 2007). There are two main types of quota systems: an obligation/tradable green certificates system and a tendering system.

Obligation/Tradable Green Certificates (TGCs) System

This system is often referred to as the Renewables Portfolio Standard (RPS). Under an RPS, an overall target is set for the minimum amount of capacity or generation that must come from renewable energy sources, with the target usually increasing over time (Mendonca, 2007). At the end of the target period, the designated member of the electricity supply-chain must demonstrate, through the ownership of Tradable Green Certificates (TGCs) that they are in compliance with the set targets in order to avoid paying a penalty. The TGCs are based on the amount of MWh of renewable energy electricity and are provided to producers for the energy that they generate. Producers with surplus TGCs can trade or sell them; those with too few can build their own renewable capacity, buy electricity from other renewable plants, or buy TGCs from others (Mendonca, 2007).

The principle behind the quota system is that a renewable energy producer may receive additional financial benefit from the selling of certificates on the market, therefore, the target is set by the government but the certificate price is determined by the market (Fouquet and Johansson, 2008). This is the regulatory support mechanism for renewable energy found in countries such as Belgium, Italy, Poland, Romania, Sweden, and the UK.

Figure 1 shows an example of two distributors A and B who are assigned production targets *q*. To reach the objective *q*, distributor A, who has poorer quality resources, will incur a higher marginal production cost MC_A. The possibility of trading certificates enables him to limit his production to Q_A, and purchase certificates at the equilibrium price *p* to reach the target amount *q*. Distributor B, on the other hand, increases his production to Q_B and sells his surplus certificates on the market at price *p*. The ability to trade certificates results in a reduction in the cost of achieving the overall objective, shown by the shaded areas, compared with a system that does not have the flexibility of TGCs, where the operators are subject to constrains Q_A and Q_B (Menanteau et al., 2003).

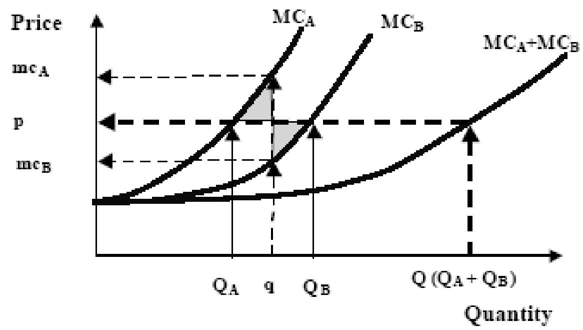

Figure 1: Operation of green certificates market
(Menanteau, Finon and Lamy., 2003, p. 803)

Tendering System

A different strategy adopted in countries that have a quota system in place is the tendering system, or a competitive bid process. Under this system, regulators define a reserved market for a given amount of renewable electricity and organize a competition between producers to allocate this amount (Menanteau, et al., 2003). Electric utilities are then obliged to purchase the electricity from the selected power producers. The competition is often focused on the price per kWh proposed during the bidding process and proposals from the potential developers are accepted until the level of capacity or generation required is achieved (Menanteau, et al., 2003). Those developers that win bids are guaranteed the price that they bid for their energy under a long-term contract.

Figure 2 illustrates how a tendering system works. The marginal cost P_{out} is the price paid for the last project selected which enables the quantity Q_{in} to be reached. The tendering system enables the marginal production costs of all the producers to be identified. The overall cost of reaching the target is then given by the area situated under the marginal cost curve. The extra cost associated with this system is either added to electricity bills in the form of a levy, or the cost is covered through cross-subsidization among all electricity consumers (Menanteau et al., 2003).

Tendering systems have been used in countries such as Ireland, France, the US and Canada.

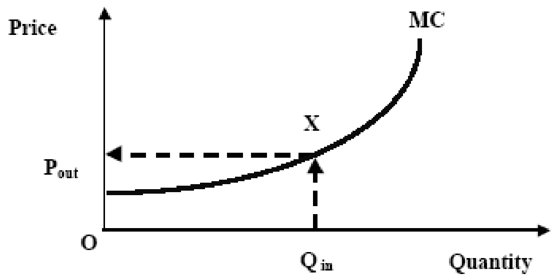

Figure 2: Tendering system
(Menanteau, Finon and Lamy, 2003, p. 803)

The quota system is generally favoured by free-market proponents who prefer leaving technology choice and price unregulated (Komor, 2004). Quotas can provide support for the least-cost renewable energy sources and ensure a maximum degree of competition among renewable generators.

The main risk for a TGC system is the volatility of the certificate price and its negative effects on investors, which happens if the market is limited and lacking liquidity due to a small number of participants. Under the tendering system, there is an uncertainty regarding the profitability of submitted projects, for which considerable preparation costs are incurred (Menanteau et al., 2003). This type of system also means that profit margins are considerably reduced and expected profitability rates are significantly lower than those associated with fixed tariffs (Menanteau et al., 2003). Also, under this system, overall diversity among renewable energy sources will be limited, because of the strong competition between project developers, favouring the most experienced industry participants; usually the largest firms and/or foreign companies who are able to bid lower prices than small- and medium-sized firms (Wiser et al., 2002). This can lead to a small number of large players in the renewable energy industry, which may result in the gaming of the bid prices under the tendering system. Because of this, a large amount of renewable projects that have won tenders will not actually end up being developed (Wiser et al., 2002).

The quota system has been the preferred regulatory support mechanism for renewable energy throughout the US. However, while there are many countries in Europe that also use a quota strategy, a feed-in tariff system has been identified by many as the most effective policy for rapid deployment of renewable energy generation (Mendonca, 2007; Klein et al., 2008; Butler and Neuhoff, 2004).

3.2.2 Feed-in Tariffs

A basic feed-in tariff (FIT) model is a generation-based, price-driven policy instrument. Under this model, all electricity generated from renewable energy sources and supplied to the electrical grid is compensated by fixed feed-in tariffs as a minimum sales price. This sales price is usually differentiated according to the type of renewable energy technology used and the size of the installations. Some countries also differentiate rates based on project location. The price paid to producers should be scientifically calculated to ensure that the rate is not set so low that renewable energy projects are no longer economically viable, or so high that the energy is purchased at a far higher price than necessary. The period for which that rate is received should also be set in law and should cover a significant proportion of the working life of the installation. The grid operators are then obliged to provide priority access to the grid for renewable energy installations (Mendonca, 2007).

The feed-in tariff model operates as a subsidy allocated to producers of renewable energy. The cost of subsidizing producers of renewable energy is covered either through cross-subsidies among all electricity consumers, by those customers of the utility obliged to purchase green electricity, by the taxpayer, or a combination of all three (Menanteau, et al., 2003). In the case of wind energy, producers are encouraged to exploit all available generating sites until the marginal cost of producing wind power equalizes the proposed feed-in tariff P_{in}, shown in **Figure 3**. The amount generated then corresponds to Q_{out}. All projects benefit from the tariff P_{in}, including those whose marginal production costs are considerably lower than the proposed tariff, therefore projects that have the lowest production costs will benefit more than those with higher production costs. The overall cost of reaching the objective is given by the area $P_{in} \times Q_{out}$.

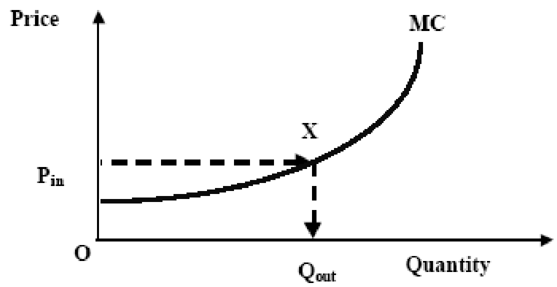

Figure 3: Feed-in tariffs
(Menanteau, Finon and Lamy, 2003, p. 802)

One of the most important aspects of a feed-in tariff design is the determination of the tariff level and the duration of support. As mentioned above, if a tariff is set at the incorrect level, renewable energy will not be economically efficient. One common system used to determine the feed-in tariff rate is to base the tariff level on the electricity generation costs from renewable energy sources (Klein, et al., 2008). By assessing costs, expected generation performance and estimated lifetime of the plant, an appropriate tariff level can be determined. The factors affecting the final generation costs can include the investment for plant construction, project-related costs such as licensing and planning, operation and maintenance, fuel type (for biomass and biogas), inflation, interest payments on capital invested, and payment to investors (Mendonca, 2007).

Alternatively, the rate paid for renewable energy can be based on the avoided external costs induced by electricity generation using renewable energy sources (Klein et al., 2008). Possible external costs that can be taken into account when fixing the tariff received by renewable energy producers can include climate change, health damage from air pollutants, agricultural yield loss, material damage, and effects on the energy supply security (Klein et al., 2008).

In order for a feed-in tariff model to be effective and efficient, the tariff level must be reviewed and revised regularly to verify that the tariffs are still at an appropriate level to reach the energy policy goals. Also, over time the power plant prices, which have a significant impact on the electricity generation costs, may undergo unexpected changes due to varying input prices or a technology breakthrough (Klein et al., 2008).

Another common feature of a feed-in tariff model is the purchase obligation for renewable energy, requiring electricity grid operators, energy supply companies or electricity consumers to purchase power generated from renewable sources over conventional energy sources. This purchase obligation is meant to provide investment security and attract investors to the renewable energy industry. However, some argue that a purchase obligation does not represent market compatibility (Klein et al., 2008).

While the feed-in tariff model is regarded as being a very effective policy instrument for promoting renewable energy, the model has its advantages and disadvantages. The feed-in tariff has been so successful because it has encouraged the steady growth of small- and medium-scale renewable energy producers compared to other renewable energy regulatory support mechanisms by making it easier for homeowners and communities to enter the market (Mendonca, 2007). It has also lowered transaction costs for producers and made financing easier by reducing economic risks. Greater flexibility can also be designed into the scheme to account for changes in technology and the marketplace (Mendonca, 2007).

On the other hand, if the tariffs are not adjusted over time, consumers may pay unnecessarily high prices for renewable power. This issue, however, can be addressed through frequent monitoring of the model. Many critics have argued that a feed-in tariff model has failed to be economically efficient (i.e. it has failed to ensure that electricity is generated and sold at minimum costs and failed to foster innovations that drive costs down) because feed-in tariffs are fixed (Sijm, 2002). However, the experience in countries such as Germany has shown that costs for renewable energy technologies have decreased under a feed-in tariff system (Wustenhagen and Bilharz, 2006).

The feed-in tariff system has become very popular in recent years and has been adopted in 20 of 27 Member States of the European Union. While these countries may all use a system of feed-in tariffs to promote renewable energy generation, the design of these systems differ greatly from country to country. Some of these differences include whether or not a purchase obligation exists for, the method used for the determination and adjustment of the tariff level, concepts applied to account for different generation costs within one technology and whether or not there is automatic tariff regression, where tariffs are lowered consistently over time (Klein et al., 2008). These policy design differences can be seen in **Table 1**. The ‘purchase obligation’ in this Table refers to the implication that electricity grid operators, energy supply companies or electricity consumers are obliged to buy the power generated from renewable energy sources. A ‘stepped tariff’ is a tariff system where different levels of remuneration are paid for electricity generated by the same renewable energy technology. This is done as a way to take into account the differences in the costs of electricity generation within the same renewable energy technology that can be caused by different plant size or the diverse external conditions at different sites (Klein et al., 2008). **Table 1** also refers to ‘tariff digression’ which refers to a system where tariff levels are dependent on the year that a renewable energy plant begins to operate and each year, the tariff level paid for new plants is reduced by a certain percentage. ‘Premium options’ listed in this table refer to different premiums and incentives applied for features such as building integrated PV, high efficiency of plants and regular electricity production (Klein et al., 2008). ‘Equal Burden Sharing’ is a method used to equally distributed costs among all electricity consumers by including them in the power price (Klein et al., 2008). Lastly, the ‘forecast obligation’ in **Table 1** is a situation where the operators of a renewable energy plant are obliged to predict the amount of electricity they plan to feed into the grid (Klein et al., 2008).

