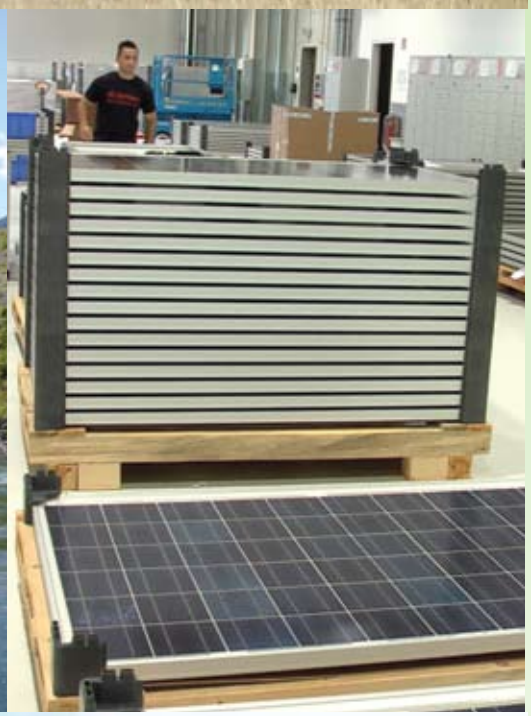

Ontario's Road Map to Prosperity:

Developing Renewable Energy to its Full Potential

Final Report Submitted
to the Toronto and
Region Conservation Authority

by
José Etcheverry PhD
Lynda O'Malley
Jennifer Taylor

TORONTO AND REGION Conservation
for The Living City

YORK UNIVERSITÉ UNIVERSITY
redefine THE POSSIBLE.

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Contents

Executive Summary

Ontario needs a practical solution that provides strong local economic development and new employment sources to replace the 230,000 manufacturing jobs that have disappeared from the province in the last five years.[1]

As recent statistics clearly indicate this worrisome unemployment trend is accelerating as the current economic downturn gathers momentum.[2]

In addition, our province requires an innovative approach to fulfill its commitments to reduce greenhouse gases and to control air and water pollution.

Fortunately the solution is at hand: developing renewable energy sources to their full potential. This document summarizes a viable strategy, a roadmap, to achieve prosperity, energy security and ecological protection in Ontario.

Developing this renewable energy roadmap to achieve prosperity and environmental protection will require vision, widespread collaboration, and political leadership.

The roadmap is based on three crucial principles that form the foundation for achieving the multiple benefits of developing renewable energy sources to their full potential in Ontario:

1. Establishing a robust domestic market that prioritizes sustained renewable energy development
2. Development of a strong financial infrastructure that ensures that Ontarians can actively invest in renewable energy development
3. Strengthening the province's educational networks to develop the skilled workforce required to manufacture, design, install, and maintain renewable energy systems and all associated support infrastructure.

These three principles have been successfully employed in the jurisdictions that have become the global leaders in renewable energy development: Denmark, Germany and Spain.

These three jurisdictions have achieved strong domestic markets that provide the required stability for their local industries to thrive and for investment decisions to take root. Their healthy domestic markets have made the renewable energy industries of these three leaders into export powerhouses and have also developed strong and skilled workforces.

1 For additional information see Statistics Canada, Labour Force Survey for Ontario, July 2004 (manufacturing number compared to the latest figures available) at Statistics Canada site: *www.statcan.gc.ca/daily-quotidien/090206/dq090206a-eng.htm*, also see: Popplewell, B. (2008). Search is on for solutions to sector's woe. Toronto Star, October 11. Available at: *www.thestar.com/FederalElection/article/515941* and also: Perry, A. (2008). Canadian employers wipe out 71,000 jobs. Toronto Star, December 6. Available at: *www.thestar.com/Business/article/549430*

2 Between December 2008 and January 2009 71,000 jobs were lost in Ontario, with 36,000 jobs lost in Ontario's manufacturing sector for further details see: CBC.(2009). Canada lost 129,000 jobs in January: StatsCan. *Canadian Broadcasting Corporation*, February 6. Available at: *www.cbc.ca/canada/toronto/story/2009/02/06/januaryjobs.html*

Germany today has more than 248,000 people working in its renewable energy sector and Spain has achieved, in 10 years, a workforce of 190,000 people.[3]

The lessons emanating from these three leading countries can be adapted to suit the unique conditions of Ontario to rapidly achieve the adoption of a new energy paradigm.