Country	Purchase obligation	Stepped tariff	Tariff degressio n	Premium option	Equal Burden Sharing?	Forecast obligation
Austria	x	x	–	–	x[1)]	–
Bulgaria	x	x	–	–	–	–
Cyprus	x	x	–	–	x	–
Czech Rep.	x (for fixed tariff)	x	–	x	x	–
Denmark	x (except for wind onshore)	x	–	x (wind)	x[1)]	–
Estonia	x (for grid losses)	–	–	x (new draft)	x	x (new draft)
France	x	x	x (wind)	–	x	–
Germany	x	x	x	–	x[1)]	–
Greece	x	x	–	–	x	–
Hungary	x	–	–	–	x	–
Ireland	x	x	–	–	x	–
Italy	x	x	x (PV)	–	x	–
Latvia	x	x	–	–	–	–
Lithuania	x	–	–	–	x	–
Luxembourg	x	x	–	–	x	–
Netherlands[3)]	-	x	–	x	[2)]	–
Portugal	x	x	–	–	x	–
Slovakia	x (for grid losses)	x	–	–	x	–
Slovenia	x (for fixed tariff)	x	–	x	x	x
Spain	x (for fixed tariff)	x	–	x	x	x

1) Austria, Denmark and Germany apply an equal burden sharing with advantages for electricity intensive industries (see Chapter 4 on page 64).
2) In the Netherlands each electricity consumer contributes the same amount of money to RES-E support, regardless of the amount of electricity consumed (see Chapter 4 on page 64).
3) In the Netherlands no FITs were paid for electricity from RES-E plants that applied for support after the 18th of August 2006, thus pausing the support. In April 2008 feed-in tariffs were re-established as main support mechanism introducing new tariffs.

Table 1: Feed-in tariff designs in the EU Member States

(Klein et al., 2008, p. 10)

While the policy design principles may differ, the overall concept of the feed-in tariff remains the same. However, it is these design elements that may explain why some countries have had great success with the FIT model (i.e. Germany, Spain, Denmark) while others have been less successful (i.e. Greece) (Klein et al., 2008).

3.2.3 Other political instruments and complementary policies

Most countries that have implemented a promotional strategy for renewable energy generation have opted for one of the regulatory support mechanisms described above, combined with other political instruments such as direct subsidy programs (which are sometimes financed by the revenue of energy taxes), soft loans, tax allowances, exemptions for renewables from energy taxes, and information campaigns (Reiche and Bechberger, 2004). Two of these complementary policies include investment incentives and production incentives. While some countries do rely solely on these instruments to promote renewable energy generation, as seen in **Figure 4**, the majority rely mainly on either a quota system or a feed-in tariff and use investment and production incentives to complement these strategies.

Investment Incentives

Investment incentives are often used to reduce project developers' capital costs and thus provide incentives to developers to invest in renewable energy. Incentives are typically paid either by the government through a general tax base or by utility customers through a surcharge on their utility bills (Wohlgemuth and Madlener, 2000). These incentives can take many forms, including investment incentives provided per kW of rated capacity or as a percentage of total investment cost, investment tax credits that serve to lower capital costs by allowing developers to reduce their taxes by the amount invested in qualifying projects, property tax reductions and value-added tax rebates (Wohlgemuth and Madlener, 2000). One of the advantages of this type of incentive is that it is a simple system where subsidies are paid up front. However, the incentive does not differentiate 'good' projects that are likely to generate an efficient amount of electricity, from 'bad' projects that may produce very little energy (Wizelius, 2007).

Production Incentives

Similar to investment incentives, production incentives are subsidies paid per kWh of electricity generated, used to reduce the cost of producing electricity from renewable sources. These incentives can be provided as a direct cash subsidy, paid per kWh of electricity produced, or as a production tax credit. Production incentives can be superior to investment incentives by eliminating the temptation to inflate initial project costs and by encouraging developers to build reliable facilities that maximize energy production (Redlinger, 2002). However, because they are paid per kWh generated, renewable energy project developers and investors must rely on the assumption that the incentives will continue to be available in future years, which is not always the case (Redlinger, 2002).

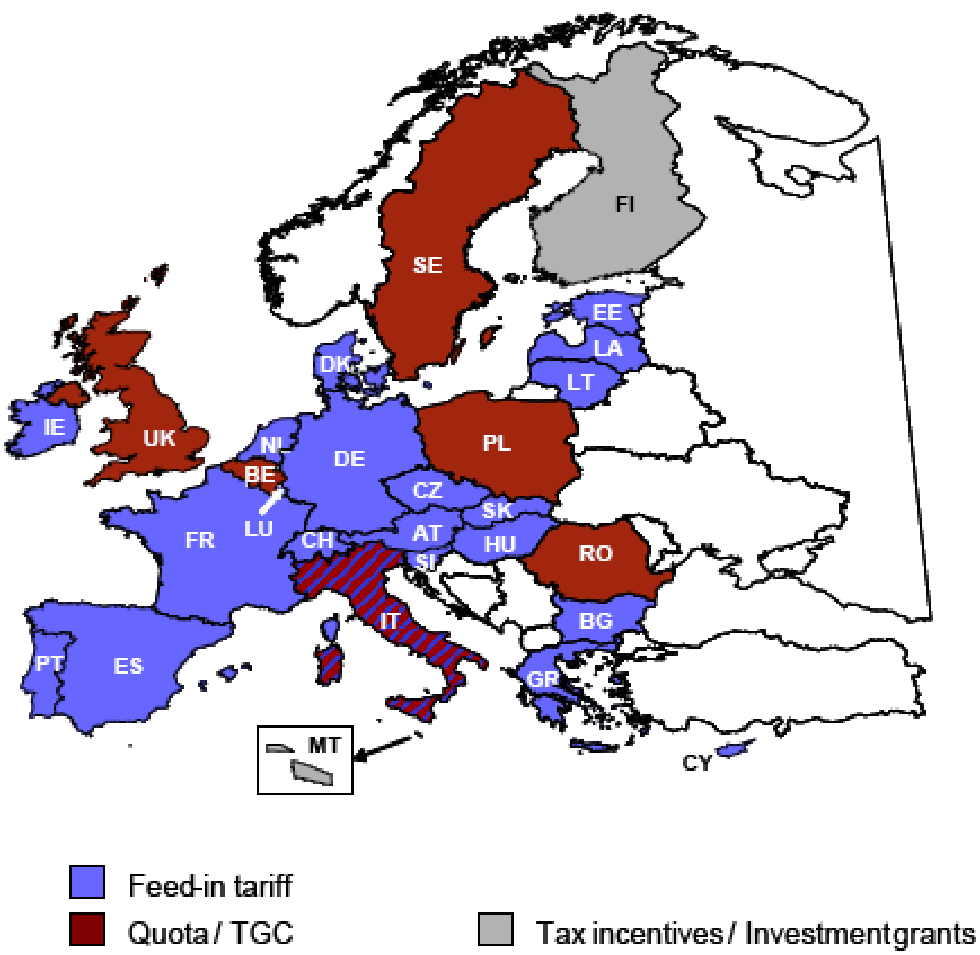

Figure 4: **Currently applied schemes for the support of electricity from renewable energy sources in the EU-27 countries**
(Klein et al., 2008, p. 8)

Some form of promotional strategy for renewable energy generation has been implemented in almost every industrialized country worldwide (Klein, et al., 2008). While countries such as the US and UK have opted for a quota system, a feed-in tariff model has been argued by many to be the most effective strategy for increasing renewable energy generation when designed and implemented properly (Mendonca, 2007; Klein et al., 2008; Butler and Neuhoff, 2004). While quota systems have been the dominant policy instrument in use in North America to date, the province of Ontario currently plans to implement a feed-in tariff system based on the successful German and French models through the introduction of *Bill 150: The Green Energy and Green Economy Act, 2009* (also referred to as the Green Energy Act or GEA).

CHAPTER 4: RENEWABLE ENERGY POLICY IN ONTARIO

4.1 Renewable Energy Policy in Ontario until 2009

Over the last decade, renewable energy policy in Ontario has undergone dramatic changes. It has gone from being non-existent on the political agenda in 1995, to having a Renewables Portfolio Standards and tendering system for procuring renewable energy capacity introduced by 2003. By 2006, the first feed-in tariff system was introduced for small-scale energy producers, leading to the implementation of a full FIT program for all renewable energy producers of any size by 2009. These drastic changes can be attributed to the change in ruling party in the government, how the regulatory governance works in Ontario with regard to energy and an increasing focus on environmental issues and declining fossil fuel supply. The following section looks at the change in renewable energy policies in Ontario from 1995 to 2008, leading up to the proposal of the Green Energy Act in 2009 and assesses the success of these policies in meeting renewable energy targets set by the government.

4.1.1 1995-2003: The Progressive Conservative Government's Renewable Energy Policy

When the Progressive Conservative Party won a majority of seats in the Ontario legislature in 1995, renewable energy was not a part of their political agenda. Even with a report of the Advisory Committee on Competition on Ontario's Electricity System in 1996 and the Government's White Paper on electricity in 1997, renewable electricity still received only limited attention (Rowlands, 2007). During the late 1990s, the Government maintained that the opening of the electricity market was all that was needed to promote renewable energy (Rowlands, 2007). The electricity market was finally opened on May 1, 2002 and the Government soon received a report from a multiparty "Select Committee on Alternative Fuel Sources" that recommended policies to promote renewable energy, in addition to opening up the market (Rowlands, 2007). It was at this time that the Government began discussing a Renewable Portfolio Standard (RPS) to promote renewable energy generation. By June 2003, the Government of Ontario proposed a large-scale RPS that would be managed by the Ontario Electricity Finance Corporation (Rowlands, 2007). Policy targets were set at 1% of Ontario's electricity demand being met by renewable sources by 2006, with the share rising 1% each year until 8% of the electricity demand was met by 2013 (Rowlands, 2007). However, these plans were never implemented as the Liberal Party defeated the Progressive Conservative Government in October 2003.

4.1.2 2003 - 2008: The Liberal Government's Renewable Energy Policy

In 2003, as part of their election campaign, the Liberal Government promised to close Ontario's coal-fired power stations by 2007 and increase renewable electricity to 5% of the province's electricity capacity by 2007 and 10% by 2010 (Rowlands, 2007). On June 24^{th}, 2004, Ontario issued its first Renewable Energy Supply Request for Proposals (RES I RFP) for 300 MW of renewable energy. Ten projects, totaling 395 MW were selected (Rowlands, 2007). On November 24^{th}, 2004, there was a second RFP (RES II RFP) for an addition 1000 MW. Later in 2005, there was a third RFP for 200 MW, with a focus on procuring electricity from smaller-scale developers. An additional 500 MW RES III RFP took place in October 2008, with contracts for 492 MW being awarded in January 2009.

In May 2005, the Ontario Government received a report on "feed-in tariffs", leading the Energy Minister to instruct the Ontario Power Authority (OPA) to investigate a workable pricing scheme and the Ontario Energy Board (OEB) to look at necessary connection-policy changes that would ensure non-discriminatory access to the grid (Rowlands, 2007). By November 2006, a formal policy emerged, implementing a Renewable Energy Standard Offer Program (RESOP), which offered incentives for small power producers to sell their energy at pre-determined prices (Wong, Bhattacharya and Fuller, 2008). It was the first feed-in tariff style program to be implemented in Canada. The RESOP targeted small-scale developers, farmers, medium-sized businesses and rural communities by placing a limit of 10 MW per project, which gave these developers that may normally be excluded from the RFP process a chance to obtain a contract with the OPA (Holburn et al., 2009). Unlike the competitive tendering system for renewable energy, under the RESOP, as long as a project met the eligibility criteria, in principle all RESOP applications could be approved. The price for wind power projects was set at a fixed level of 11 cents per kWh (Holburn et al., 2009).

However, after the implementation of the tendering system and the RESOP, investment levels in renewable energy were found to have fallen substantially short of initial expectations (Holburn et al., 2009). By the end of November 2008, approximately 800 MW of new renewable energy capacity was in operation, accounting for approximately 2.5% of total installed capacity (IESO, 2008). This fell quite short of the target of 5% of renewable capacity by 2007, set by the Liberal government in 2003. Under both the RFP's for renewable energy and the RESOP programs, Ontario had awarded 2,861 MW of renewable energy Power Purchase Agreements by the end of 2008 (Holburn et al., 2009).

There is a significant difference between the amount of capacity that has been awarded contracts by the OPA and the amount of capacity that has actually been installed. This can be accounted for by substantial project cancellations, delays and withdrawals. Of the RES I RFP wind capacity contracted, 14% was cancelled by developers before the operational deadline. More than 50% of the contracts from the RES II RFP were also either cancelled or delayed beyond the commercial deadline date. The reasons for these cancellations include opposition from local anti-wind groups, who lobbied against land use permits at the municipal level, as well as difficulties in obtaining approvals from government agencies (Holburn et al., 2009).

The performance of the RESOP program had also not met expectations by the end of 2008. Only about 50 MW of wind capacity was actually operating by the end of 2008, despite having more than 800 MW of contracts awarded (Holburn et al., 2009). One reason behind the poor performance of the program was due to the structure of the RESOP contract. There was no penalty placed on non-performance of a project, meaning that if a contract was awarded but the project was never built, the developers faced no financial penalty. Therefore, developers had little incentive to rapidly build projects, especially given uncertainties over the timing of the permitting processes (Holburn et al., 2009).

Table 2 shows the amount of renewable energy capacity that was awarded a Power Purchase Agreement by the OPA compared to the amount of renewable energy capacity that was actually in operation by the end of November, 2008. **Figure 5** shows the amount of renewable energy capacity in operation in Ontario compared to the targets set by the provincial government.

Fuel	RES PPAs Awarded (MW)	RESOP PPAs Awarded (MW)	Total PPAs Awarded (MW)	RES MW In Operation by 30/11/2008	RESOP MW In Operation by 30/11/2008	Total MW In Operation by 30/11/2008 (% Awarded)
Wind	1,310	836	2,146	704	50	754 (35%)
Solar	-	515	515	-	1	1 (0%)
Small Hydro	51	67	118	8	8	16 (14%)
Bio-energy	9	74	83	9	20	29 (35%)
Total	1,370	1,492	2,861	721	78	800 (28%)

Table 2: RES & RESOP PPA Capacity and Status

(Holburn et al., 2009, p. 22)

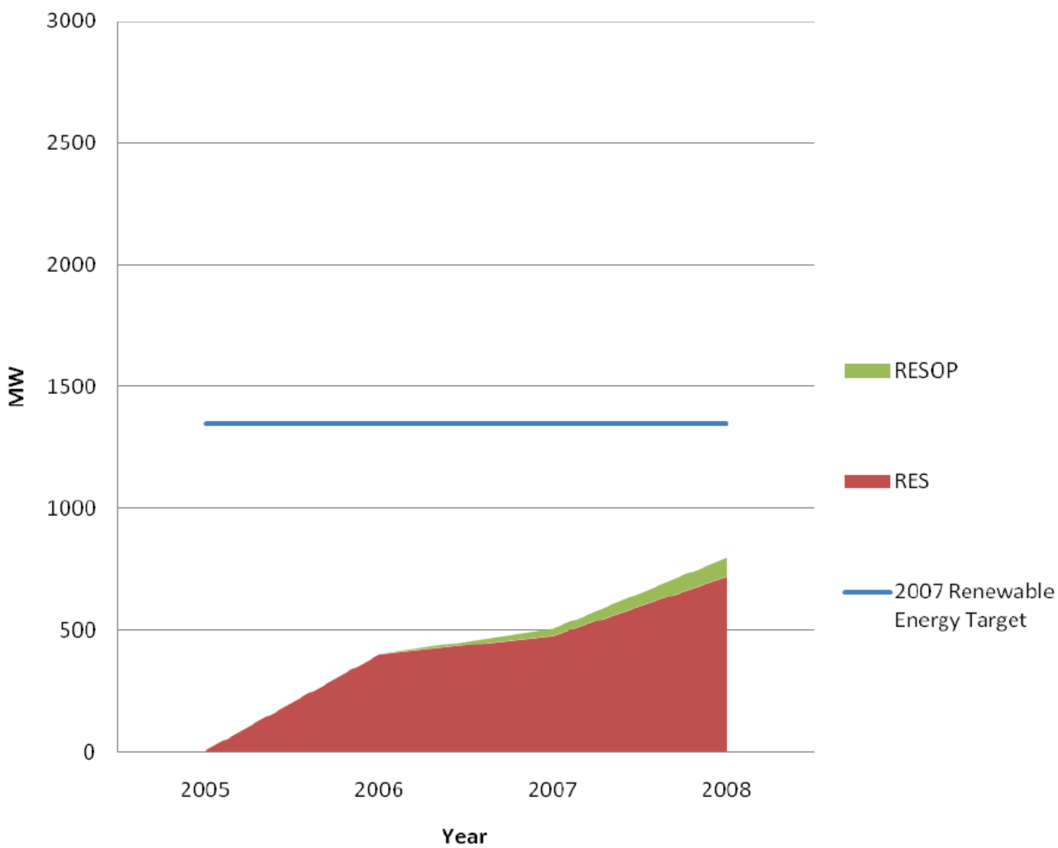

Figure 5: Renewable Energy Capacity in Operation vs. 2007 Target
(Holburn et al., 2009, p. 33)

As mentioned above, the permitting process in Ontario for wind energy projects has proven to be one source of regulatory risk that has resulted in many delayed or cancelled projects. However, policy analysts have also identified the weak regulatory governance regime in Ontario as a reason renewable energy policy has not been achieving its objectives (Holburn et al., 2009; Rowlands, 2007).

4.1.3 Regulatory governance in Ontario

One of the key reasons that Ontario has seen such a dramatic change in its renewable energy policy over the last ten years has to do with its regulatory governance for energy. Regulatory governance in Ontario for energy is not well insulated from political control, which exposes the utility sector to a high degree of direct political intervention (Holburn et al., 2009). The Ontario Energy Board holds primary responsibility for regulating the electricity sector and operates under the oversight of the Ministry of Energy and Infrastructure (MoEI). Ontario has a parliamentary system, with legislative and executive powers centered in the Cabinet, of which the MoEI is a member. This concentration of legislative power in a single institution in Ontario provides a strong incentive for agencies to adhere to the government's wishes in their policy decisions. This allows the Ministry to use directive powers, as prescribed by legislation, to control agency decision-making (Holburn et al., 2009).

The Ontario Energy Board and the Ontario Power Authority are the two main agencies that govern the renewable energy sector in Ontario. The OEB regulates distribution and transmission rates, issues licenses and monitors the overall market while the OPA has a more direct role in the implementation of renewable energy policy. The OPA is responsible for forecasting the provinces energy requirements, developing an overall strategic plan for conservation, generation and transmission, and awarding long-term contracts to private generators to secure sufficient capacity of renewable energy (Holburn et al, 2009). Although both the OPA and OEB are technically separate from the MoEI, the Minister is able to exert a considerable degree of control over policy formulation and implementation through initiating directives and agency appointments (Holburn et al., 2009).

The ability of one minister to exert political control over central aspects of renewable energy policy-making outside the scope of the legislative process can result in policy having a lack of long-term credibility. This has been shown to be a problem with Ontario's renewable energy policy, since key dimensions of policy may be modified at the Minister's discretion by initiating directives to agencies (Holburn et al., 2009). Since 2003, renewable energy targets and the choices of target policy instruments for the promotion of renewable energy investment have been subject to unexpected alterations (Holburn et al., 2009). This has led to regulatory risk for renewable energy developers, which has discouraged investment.

4.2 Ontario's Bill 150: The Green Energy and Green Economy Act, 2009

Bill 150: the Green Energy and Green Economy Act, 2009 (GEA), was passed in the Ontario Legislature on May 14, 2009. The Act places a priority on expanding Ontario's use of clean and renewable sources of energy including wind, water, solar, biomass and biogas power. Bill 150 enacts the GEA and amends and repeals various Acts, such as the *Electricity Act, 1998*, the *Ministry of Energy Act*, the *Ontario Energy Board Act, 1998*, the *Clean Water Act, 2006*, the *Environmental Protection Act*, the *Ontario Water Resources Act*, the *Co-operative Corporations Act*, the *Building Code Act, 1992*, and the *Planning Act*.

This piece of legislation contains groundbreaking provisions, particularly in its amendments to the *Planning Act*, which significantly reduces a municipality's ability to delay or prevent a renewable energy project in their jurisdiction by eliminating the need for a renewable energy project to receive municipal approvals such as zoning by-law amendments. By significantly reducing the power of the municipalities to stop a project, the GEA hopes to reduce delays caused by groups opposed to renewable energy projects (wind projects in particular). The GEA also aims to reduce delays in renewable energy projects by streamlining the regulatory approvals process into one Renewable Energy Approval (REA) process. In addition, the Act proposes an advanced Feed-In Tariff (FIT) for renewable energy program that would provide a greater level of regulatory security for renewable energy developers and investors.

The purpose of the GEA is "to facilitate the development of a sustainable energy economy that protects the environment while streamlining the approvals process, mitigating climate change, engaging communities and building a world-class green industrial sector" (Green Energy Act Alliance, 2009). The objective of this Bill is to enable all Ontarians to participate and benefit from green energy as conservers and generators, at the lowest cost to consumers.