Although Ontario has a smaller population than Germany or Spain we have a skilled workforce and a much larger territory that is richly endowed with abundant renewable energy resources.

Ontario also has the comparative advantage of having as neighbours provinces that are already powered largely by hydroelectric plants that can provide our province with the opportunity to access affordable dispatchable power to compliment the large-scale local implementation of intermittent renewable energy sources (such as wind and solar power). Most importantly, Ontario already has some of the key policies in place that have made Denmark, Germany and Spain world leaders in renewable energy. In addition, the province provides attractive working and investment conditions such as public health care and affordable education systems, which constitute two clear advantages over neighbouring US states.

To capitalize on these benefits, Ontario needs a strong policy framework to ensure that a sustainable domestic market can develop to satisfy our energy needs and to provide a strong beacon for investment flows. Leading RE countries such as Germany and Spain have structured their policy framework around renewable energy legislation. Similar legislation would enable Ontario to meet its RE targets for 2010 and beyond, help launch a key foundation for a local sustainable economy, enable the building of innovative industries, create new jobs, and help reduce pollution. Most interestingly, all of these benefits can be achieved by harnessing in a new manner current investment used for keeping the lights of Ontario on.[4]

The roadmap summarized here uses the combined knowledge of some of the best renewable energy experts in our province and the world to illustrate clearly the steps required for Ontario to become the North American leader in renewable energy.[5]

This document also highlights specific collaborative areas in which agencies such as the TRCA can continue to lead to ensure the adoption of renewable energy and a successful and sustained transition to a more prosperous, resilient and ecologically sound society.

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3 For Germany's employment achievements see Bundesministerium fur Umwelt, Naturschutz und Reaktorsicherheit. (2008). Big boost for renewable energies-share in electricity supply has gone up to 14 per cent. Online article available at: *www.erneuerbare-energien.de/inhalt/40791/5466/*

For Spain's figures see Gasco, C.(2008). Wind and the changing power industry structure. Renewable Energy World, 11 (3), Available online at: *www.renewableenergyworld.com/rea/magazine/story?id=52705*

4 A diverse group of non-governmental organizations, academics, renewable energy advocates, First Nations and community groups is currently conducting a campaign for the adoption of renewable energy legislation in Ontario for details see *www.greenenergyact.ca*

5 The bulk of the background information informing this document is based on the accumulated knowledge of Germany and Spain two leading renewable energy jurisdictions that are actively sharing their policy experience through the International Feed-in Cooperation (IFC) a governmental organization that meets regularly to discuss best practice in renewable energy policy design. In addition, the document relies on a wealth of international best practice renewable energy policy information, which was codified during the 2004 UN-sponsored International Conference on Renewable Energies held in Bonn, Germany. Roadmap readers are encouraged to familiarize themselves with the valuable information contained in the IFC site which is available at: *www.feed-in-cooperation.org* and also the Bonn RE conference site available at: *www.renewables2004.de*

Summary of Roadmap Recommendations

Context

Ontario has already implemented some of the most innovative renewable energy policies in North America (e.g. Renewable Energy Standard Offer Program or RESOP). In addition, the provincial government has recently announced that it intends to implement an Ontario Green Energy Act (GEA) aimed at positioning the province as one of the most attractive jurisdictions in the world to invest in renewable energy development.[6]

For the Green Energy Act to achieve its goals, market forces need to be properly harnessed by implementing a supportive policy environment that ensures that renewable energy industries can become a crucial new source of manufacturing jobs in Ontario.

Furthermore, once the review of the RESOP is completed, a key component of this crucial policy environment (premiums for entrepreneurs) will be restored.[7] The review of the Ontario Power Authority's Integrated Power System Plan (IPSP) for the reconsideration of the province's renewable energy and conservation goals can also provide further potential impetus for the expanded role of renewables and conservation in meeting Ontario's energy needs.[8]

The 2008 Ontario Provincial Budget established the foundation for an additional key policy component through its focus on human resources & capacity development, an investment which should be re-focused to help ensure that Ontario has in place the human resources needed to satisfy the needs of a rapidly growing Ontario renewable energy market.

Through these policies Ontario can build a strong domestic market for renewable energy that will attract sustained investment into local manufacturing and project development and that will also ensure that our province's energy needs are satisfied using reliable locally available resources.

Roadmap Recommendations for 2009

1. Implement a strong Green Energy Act to ensure that renewable energy development is prioritized throughout the province and to send a clear international market signal to attract investors.
2. Use legislation to ensure that renewable energy and conservation resources are prioritized to become the primary sources of new supply in the Province, and to ensure that the province adopts ambitious targets and timelines for renewable energy development (i.e. 10,000 MW by 2015, and 25,000 MW by 2025).

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6 Premier McGuinty announced on February 2, 2009 that his government will implement a Green Energy Act aimed at making Ontario a leading jurisdiction in renewable energy development. For details see *www.premier.gov.on.ca/news/Product.asp?ProductID=2821*

7 The provincial government decided on May 13, 2008 to review the RESOP and freeze the bulk of the program until the review is complete. Transmission and distribution constraints were cited as the main reason for the program freeze.

8 For further details see: George Smitherman, Ontario Minister of Energy and Infrastructure, *Amendment to the Supply Mix Directive*, September 17, 2008. Available at: *www.powerauthority.on.ca/Storage/83/7831_Ministry_Directive_PSP_Sept_18_08.pdf*

3. Ensure a thorough and rapid completion of the ongoing revision of the RESOP, so that this crucial program becomes as attractive to local and international investors as the German and Spanish renewable energy programs.

4. Ensure that the IPSP revision of the potential for renewable energy and conservation in Ontario is informed by: the latest advances in technology (e.g. storage, RE grid integration, smart grids); by the empirical market response shown by Ontario's RESOP; and by the program results of Germany and Spain.

Roadmap Recommendations for Budget 2009

5. Provide new funding (e.g. loan guarantees) to facilitate access to zero interest loans for financing renewable energy systems in residences and small businesses throughout Ontario.

6. Re-focus existing budget commitments to develop new renewable energy training initiatives in colleges and universities and to fund professional secondments (essential to develop local capacity and meet growing RE market needs).

7. Provide new funding to create municipal funds (similar to the Toronto Atmospheric Fund) that allow municipalities and local distribution companies (LDCs) to provide revolving loans for renewable energy systems in schools and other municipal buildings (in addition to #1 above).

8. Replenish Ontario's Community Power Fund so it can be expanded to more communities and First Nations.

Additional Roadmap Recommendations

9. Develop a new Ontario based effort to collaborate actively with leading international renewable energy agencies (e.g. International Feed-in Cooperation, International Renewable Energy Agency) so local capacity can be developed in a sustained manner and to position Ontario as a leading international 'know-how' jurisdiction.

10. Start a province-wide renewable energy promotion program that builds on the Every Kilowatt Counts program to promote Ontario's renewable energy programs and to increase awareness about the multiple benefits of renewable energy.

11. Create a highly visible province-wide network of education and demonstration centres and projects (fixed-site and mobile) to ensure that Ontarians can see and experience renewable energy and other environmental technologies in action. Existing model examples of these initiatives include the Toronto and Region Conservation's Living City Campus at Kortright Centre for Conservation and the Evergreen's Brickworks Site.

Report Overview

Our province currently faces an innovation challenge posed by the unavoidable and strategic need to phase-out the use of polluting fuels while ensuring prosperity and job creation. This challenge has been compounded by President Obama's decision to focus on renewable energy development as a key strategy of his administration.

The research presented here provides a road map to overcome these challenges by ensuring that Ontario becomes a North American expert in maximizing the use of renewable energy to its full potential.

The road map has been derived through interviews with experts and analysis of the most recent literature to highlight some of the predominant obstacles preventing Ontario from becoming a leading renewable energy jurisdiction. Most importantly, it provides a number of key solutions that can inform the development of practical strategies and stimulate interactive policy debate aimed at propelling the renewable energy agenda forward.

The first phase of the road map consisted of a literature review that provided an analytical framework to guide the development of the project. The literature review includes a synthesis of key findings compiled by the Toronto Region and Conservation Authority (TRCA) and an analysis of fiscal, regulatory, and education policies that aim to support renewable energy development.