4.2.1 Targets of Bill 150

The Ontario government has set specific targets for the GEA concerning energy conservation and renewable energy generation. These targets include:

• Achievement of a minimum 2.5% annual (compounding) reduction in energy resource needs from 2011 until 2027 through conservation.
• 10 000 MW of new installed renewable energy by 2015, over and above 2003 levels.
• 25 000 MW of new installed new renewable energy by 2025, over and above 2003 levels.
(Green Energy Act Alliance, 2009)

4.2.2 Main Elements of the Bill

Bill 150 includes ten key elements concerning energy conservation and the promotion of renewable energy generation in the province. These elements include:

1. An obligation for the authority responsible for power purchase to grant priority and obligatory purchase of power from green energy projects.

2. A system of Advanced Renewable Energy Tariffs as the primary procurement mechanism for renewable energy. The tariffs per kilowatt-hour of generation are based on key components from the successful German and French models. This system, called the Feed-in Tariff system by the Ontario Power Authority, will be discussed in more detail in Chapter 6 of this paper.

3. An obligation for all utilities to grant priority grid access to green energy projects and to connect all green energy projects. Utilities are entitled and empowered to recover all related costs. Related costs are to be spread equally across the entire rate base.

4. The explicit and direct participation of First Nations and Métis as developers and owners in green energy projects so they benefit directly from the resulting economic development in recognition of the additional and unique barriers they face.

5. The establishment of a Green Energy Debt Finance Program and a Community Power Corporation. The Green Energy Debt Finance Program would be mandated to raise the financial capital required to meet the financial market shortfalls in the development of eligible and viable projects to meet the GEA targets. The mandate of the Community Power Corporation would be to build the capacity of local communities to develop eligible and viable projects, provide early stage project funding, and to facilitate the development of financing mechanisms.

6. The adoption of smart grid technologies, including energy storage, in order to transform Ontario's energy system from highly centralized to more distributed.

7. A mandated commitment to a continuous improvement approach to conservation with a minimum 2.5% annual (compounding) reduction in energy resource needs from 2011 until 2027.

8. Electricity pricing that reflects its true cost and provides signals to consumers to manage their energy demands.

9. Priority for vulnerable consumers to reduce their energy burden through conservation, bill assistance, innovative utility policies and stronger consumer protection.

10. Streamlined regulatory approvals processes that enable the rapid but prudent development of green energy projects across the province, reducing uncertainty and transaction costs to all involved. This would include a comprehensive one-window approach to consultation with First Nations and Métis, leading to their meaningful engagement in the energy sector and creating certainty for the province.

(Green Energy Act Alliance, 2009)

The introduction of the new FIT system along with the complementary policy of streamlining regulatory approvals are the two most important aspects of the GEA. Both of these policy instruments are described in greater detail in Chapter 6 of this paper.

In order to predict whether a FIT strategy is the best policy choice for Ontario, I propose criteria that will be used to evaluate policy instruments for the promotion of renewable energy generation. These criteria can be found in Section 5.3 of this paper.

CHAPTER 5: CASE STUDY – GERMANY

Germany's renewable energy policy experience is used as a case study in this paper to evaluate the effectiveness of the feed-in tariff model for the promotion of renewable electricity, based on the above criteria. Germany's policy is then compared to Ontario's proposed FIT program and the results of the case study evaluation is used to predict whether the FIT program proposed in Ontario will be likely to succeed in achieving policy targets.

5.1 Background

5.1.1 Public Opinion of Renewable Energy in Germany

The strong public opinion in favour of renewable energy in Germany has stemmed largely from the 1970s oil crisis, growing anti-nuclear movements, and the global recognition of climate change. The renewable energy discourse first started in Germany in the 1970s, when the oil crisis clearly demonstrated the country's significant dependence on energy imports (Wustenhagen and Bilharz, 2006). A strong anti-nuclear movement also started around this time, when civil society organizations campaigned heavily against a planned nuclear plant in South-western Germany (Wustenhagen and Bilharz, 2006). The anti-nuclear sentiment in the country grew even stronger after the Chernobyl nuclear accident in 1986. In the 1980s, scientists began seriously exploring alternative energy scenarios and energy conservation. In 1987 Chancellor Kohl declared that the climate issue represented the most important environmental problem and by 1992, climate change was identified as an important driver for promoting renewables at the Rio Conference (Wustenhagen and Bilharz, 2006). As a result of these events, public perception of energy sources in Germany shifted significantly between 1984 and 2003, with support of renewable energy becoming widely accepted by 2003 (Wustenhagen and Bilharz, 2006).

5.1.2 Structure of the Electricity Sector

The structure of the German power industry throughout most of the 20th century was based on the *Energy Industry Act of 1935*, which provided for monopolies in power generation, transmission, distribution and supply. Under this Act, only one owner could control any one section of the electrical grid (Mendonca, 2007). The largest utilities were often private companies with some public ownership. The local utilities, on the other hand, were usually owned by the communities which made them subject to local political influence (Mendonca, 2007). The electricity market was liberalized in 1998, resulting in intense initial price competition, which reduced profit margins and ended in numerous mergers and acquisitions. This reduced the number of large players in the energy market significantly. Several local and regional utilities merged or were acquired by the four major companies that emerged during this time.

Germany had an enormous endowment of coal and lignite, making it easy for them to develop and sustain a huge energy supply from fossil fuels (Wustenhagen and Bilharz, 2006). Germany also started to develop their nuclear power industry in the 1960s. Because of this, coal and nuclear dominated the power generation mix in Germany. After the oil crisis of the 1970s, Germany's policy approach began to address research into alternatives to conventional energy. On the national level the Committee for the Environment, Nature Conservation, and Nuclear Safety of the German Bundestag established the Enquete Commission on Preventative Measures to Protect the Earth's Atmosphere, with the mandate to study the ozone problem, climate change and make proposals for action. This led to targets being set for greenhouse gas reduction. The federal parliament also passed a law in 2002 with the objective of phasing out nuclear power over the following twenty years. As a result, a large percentage of generation capacity that was originally coming from nuclear power will need to be replaced by 2025 (Wustenhagen and Bilharz, 2006). The combination of eliminating nuclear power and reducing CO_2 emissions has created a strong impetus for renewable energy policies in Germany.

5.2 German Renewable Energy Policies

5.2.1 Policies Prior to 1990

Support for renewable energy in Germany started in 1974 with the federal government's framework program for energy research (Wustenhagen and Bilharz, 2006). By 1990, many proposals for action against climate change were formulated. There was a growing consensus among MPs of all party groups that it was time to create markets for renewable energy technologies. In general, the German approach to promoting renewable energy has been based on four main instruments: investment subsidies, soft loans, tax allowances and subsidies for the operational costs/feed-in tariffs (Bechberger and Reiche, 2004).

The first measures introduced consisted of the 100 MW (later expanded to 250 MW) wind program and the '1000 Solar Roof program' to promote the wind and solar industries. The wind program introduced an incentive of 3 ct/kWh for wind energy generators, marking a shift from R&D funding to production incentives (Wustenhagen and Bilharz, 2006). Under the 1000 Solar Roof program (later expanded to the 100,000 Solar Roof program), applicants received 50% of investment costs from the federal government plus 20% from the regional government (Mendonca, 2007). The legal basis for utilities to pay higher prices for renewable energy was also established at this time (Mendonca, 2007). The success of these programs led to the creation of the first feed-in law in Germany.

5.2.2 The 1990 Feed-in Law: Stromeinspeisungsgesetz

The first feed-in law in Germany took the form of a relatively simple one-page bill for assisting producers of electricity from small hydro stations and expanded to include wind and other renewable energy installations. Although the law met resistance from the Federal Ministry of Economics and Technology, the parliament accepted the policy (Mendonca, 2007). The bill gained consent from all parliamentary parties and became the

Electricity Feed-In Law of 1990 or Stromeinspeisungsgesetz (StrEG). The law required electric utilities to connect renewable energy generators to the grid and to purchase the electricity at rates of 65% to 90% of the average tariff for final customers (Mendonca, 2007). The law gave considerable financial incentives to investors (although less for solar power due to the high cost of the technology).

The minimum reimbursement per kWh for electricity from solar and wind energy amounted to at least 90% of the average price that was charged to end customers by electricity providers (Mendonca, 2007). This, however, was only profitable for wind power operators at very good wind locations, resulting in many cities and parishes introducing additional reimbursements to allow an economically viable operation as incentive for investments. With this regulation in place, the operators of solar and wind installations could balance their entire costs, including expenses for financing, with the revenue from production. However, the StrEG did not include guaranteed tariffs for all renewable sources (such as biomass), causing growth to only occur for select technologies, such as wind.

Support measures to complement the new feed-in law were also instituted. From 1990 to 1998, federal energy research programs were established that provided more than €1 billion for all renewable energy technologies. Loan programs by the federal government's banking institutions were also implemented, permitting more than €3 billion in reduced interest loans for renewable energy installations (Mendonca, 2007). Other measures were the development of public awareness programs and privileging wind turbines under the construction code and developed public awareness programs. The federal government has also made reforms to the construction codes that privileged wind turbines. The construction code required that every local community presented a plan with zones appropriate for wind power, which has greatly facilitated permitting (Mendonca, 2007).

These incentives stimulated market growth and encouraged technological and political learning in the renewable energy sector. However, it also strengthened the resolve of the large utilities to oppose the feed-in law through politics and the judiciary (Mendonca, 2007). This, combined with the deregulation of the electricity market, resulted in the modification of the StrEG in April 1998 through the Energy Supply Industry Act. This Act created a new compensation mechanism for distributing the supplementary cost to the utilities. The big energy companies continued to protest the StrEG, arguing that privileging renewable energy would be opposed to the principle of market equity. However the Federal Constitutional Court and European Court ruled against these companies, stating that privileging renewable energies should be allowed due to their benefits to the environment. In 2000, Germany's renewable energy policy was updated, refined and replaced by the Erneuerbare-Energien-Gesetz (EEG), or Renewable Energy Law.

5.2.3 The 2000 Renewable Energy Sources Act: Erneuerbare-Energien-Gesetz

The aim of the EEG in 2000 was to enable the development of a sustainable energy supply in the interest of climate and environmental protection, according to the goals of the European Union and the Federal Republic of Germany. Its goal was to at least double the contribution of renewable energy to total energy consumption by 2010, with 2000 levels used as a baseline (Mendonca, 2007). **Figure 6** shows how the EEG functions, with electricity being generated, distributed and consumed, flowing one way and reimbursement flows moving in the other direction.