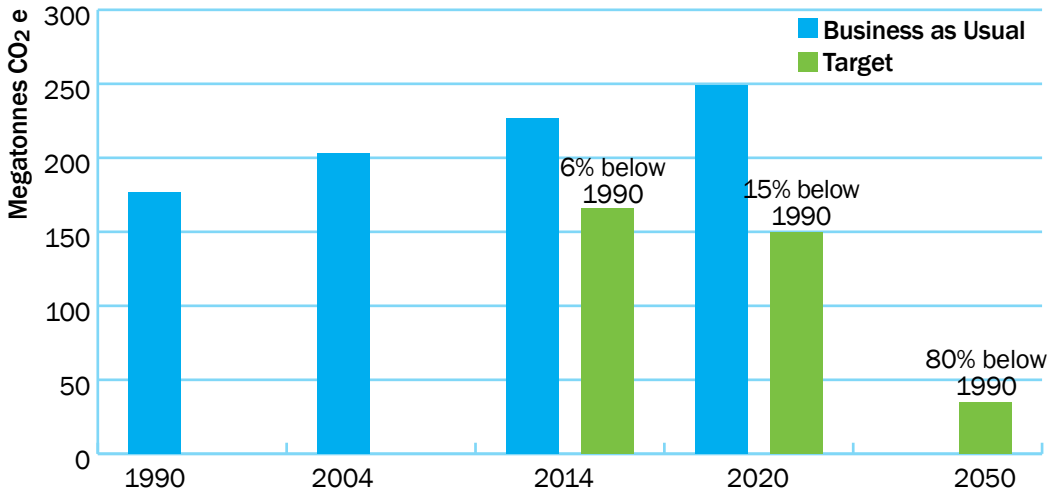
The key goals of this current phase of the project are to define what types of policy and support mechanisms are in place, what further mechanisms are needed, what adjustments need to be made to existing policies, and what measures different stakeholders can undertake to facilitate RE implementation and to increase the market for renewable energy in the GTA.

This final report is a compilation of ideas and insight from some of the most experienced and dynamic professionals in the renewable energy sector. We have interviewed experts from a variety of businesses, institutions, and organizations that are putting a great deal of effort into advancing the market for renewable energy and shortening the path to a more prosperous Ontario and sustainable future. Their responses have been used as the basis for the analysis and recommendations outlined here. Privacy was guaranteed to all participants, and therefore all responses are not directly attributed to specific research participants and are used in an anonymous manner to inform the analytical content of the paper. Their accumulated knowledge describes how to shorten the path to achieve a renewably powered and more prosperous Ontario.

Background

The drive to develop a power system based on renewable energy (RE) is motivated by environmental and socio-economic issues, as well as strategic concerns. Global climate change and localized air pollution, particularly in the Greater Toronto Area (GTA), have galvanized the public to pressure both municipal and provincial governments to achieve substantial reductions in greenhouse gases and phase out coal-fired generation from the electricity supply mix.

Figure 1: Ontario's Greenhouse Gas Emissions Targets



The province is in danger of failing to meet its greenhouse gas emission targets for 2014 and 2020 if it does not capitalize on the development of the RE sector and instead stagnates under a business as usual scenario (figure 1). Only through the expansion of the renewable energy sector can Ontario meet both its greenhouse gas emission targets and simultaneously achieve the sorely needed industry, investment, and job creation that comes with a strong RE sector.

Fear of a supply crunch coupled with the volatile costs of nuclear, oil, and natural gas have also sparked unprecedented interest in harnessing the free and inexhaustible power derived from the sun, wind, water, and increasingly, biomass products. Moreover, growing numbers of Ontarians recognize that our province is extremely well positioned to benefit from the creation of a vibrant RE manufacturing industry that could replace the losses suffered by the auto industry in recent years.

Yet, in spite of strong public support for RE and the provincial government's commitment to prioritize these sources in its energy mix, RE still accounts for only a fraction of Ontario's power supply. In fact, Ontario missed its 2007 target for installed renewable capacity (having installed as of 2009 only 781 MW of its original 2007 target of 1350 MW, excluding RESOP signed contracts) and is in danger of missing its target for 2010.[9]

Although the IPSP intends to double RE capacity, it is only a target that without ambitious enabling policies will not send a strong market signal to attract significant RE investment, create new manufacturing industries, or position the province as an international leader. Furthermore, the original IPSP proposed committing Ontario to maintain its nuclear capacity and significantly increase natural gas reliance, and approach that severely shrinks market potential for renewable energy development.