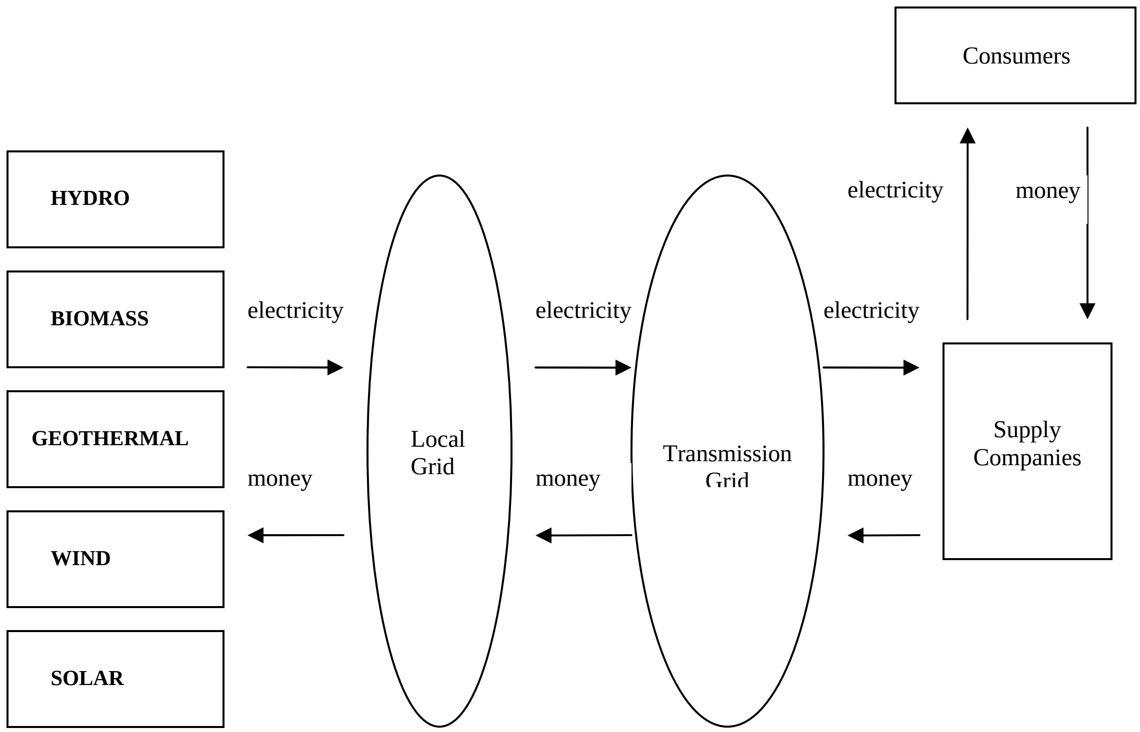

Figure 6: How the EEG works

(Mendonca, 2007, p. 31)

The key changes in Germany's renewable energy policy through the EEG were in the differentiation of the tariffs based on the technology type, size and site, and the replacement of percentage-based tariffs with fixed rates over fixed periods (Mendonca, 2007). The range of technologies covered under the feed-in tariff model was also extended under the EEG, to include geothermal energy and mine gas.

Perhaps the most important differences between the StrEG and the EEG were related to the remuneration schemes. While the StrEG was based on uniform minimum reimbursement, the production costs plus a return on investment of 5%-7% for renewable energy sources became the relevant criteria for the EEG tariffs (Mendonca, 2007). The EEG raised all tariff rates, but differentiated them according to the source of energy, capacity or location of the plant, because these factors influence project costs. The EEG also fixed the purchase guarantee and the feed-in tariffs for 20 years from the start of operation of a renewable energy installation. In addition, to stimulate technological innovation and efficiency, and to ensure better compatibility with the European law on state aid, the reimbursement period was limited and the remuneration paid under the EEG also included a digression element, where tariffs were reduced by a certain percentage over the years (Mendonca, 2007).

To comply with European law, the EEG also required a report to be submitted every two years, showing the progress achieved in terms of the market introduction and the cost development of renewable power plants. Where necessary, the reports would propose adjustments of the remuneration amounts of their reduction rates, in keeping with technological progress and market developments with regard to new installations. This allowed for frequent monitoring and adjustment of the feed-in tariffs.

The EEG has been very effective because the costs for renewable energy hinge largely on investment security. If an investment is high risk, banks demand high interest rates for the land and the investors demand high-risk mark-ups (Mendonca, 2007). Since the structure of the EEG guarantees a particularly high investment security, credit interest rates and risk mark-ups are low compared with other instruments. Furthermore, the lowering of fees as established in the EEG for installations commissioned at a later date ensures further price reductions. This digression encourages rapid construction of renewable energy projects because producers will be less likely to wait until installations become cheaper. The EEG also ensures high-quality installations because the more efficiently the projects are run, the larger the profit margin is for producers.

5.2.4 The 2004 EEG Amendment

Between 2000 and 2004, the responsibility for renewable energy production changed from the Economic Affairs Ministry to the Environment Ministry and similarly, the parliamentary committee in charge changed (Mendonca, 2007). This led to political conflict regarding the feed-in tariff law, with the Economic Affairs Minister opposing the model altogether. The regional ministries, ruled by conservative governments, also opposed the bill. This resulted in the EEG being amended in 2004.

In the amendment, a regulation was included, requiring the costs for grid connection to be paid by the plant operator, and the costs for upgrading the grid being borne by the grid operator (Mendonca, 2007). A clearing centre was also established to deal with the settling of disputes in relations to grid costs.

Compared to the previous EEG, the amendment provided for a more differentiated fee structure which takes into account levels of efficiency. It also allowed for existing power plants to receive the feed-in tariff for additional renewable electricity generated from modernization or expansion.

However, it was the increased tariffs paid for solar PV that were perhaps the most important of the changes made to the EEG in 2004. This increase in tariff price made PV far more attractive commercially than under the previous legislation, leading to a boom in the solar industry beginning in 2004 (Mendonca, 2007). The tariffs for wind, on the other hand, were lowered, due to innovation and declining costs in the industry.

5.2.5 Effects of the Legislation

Since the introduction of the feed-in law in 1990, Germany has become a world leader in renewable energy production. The renewable energy policy has consistently added to job growth, even during times of rising national unemployment (Mendonca, 2007). They have also produced valuable export markets, increased energy security and prevented the emission of vast quantities of greenhouse gases (Mendonca, 2007). Both the wind and solar sectors in particular have grown substantially. By 2006, the share of renewable energy in total electricity consumption in Germany rose to 11.8%, companies in the sector generated a turnover of €21.6 billion and a total of €6.5 billion was invested in new renewable power plants, with almost no extra burden being placed on home energy bills

(Mendonca, 2007). The renewable energy sector also employs more people than the nuclear energy, hard coal and brown coal industries put together (Mendonca, 2007). Due to the great success of this policy model, Germany has set ambitious goals for future renewable energy generation. Germany has demonstrated through past policy initiatives that it has both the commitment and public support necessary to reach these goals.

5.3 Renewable Energy Policy Evaluation Criteria

Although the feed-in tariff model has been shown to successfully stimulate the renewable energy industry, it has also been criticized for being costly, inefficient, and distortive of competitive pricing for electricity (Sijm, 2002). In order to evaluate the true effectiveness of a renewable energy policy, evaluation criteria must be established. Based on past research that has assessed renewable energy policy instruments (Sijm, 2002; Menanteau et al., 2003; Held et al., 2006; Wiser et al., 2002), I propose the following criteria to evaluate the feed-in tariff model in promoting renewable energy generation in Germany:

Investment certainty – Does the policy promote investment by creating investment certainty? Investment certainty often results from long-term contracts that guarantee a fixed tariff paid for electricity for a length of time long enough for investors to be confident that they will see a return on their investment. The length of the electricity contract will be used to evaluate investment certainty, with longer contracts encouraging more certainty.

Effectiveness in meeting policy targets – Has the implementation of the policy resulted in an increase in renewable electricity at a level high enough to reach set policy targets?

Cost-effectiveness – Does the policy help reduce costs for renewable energy over time? Will this policy likely result in increased job opportunities and economic activity in the country/province where it is implemented?

Administrative demands – Are the administrative demands of the policy low and simple?

Some feed-in tariff models have had more success in promoting renewable energy production than others. Germany was one of the first country's to introduce this type of policy instrument and since the implementation of the feed-in tariff model they have become a world leader in renewable electricity. Their policy design has been used as a model for other governments that have implemented a FIT system.

5.4 Evaluation of Germany's Renewable Energy Policy

Based on the set of evaluation criteria established in Section 5.3 of this paper, Germany's renewable energy policy will be assessed based on investment certainty, effectiveness in meeting policy targets, cost-effectiveness, and administrative demands.

5.4.1 Investment Certainty

Ensuring a stable policy environment is essential for the development of a durable renewable energy industry (Wiser et al., 2002). Germany's feed-in tariff law has been very successful in establishing such a policy environment. The long period of time that Germany has guaranteed fixed tariffs for, in combination with providing producers and investors a set price for energy, have led to greater policy stability than the country experienced prior to 1990. The considerable growth in installed capacity in Germany can largely be attributed to the increased investment certainty that the feed-in laws have provided. With greater investment certainty it is easier for renewable energy producers to receive financing for their projects, significantly increasing the installed capacity in the country over time. This certainty also encourages these producers to commit to developing projects in the first place.

5.4.2 *Effectiveness in meeting policy targets*

In large part due to the investment certainty offered by feed-in tariffs, this policy model has been very effective in promoting renewable electricity in Germany. In 1990, when Germany's first feed-in law was implemented, renewable energy's share of the electric power generation mix was less than 3% (The Joint Global Change Research Institute, 2009). By 2003, just prior to the amendment of the EEG, this share of electricity generation had grown to 9% (The Joint Global Change Research Institute, 2009). By 2008, this share had reached 15.1%, far surpassing the target of 10% by 2020 that was originally set by the German government after the establishment of the feed-in tariff law (European Nuclear Society, 2009). The share of electricity production by energy sources in Germany in 2008 is shown in **Figure 7**.

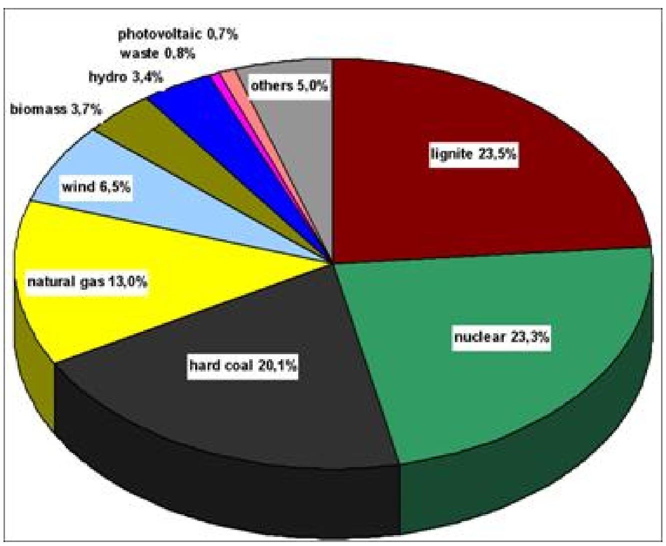

Figure 7: Electricity Production by Energy Sources, Germany 2008
(European Nuclear Society, 2009).

Building upon this success, the renewable energy sector of Germany has targeted to triple the share of its energy production to 47% by 2020 (RNCOS, 2009).

Complementary renewable energy policies and initiatives on the federal level have also contributed to the effectiveness of Germany's feed-in tariff in meeting policy targets.

Some of these policies focused on the economic aspects of renewable energy development, by providing loans, grants and support for research and development. However, the federal government has also made reforms to the construction code that has privileged wind energy projects (Mendonca, 2007). The construction code required that every local community presented a plan with zones appropriate for wind power, which has greatly facilitated permitting (Mendonca, 2007). Public awareness campaigns have also been launched geared towards educating and creating positive attitudes towards renewable energy development (Mendonca, 2007).

5.4.3 Cost-effectiveness

Many critics have argued that a feed-in tariff model has failed to be economically efficient (i.e. it has failed to ensure that electricity is generated and sold at minimum costs and failed to foster innovations that drive costs down) because feed-in tariffs are fixed (Sijm, 2002). In reality, between 1990 and 2000, it has been shown that the cost of wind and solar power has actually decreased by about 30% and 60%, respectively (Wustenhagen and Bilharz, 2006). The tariffs were also not adjusted for inflation, and therefore, prices had also fallen more significantly in real terms. As an example of how prices have decreased, **Figure 8** shows the remuneration levels for wind energy in Germany since 1990.

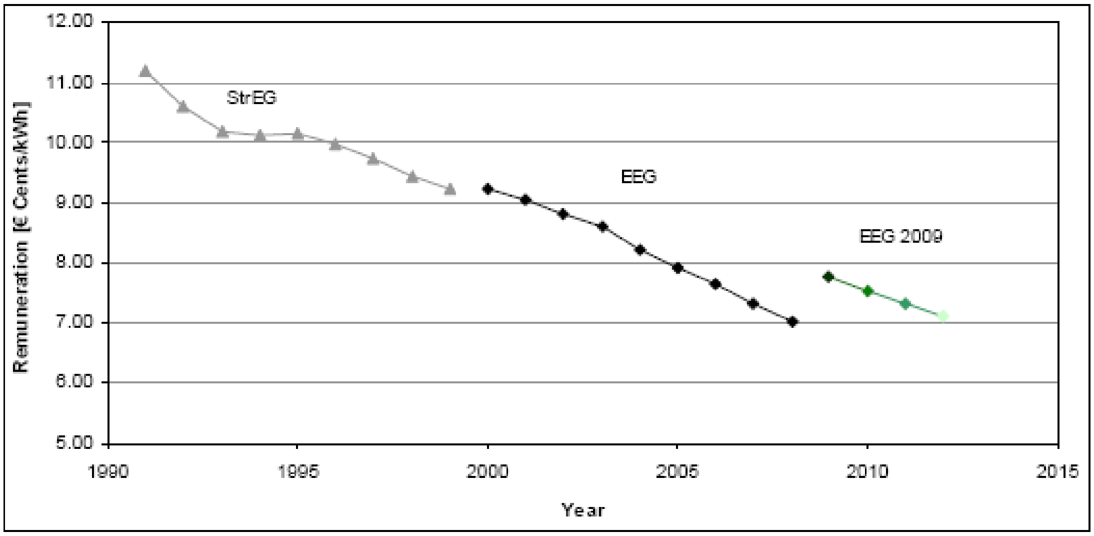

Figure 8: Development of the remuneration of electricity from onshore wind energy in Germany (inflation adjusted to values of 2005)
(Klein et al., 2008, p. 42)

It would be expected that if prices are set at a fixed rate for renewable energy, there would be no incentive for prices to fall over time. However, the results of Germany's feed-in tariff policy have shown that the remuneration levels are declining. Germany's success in lowering remuneration over time is due, in large part, to the frequent monitoring and adjustment of the regulations over the past 19 years. This has provided the policy with the flexibility required to set and adjust tariffs that are economically efficient and have encouraged cost reductions.

However, more recently, cost reductions have been less significant in the German market. For PV solar in particular, market prices in Germany are higher than in Japan or the US (Wustenhagen and Bilharz, 2006). A study supported by the World Bank found that electricity prices are lower in competitive markets than the feed-in tariffs set in Germany (Rowlands, 2005). So, although tariffs have indeed dropped since last year, they are still higher than many countries that have not implemented a feed-in tariff model.

The significant and rapid growth of the renewable energy industry in Germany has also resulted in an employment boom. By 2007, almost 250,000 renewable energy jobs had been created and according to government figures, this number is expected to rise to as many as 400,000 by 2020 (Burgermeister, 2008). Of these, at least 134,000 of the jobs are thought to be a direct result of the stimulated investment created by Germany's renewable energy law (Burgermeister, 2008).

5.4.4 Administrative Demands

A major advantage of Germany's feed-in tariff model is that its administrative demands are low and simple. The first feed-in law, the StrEG, consisted of only one page of text and was considered to be the shortest and simplest law implemented in Germany at the time (Sijm, 2002). Simple administrative demands make the policy less expensive and easier to implement. However, in order to provide the flexibility in the policy that is required to maximize efficiency through frequent monitoring and adjustments, the administrative demands of Germany's renewable energy policy has grown. As tariff schemes become more complex (which is sometimes necessary to receive the optimal price level) administrative costs will often rise.

CHAPTER 6: EVALUATION OF PROPOSED FEED-IN TARIFF SYSTEM IN ONTARIO

6.1 Overview of the Feed-In Tariff (FIT) Program in Ontario

The fundamental objective of the FIT program, in conjunction with the *Green Energy and Green Economy Act, 2009* is to facilitate the increased development of renewable energy generating facilities of varying sizes, technologies and configurations via a standardized, open and fair process (Ontario Power Authority, 2009a). In order to participate in the FIT program, a project proponent must be willing to make necessary investments in their facilities, including the connection and metering costs, bear certain ongoing costs and risks of operation and maintenance, and enter into a FIT Contract with the OPA. The program promotes small-, medium- and large-scale renewable electricity generation in Ontario by providing a simplified procurement process that encourages investment by providing a fixed price for renewable energy through a long-term contract.

6.1.1 Main elements of FIT program

Tariff Level

The tariff being offered for renewable energy projects through the FIT program are differentiated by project size and technology. The price is based on building and maintenance costs, plus a reasonable return on investment.

The proposed tariff levels are presented in **Table 3.**

Proposed Feed-In Tariff Prices for Renewable Energy Projects in Ontario Base Date: July 8, 2009			
Renewable Fuel	**Proposed size tranches**	**Proposed Contract Price ¢/kWh**	**Escalation Percentage****
Biomass*^			
	≤ 10 MW	13.8	20%
	> 10 MW	13.0	20%
Biogas*^			
On-Farm	≤ 100 kW	19.5	20%
On-Farm	> 100 kW ≤ 250 kW	18.5	20%
	≤ 500 kW	16.0	20%
	>500 kW ≤ 10 MW	14.7	20%
	> 10 MW	10.4	20%
Waterpower*^			
	≤ 10 MW	13.1	20%
	> 10 MW	12.2	20%
Landfill gas*^			
	≤ 10MW	11.1	20%
	> 10 MW	10.3	20%
Solar PV			
Any type	≤10 kW	80.2	0%
Rooftop	> 10 ≤ 250 kW	71.3	0%
Rooftop	> 250 ≤ 500 kW	63.5	0%
Rooftop	> 500 kW	53.9	0%
Ground Mounted^	≤ 10 MW	44.3	0%
Wind^			
Onshore	Any size	13.5	20%
Offshore	Any size	19.0	20%

*Peak Performance Factor applies.

^Aboriginal Price Adder and Community Price Adder eligible as outlined in Appendix A below.

**Escalation Percentage will be applied to eligible Renewable Fuels as calculated in Exhibit B of draft FIT Contract.

Table 3: Proposed feed-in tariff prices for renewable energy projects in Ontario; July 8, 2009
(Ontario Power Authority, 2009b, p. 1)

Application Fee and Application Security

With the FIT program application, proponents must provide an Application Fee of $500 CAD per MW to a maximum of $5000 CAD, which is nonrefundable. In addition, an Application Security equal to $10,000 CAD per MW of a project's contract capacity (or $20,000 CAD per MW for solar PV projects) must also be provided. Upon signing a contract with the OPA, this Application Security will be returned to the proponent.

Approximately every six months the OPA will evaluate if it is economic to connect new renewable energy projects to the grid and offer FIT Contracts accordingly. If a project proponent does not receive a FIT Contract offer at this time, then 5% of their Application

Security will become at-risk (Ontario Power Authority, 2009c). A proponent may withdraw an application from the FIT process at any time but the OPA will be able to draw the portion of the Application Security that has become at-risk. By forcing project proponents to put up a large Application Security that can be lost should a project withdraw from the process, the OPA is trying to ensure that only serious developers enter into the FIT program. The previous feed-in tariff program in Ontario (RESOP) did not have financial consequences for projects that were not built, which is a key reason why many contracts were awarded, but few projects ever reached operation.

Long Term Contract

Following the acceptance of an application through the FIT program, the OPA shall offer project proponents a FIT Contract. Under this contract, the OPA is obligated to pay for hourly delivered electricity at the contract price for a period of 20 years (or for 40 years in the case of hydropower projects) (Ontario Power Authority, 2009c).

Incentives for First Nations, Métis and Community projects

In order to encourage First Nations, Métis and communities to develop, build and own renewable energy projects, the OPA has provided incentives for these groups within the FIT program. Projects owned by these groups will be eligible to receive a higher tariff price, as well as be required to put up a lower Application Security deposit ($5000 per MW, regardless of technology). At the time of writing this paper, the OPA had not yet defined what constitutes a ‘Community-Owned’ project.

Provincial Content

Under the FIT Contract, certain renewable energy facilities will be required to meet a minimum level of provincial content in terms of equipment procurement (depending on technology and size). If the renewable energy supplier is unable to do so, they will be required to pay liquidation damages to the OPA and the OPA will be eligible to terminate the FIT Contract. At the time of writing this paper, the level of provincial content had not be identified by the OPA but it is presumed it will consist of 40%-60% of the major equipment components of a project (Gipe, 2009). The contract also requires that the proponent must own, or have a fixed or guaranteed maximum price contract, for a major equipment component (in the case of wind projects, this would include the towers, nacelles or turbine blades, for example). For wind and solar PV projects, this component must have undergone an “Irreversible Manufacturing Process” in Ontario (Ontario Power Authority, 2009c). An Irreversible Manufacturing Process is defined as a having a transformation of subcomponents or raw materials into a component, which cannot be undone without destroying the subcomponents (or raw material’s) integrity (Ontario Power Authority, 2009c).

MicroFIT program for small-scale developments

In addition to the FIT program, which is geared towards small-, medium- and large-scale renewable energy projects, typically generating over 10 kW of electricity, the OPA is also implementing a microFIT program. This program is for very small renewable power projects, such as a home or small business installation that would generate 10 kW or less. Rooftop solar installations on homes and businesses are expected to be the most common microFIT project and will benefit from the highest proposed Feed-in Tariff price of 80.2 cents per kWh (Ontario Power Authority, 2009d). In order to encourage small-scale renewable energy developments, it is expected that the microFIT program process will be a much more simplified process than the FIT program, where projects are automatically approved for connection.

Amendments and Cancellation/Suspension of the FIT Program

The OPA intends to review and amend the FIT program, the FIT rules, the form of the FIT Contract and the Price Schedule, as necessary, at regular 2-year intervals. The OPA may make an amendment outside of the scheduled program review in response to Ministerial directions, changes in laws and regulations, significant changes in market conditions or other circumstances as required (Ontario Power Authority, 2009c).

The OPA also reserves the right to cancel all or part of the FIT program at any time and for any reason or to suspend the FIT program in whole or in part for any reason, in each case without any obligation or any reimbursement to the project proponents. In the event that the FIT program is cancelled, the OPA will return the full Application Security to all project proponents (Ontario Power Authority, 2009c).

6.1.2 Complementary Policy – The Renewable Energy Approval Process

Along with the Feed-In Tariff program for renewable energy, the GEA also proposes to implement a complementary policy that will streamline the regulatory approvals process for renewable energy projects. Delays in the permitting process have been identified as a key factor for the delay or cancellation of many renewable energy projects (Holburn et al., 2009). Without a reduction in these delays, the FIT program could fail to meet policy objectives, similar to what has happened with past renewable energy policy instruments in Ontario. Therefore, the introduction of the Renewable Energy Approval (REA) process, which will be overseen by the Renewable Energy Facilitation Office, could be vital for the success of the FIT program. The Renewable Energy Facilitation Office will be within the Ministry of Energy and Infrastructure and will coordinate with the Ministry of Environment (MOE) and Ministry of Natural Resources (MNR) for the issuance of permits.

Previously, renewable energy projects had to be issued approvals from the MOE, the MNR and the local municipalities in order to initiate project construction. Often developers encountered significant delays in obtaining these approvals. Many approvals overlapped each other, there was little coordination between agencies and the entire process was considered quite inefficient overall (Holburn et al., 2009). The REA has been proposed to improve the approvals process to ensure that renewable energy projects receive approvals in a more timely fashion, while still protecting human health and the environment (Ministry of Environment, 2009a). The ministries aim to administer the new REA process in a coordinated fashion, in order to eliminate duplication, provide certainty and meet the requirements set out under legislation administered by various ministries (Ministry of Environment, 2009). The goal is for the legislation, regulations and policy documents to all work together to provide a clear set of rules for proponents of renewable energy facilities, and the communities that may be involved.

One of the key elements of the REA process is the creation of provincial standards, including requirements and setbacks for renewable energy projects. These setbacks will have a particularly large impact on wind energy projects. Previously, it was the local municipalities that established setback for renewable energy projects in their area. Applications for the Renewable Energy Approval will have to include: a description of the project; a construction plan; a site plan; a stormwater management plan; a response plan; an aboriginal, municipal and public consultation summary; a cultural and natural heritage assessment; a water bodies assessment; an analysis of how provincial policy plans apply to the renewable energy generation facility; as well as technology-specific requirements.

A key source of contention regarding this new Renewable Energy Approval process is how municipal and public consultation will take place. The GEA amends the *Planning Act* to allow renewable energy generation facilities to be exempt from having to obtain municipal planning approval. Previously renewable energy projects would need to obtain municipal zoning by-law amendments and sometimes, official plan amendments, before the construction of a project could begin. Obtaining these approvals required a certain level of municipal and public consultation that usually included a number of public meetings and a Municipal Counsel meeting. In addition, these approvals could be appealed to the Ontario Municipal Board, which could greatly delay the development of a project.

In the MOE's *Proposed Content for the Renewable Energy Approval Regulation under the Environmental Protection Act* document, it states that a proponent must consult with the municipality regarding matters such as the proposed project area, the proposed road access locations, traffic management plans, among others and that the MOE will provide a template that the proponent must complete in conjunction with the municipality. The details of what constitutes a 'consultation' are still to be finalized (Ministry of Environment, 2009b). Regarding public consultation, the MOE states that a project proponent will be required to provide public notice within no less than a 1.5 km radius of the proposed renewable energy generation facility at the preliminary stage of project planning and that the proponent must post notice of the proposed project in a local newspaper of general circulation within the municipality where the project is located, as well as hold a community consultation meeting. At least one additional community consultation meeting will be required after studies and project design work have been submitted to the MOE. The purpose of these new consultation requirements is to ensure that a municipality or special interest group is not able to delay or stop a renewable energy project that the province of Ontario approves. In the past, this occurred by either denying planning applications or by appealing planning decisions to the Ontario Municipal Board. However, by exempting renewable energy projects from requiring municipal approval, in addition to allowing the province to establish setbacks rather than the municipalities, the result of the REA process could be an even greater local opposition to renewable energy projects overall because it may make local communities and municipalities feel almost powerless in the decision to site a renewable energy facility in their jurisdiction. However, if the consultation requirements set by the MOE are significant enough to effectively engage the public and municipalities, then this potential growth in opposition may be avoided.

The goal of the REA process is to streamline renewable energy project approvals into a ‘one-window system’ which could significantly reduce the time it take a renewable energy project to begin construction. Combined with the FIT program, Ontario could see a rapid deployment of renewable energy generation within the next few years.

6.1.3 Ontario’s FIT Compared to Germany’s FIT Model

Table 4 compares the German FIT model with the Ontario FIT model, based on tariff design, length of contract, obligation to connect and purchase, policy flexibility and complementary policies.

	GERMANY	ONTARIO
Tariff Design	Tariff levels are differentiated by technology, size, location and levels of efficiency. The relevant criteria for establishing tariff levels are production costs plus a return on investment of 5%-7%. Remuneration levels also include a digression element, where tariffs are reduced by a certain percentage over the years, encouraging rapid construction of projects while tariff levels are at their highest.	Tariff levels are differentiated by technology and size. The relevant criteria for establishing tariff levels are building and maintenance costs for the facility, plus a reasonable return on investment (the amount of this return, as well as all the assumptions used to determine tariff levels have not yet been made available by the OPA). While a digression element is not explicitly built into the OPA program, tariff levels can be reduced by the OPA at any time. These lower tariffs would only affect new projects and existing projects will continue to receive the tariff level established in their FIT Contract.
Length of Contract	Contracts are long-term, with tariffs being guaranteed for 20 years.	Contracts are long-term, with tariff levels being guaranteed for 20 years.
Obligation to Connect and Purchase	The law requires electric utilities to connect renewable energy generators to the grid and to purchase the electricity at the fixed tariff.	The Green Energy and Green Economy Act, 2009, requires all utilities to grant priority grid access to green energy projects and connect all green energy projects. The OPA is obligated to purchase the electricity at the fixed price.
Policy Flexibility	A report must be submitted every two years, showing the progress of the policy and recommending adjustments as necessary. This allows for frequent monitoring and adjustment of the feed-in tariffs.	The OPA will review and amend the FIT program every two years, or at any time in response to Ministerial directions, changes in laws and regulations, significant changes in market conditions or other circumstances as required.
Complementary Policies	Support measures on the federal level include federal energy research programs, loan programs, and reforms to the construction code that requires local communities to present a plan with zones appropriate for wind power, in order to facilitate permitting. Setbacks are determined at the local level and projects must receive local, regional and national approvals.	Ontario has not yet provided any economic support measures for commercial renewable energy projects. To address permitting and siting issues, the government has established a Renewable Energy Approval system with the objective of streamlining the approvals process and significantly reducing the time it takes to permit a project.

Table 4: Comparison of Germany's FIT model and Ontario's FIT model

6.2 Evaluation of Ontario's Proposed Feed-In Tariff Program

Drawing upon the evaluation of Germany's renewable energy policy conducted in Section 5.4, the following section predicts the likelihood of success of Ontario's proposed Feed-In Tariff program in terms of creating investment certainty, effectiveness in meeting policy targets, cost-effectiveness and administrative demands.

6.2.1 Investment Certainty

When examining the German experience with a feed-in tariff model, it has been shown to be very successful in promoting investment in the renewable energy sector by creating a higher level of investment certainty than other procurement methods. The Ontario FIT program has been modeled after the German system, providing renewable electricity suppliers with 20 year contracts. This long-term contract, coupled with a fixed price, should result in a significant increase in investment certainty in Ontario. These two factors allow developers to create a more reliable business plan and allows for profit margins to be better predicted. This can improve access to financing for many projects and will likely result in better financing terms from banks due to the reduced investment risk. An increase in access to financing will no doubt result in an increase in the amount of renewable energy projects that are able to be constructed.

The Renewable Energy Approvals process that will be implemented in conjunction with the FIT program in Ontario will also provide a greater level of certainty for investors. As mentioned earlier, many renewable energy projects in Ontario have been either significantly delayed or cancelled due to permitting delays. If the REA process is successful in greatly reducing the time it takes a renewable energy project to receive the necessary permits for construction, investors will have an increased security that a project will not be stalled in the permitting process. It will also act to reduce development costs for these projects. It is important, however, that the REA process include public and municipal consultation requirements that are significant enough to effectively engage these groups, in order to avoid creating increased opposition.

However, the OPA still maintains the right to cancel or suspend the FIT program at any time, for any reason, without any obligation or any reimbursement to the project proponents in the FIT process. While the creation of a stable policy environment is a key factor for the success of a FIT program, as seen in Germany, the right of the OPA to cancel the program at any time is not conducive to creating the type of stable policy environment that is essential for a successful feed-in tariff system.

6.2.2 Effectiveness in meeting policy targets

The German experience with a feed-in tariff program has shown that this type of policy can encourage the rapid deployment of renewable energy generation. Germany has been able to surpass the capacity targets originally set for its renewable energy policy and have increased policy targets to reflect this rapid growth (RNCOS, 2009). It is anticipated that that rapid growth will also occur in Ontario after the FIT program is implemented, however, this growth could be significantly limited if the policy is not well designed. It is imperative that that FIT program and complementary policies such as the Renewable Energy Approvals process give developers and investors a sense of investment certainty. If the FIT program can be cancelled at any time, or the REA process is designed to exclude the local communities and municipalities from the planning and approvals process, the result could be low investment certainty and increased opposition which would significantly reduce the growth of the renewable energy industry.

One key difference between the FIT design in Germany and the FIT design in Ontario is that Germany has differentiated tariff prices by technology, size, location and levels of efficiency. Ontario’s proposed tariffs are only differentiated by technology and size. This could result in a concentration of developments in certain areas where the renewable resource is the most abundant, particularly in the case of wind energy projects. With wind energy, if the fixed tariff does not take the efficiency level of the resource into account for price, projects in the areas with the best wind resources will receive excessive profits through the FIT program, whereas many other projects in less windy areas will be underpaid. This could significantly limit the amount of capacity installed throughout Ontario, as it is unlikely that developers will build projects in less windy areas because it will not be profitable. Germany's model, which differentiates tariffs by location and efficiency, provides higher tariff levels for sites that are less windy (i.e. sites in the interior of the country rather than on the coast). The result has been a significant increase in projects built inland. Without this tariff differentiation, projects would have likely been limited mainly to the coastline.

Therefore, while Ontario will likely see a rapid increase in renewable energy capacity soon after the implementation of the FIT program, this capacity growth could be limited over time if the tariff level is not differentiated further to take into account location and resource efficiency. Based on the currently proposed FIT program and the current transmission system in Ontario, it would be a challenge for the province to reach its policy goals of installing 10 000 MW of new renewable energy by 2015 and 25 000 Mw by 2025. However, if the program were adjusted to account for differences in efficiency due to location and the transmission system was upgraded to provide greater capacity then the policy goals are more likely to be achievable.

6.2.3 Cost-effectiveness

In Germany, the price paid for renewable energy has been reduced significantly since the implementation of its feed-in tariff system. They have been successful in reducing tariffs in large part due to the frequent monitoring and adjustment of the program. While both the Ontario FIT program and German FIT program have scheduled reviews of the tariffs every two years, the German system has a built-in digression element that is lacking in Ontario. Under the German system, the tariff level offered is automatically reduced by 1% each year. This provides incentive for projects to be built rapidly in order for developers to take advantage of the highest tariff possible. It has also resulted in a steady decrease in tariff levels since 1990. Because Ontario's FIT system currently lacks this digression element for tariff prices, it is possible that the system will not be as economically efficient in reducing remuneration levels over time as Germany has been.

A key criticism of the feed-in tariff model is that it is not as cost-effective as a quota system because it does not stimulate competition. Under Ontario's previous tendering system, the prices paid for renewable electricity were often lower than what is being proposed under the FIT program (P. Clibbon, personal communication, July 15, 2009). However, due to the high level of competition between projects, it was often very difficult for a small- or medium- scale developer to win a contract for a renewable energy generating facility because they were not able to cut their costs low enough. Therefore, the majority of development was limited to large companies. The FIT program allows for small-, medium- and large-scale developers to enter the market, which will likely greatly increase the amount of capacity installed overall.

Past research has also found that the capital costs for renewable energy investments in countries that have implemented a FIT program have proven to be significantly lower than in countries with a quota system because of the reduced risk on investment (Ragwitz et al., 2006). If the OPA frequently monitors and revises the FIT tariffs to reflect declining costs caused by higher growth rates and technological innovation, then they should be able to pass those cost reductions on to the consumer over time, making the system more cost-effective.

One of the key objectives of the *Green Energy and Green Economy Act, 2009* is to stimulate growth in the 'green economy' in Ontario. Germany has seen a significant boom in the renewable energy industry since implementing their FIT program, with almost 250 000 jobs in the renewable energy sector created by 2007 (Burgermeister, 2008). While Ontario has not set specific policy goals for employment in the green energy sector, it is estimated that the new legislation could result in the creation of up to 90 000 jobs through investments in green energy and electrical grid upgrades (Pollin and Garrett-Peltier, 2009).

The Province is also hoping to stimulate the manufacturing industry through the FIT program by requiring that a certain percentage of a renewable energy projects' major equipment components have undergone an irreversible manufacturing process in Ontario. FIT programs in other countries have been shown to stimulate the domestic market for renewable energy equipment and this domestic content requirement for projects would likely cause the market to grow in Ontario as well.

However, the provincial content requirement could have a negative impact on project costs. Particularly in the case of wind energy, there are few equipment components available that have been processed in Ontario. Therefore, a project could be stalled while waiting for the manufacturing industry to essentially 'catch up' to the development of renewable energy projects. This could also drive up costs if project developers were forced to purchase equipment processed in Ontario that could be purchased elsewhere at a significantly lower cost. However, overall, the stimulation of the manufacturing industry for renewable energy in Ontario will increase economic activity, create jobs, and eventually provide renewable projects with locally sourced equipment, with costs that are not subject to fluctuating exchange rates.

6.2.4 Administrative Demands

An advantage of the German FIT model over a quota system for renewable energy is its relatively low administrative demands. Compared to the previous tendering system used in Ontario, the FIT program should have significantly less administrative demands as well. This is because the FIT system will have standardized interconnection requirements, contract terms and conditions, which can simplify negotiations and speed up the development and contracting process for renewable generation (Ragwitz et al., 2006). This makes the program easier and less costly to implement and operate.

However, FIT programs often require many special provisions in order to achieve an effective level of policy flexibility (such as tariff digression, differentiation by resource and location, etc.). This flexibility allows the program to be more cost-effective because it allows the program to adapt better to changes in costs and market conditions. As FIT systems become more complicated, administrative demands will likely increase.

6.3 Recommendations

The Feed-In Tariff program being proposed in Ontario has the potential to result in a rapid growth of installed renewable energy capacity, as has been in the case in other countries that have employed this strategy. However, there are aspects of the program that should be revised in order to provide a more stable policy environment, encourage a broader geographic development of facilities, reduce tariffs and project costs over time and increase the chances of capacity targets being achieved. Based on the German experience and the evaluation conducted in this Chapter, this paper recommends the following revisions to the model:

1. A stable policy environment has been found to be a vital aspect for the success of a policy in promoting rapid deployment of renewable energy generation. For this reason, it is recommended that Ontario limits the OPA's right to terminate or suspend the FIT program at any time, for any reason. Developers and investors must have confidence that the FIT program will be the main procurement strategy for renewable energy for a significant length of time. Without that certainty, investment is less likely to occur. By providing some kind of guarantee of the minimum length that the program will run for, Ontario will be creating a more stable policy environment for investors.

2. Currently, the Ontario FIT model does not differentiate tariffs by location or resource efficiency. This will likely result in a concentration of renewable energy projects in areas with good resources (with wind energy, for example, this will likely occur along Lake Huron and Lake Erie, where wind resources are best) (Gipe, 2009). This concentration can result in social friction, as residents of these

areas may become resentful of having a high concentration of projects in their region. On the other hand, areas with moderate resources that would welcome renewable energy projects may be left out.

Not differentiating tariffs by location or resource efficiency may also limit overall capacity growth because developers will be less likely to develop projects in regions with less efficient resources. If the FIT program were to differentiate tariffs by location and/or resource efficiency, then development would be encouraged across a broader geographical area. In Germany, this differentiation has been very successful in moving wind energy projects inland and encouraging investment across the country.

3. In order for a feed-in tariff model to be cost-effective, tariff levels need to be revised and reduced over time. The goal of a FIT system is to encourage renewable energy development until the market has grown to the point where fixed tariffs are no longer necessary for the renewable energy technologies to compete with conventional energy sources. Reducing tariffs over time also encourages rapid development because project developers and investors will want to take advantage of the highest tariff possible. Rather than just assuring that the tariffs will be reviewed and revised every two years, it is recommended that Ontario's FIT program include a digression element for tariff levels, similar to Germany's policy. If a digression was automatically built into the model so that tariffs were reduced each year, development is likely to occur more rapidly and costs are guaranteed to be reduced at a steady rate.

4. The level of provincial content required for renewable energy projects under the FIT program could cause a significant roadblock for rapid capacity installation. As mentioned above, there are currently few, if any, suppliers of major equipment components for renewable technologies, such as wind. If a significant percentage of components for a renewable energy project must come from domestic sources at the onset of the FIT program, it may be too difficult for many projects to access the

necessary materials. One objective of the GEA is to stimulate the ‘green economy’ in Ontario and requiring high levels of provincial content for renewable energy projects is an effective way to accomplish this. However, another objective is the rapid growth in renewable energy installed capacity in the Province, which could be hindered if projects are required to include a high percentage of provincial content that is not yet available. Therefore, it is recommended that the provincial content requirements for renewable energy projects be set at a lower percentage during the initial implementation of the FIT program, in order to allow projects to be built immediately, without being stalled or penalized because domestically produced equipment components are not currently available. After the manufacturing industry has had a chance to grow and can supply the necessary equipment, then the provincial content requirement can be increased to a higher level.

5. Although the Renewable Energy Approvals process is not technically an element of the Feed-In Tariff program proposed by the OPA, receiving this approval is a requirement for a FIT Contract and an important aspect of the Green Energy Act. If designed well this new approvals process could significantly reduce the time and costs required for developing a renewable energy project. However, a main area of concern regarding these new regulations is the changes to the *Planning Act* that eliminates the need for renewable energy projects to receive municipal approvals, such as zoning by-law amendments. The REA process does require developers to consult with the public and municipality regarding a project, however, the details of what constitutes a ‘consultation’ have not yet been released. In order to avoid creating increased opposition towards renewable energy projects, it is important that the consultation requirements for an REA be extensive enough that local communities and municipalities feel engaged in the process. If the consultation requirements are not significant enough, communities and municipalities may feel alienated from the planning and approvals process, which could lead to greater resistance.

CHAPTER 7: CONCLUSION

7.1 Summary

Worldwide there has been a growing concern about global warming and climate change. The promotion of electricity generated from renewable sources has been identified as a key means to reducing greenhouse gas emissions and promoting energy security, moving renewable energy to the forefront of energy policy around the world. In addition to the environmental benefits of producing electricity from renewable sources that produce fewer air emissions, the renewable energy industry also has significant economic advantages. The renewable energy industry has created hundreds of thousands of jobs and stimulated markets for new technology development and manufacturing. Wind power in particular has grown to be one of the most popular forms of renewable energy, with the industry growing exponentially since the early 1990s (Rechsteiner, 2008).

However, there continue to be significant barriers to renewable energy investment which include subsidies for conventional energy sources, high initial capital costs, larger transaction costs, a lack of legal framework to support renewable energy development, a lack of transmission access, as well as planning and siting difficulties. To overcome these barriers and encourage investment, regulatory support mechanisms have been implemented in almost every industrialized country worldwide. The most dominant of these mechanisms is a feed-in tariff system that provides a fixed price for renewable energy for an assumed length of time. This model was implemented in Germany in 1990 and has resulted in a dramatic boom in the industry, making Germany a world leader in renewable energy generation.

In 2004, the Ontario government implemented its first support mechanism to promote renewable energy production through a tendering system. By 2006, they had created Canada’s first feed-in tariff program for small-scale energy producers through its Renewable Energy Standard Offer Program. This program led to the eventual passing of *Bill 150: the Green Energy and Green Economy Act, 2009*, which includes an advanced feed-in tariff system for all renewable energy producers, modeled after the German and French systems, along with a streamlined regulatory approvals process as its main components. This piece of legislature is considered to be groundbreaking and could act as an example for other provinces and states throughout North America.

7.2 Conclusion

Ontario's renewable energy feed-in tariff program was evaluated based on Germany's successful experience with a FIT model. While overall, the program is likely to result in a rapid deployment of renewable energy generation at the onset of implementation, this growth could be limited by some of the design elements of the policy. This paper recommends that in order to create a stable policy environment that is necessary for rapid and continued investment in renewable technologies, Ontario needs to limit the Ontario Power Authority's right to cancel or suspend the program at any time and provide a guaranteed minimum length of time that the FIT program will be operational for. The tariff design should also include a differentiation of tariff levels by location and/or resource efficiency in order to promote a broad development of projects across the province, as well as a digression element for tariffs to guarantee a consistent reduction in remuneration levels over time for cost-effectiveness. It is recommended that the provincial content requirements for projects be limited to a small percentage at the onset of the FIT program until the domestic manufacturing industry is able to supply all necessary materials, at which point the domestic content requirement should be increased. Lastly, it is important that the Renewable Energy Approval includes extensive municipal and public consultation requirements to ensure that communities and municipalities feel engaged in the development process. Without this, renewable energy projects could face an increased level of local opposition.

While the OPA may see a rapid increase in installed renewable energy capacity during the initial implementation of the FIT program, they may find that development could stall over time, forcing them to revise the program to include elements such as the ones described above. Overall, however, the proposed Feed-In Tariff program in Ontario is a significant step towards greatly increasing the amount of installed renewable energy capacity in the Province. This will improve the Government's ability to deliver on their campaign promise of scaling Ontario's coal-fired power stations, resulting in a decrease in greenhouse gas emissions. If this policy instrument is successful in Ontario, it could act as a model for renewable energy policy throughout North America.

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