9 For details see: Canwea (2009). Canadian wind capacity tops 2,000 MW. *WindLink*, 112. Available at *www.canwea.ca/media/release/release_e.php?newsId=51* and Government of Ontario, "The Ontario government has set a goal of generating five per cent (1,350 MW) of the province's total generation capacity from new renewable sources by 2007" in *Ontario's Electricity Future*, Accessed at: *http://occ-oes.com/wp-content/uploads/2008/09/ontarios-electricity-future.pdf*
Also see: Ontario Power Authority. January 2008, *Progress Report on Electricity Supply* [online], Available from: *www.powerauthority.on.ca/Storage/65/6055_Progress_Report_on_Electricity_Supply_-_January_2008.pdf* [Accessed: 1.2.2009]

Policies that have put Ontario on the international renewable energy map, such as the RESOP, have only begun deploying enough resources to fundamentally alter the existing power system paradigm.

This roadmap demonstrates that the transition to a system based on renewable sources requires a fundamental shift in mindset with regards to how energy is generated, distributed and consumed. The barriers set out in this paper represent what many experts identify as hindering or outright working against RE deployment. These barriers range from physical obstacles such as centralized grid design to social impediments such as a lack of social capital and limited know-how.

The second part of this report sets out feasible solutions to these barriers – those that are socially, economically, and technically possible. Above all, this report aims to show readers that as long as there is a will to transform the energy economy, there are many ways to work towards its realization and capitalize on the multiple associated rewards.

PART 1: Barriers to the Deployment of Renewable Energy in Ontario[10]

1. Financial Barriers

Ontario has introduced one of the most advanced policies for renewable electricity in North America: the Renewable Energy Standard Offer Program (RESOP). However, this policy is currently under review and the outcome of that evaluation is not yet certain. Furthermore, the Province has not yet introduced other crucial policy mechanisms that are used in leading RE jurisdictions, such as zero or low-interest loans.

1.1 High up-front costs and lack of adequate financing mechanisms

The up-front costs of RE systems are a barrier to the widespread expansion of these technologies in Ontario. These up-front costs represent more than just the cost of the system, but include additional incidental costs, such as renovations, permits, audits, and applications. Zero-interest loans, such as those provided by the Powerhouse Program, already exist but are currently not available throughout all of Ontario.[11]

Likewise, rebate systems that provide some relief to reduce the cost of purchasing and installing a RE system in Ontario, such as the Toronto Solar Hot Water Neighbourhoods Initiative (see box 1) are not widespread or available for other RE technologies.

10 It is important to recognize that the barriers outlined in this section are not ranked in order of importance, nor do they exist independently of one another. Although they have been laid out categorically, to enhance the reader's convenience, it is critical to understand that these barriers are interdependent.

11 Powerhouse loans or rebates are available to homes in Brampton, Caledon, Mississauga, and Parts of York Region for details see *www.powerhouseprogram.ca*

Box 1: Toronto Solar Neighbourhoods Initiative (TSNI):

Homes in the GTA can reduce their annual hot water NG bills by 40-60% by installing a solar hot water system. Top quality systems are already manufactured in Ontario and take 1-2 days to install.

This pilot program analyzes the feasibility of expanding similar RE programs to the rest of Toronto. The pilot is located in the South Riverdale neighbourhood.

With over 400,000 single-family homes, Toronto is the 6th largest government in Canada (and is larger than 3 provinces). Smog has been identified as a serious health issue for Toronto, and this program seeks to reduce the source of this problem i.e. the burning of fossil fuels. At the residential level two key uses of fossil fuels are: driving automobiles and using hot water heaters fueled by natural gas (NG). Homeowners can reduce their use of fossil fuels through driving less, and by using solar systems for heating water and for space heating.

In addition to the petroleum used for transportation, Toronto satisfies much of its energy needs (e.g. space heating) by using NG (up to 60% of Toronto's energy consumption is satisfied by NG). The use of NG is also rising because of its growing popularity for electricity generation.

The TSNI aims to displace the use of NG, particularly during the summer smog days when solar systems work the best. The program has been structured so that a home can receive $1000 off the cost of a solar thermal system or they can receive a zero-interest loan. Traditionally, policy support has been in the form of subsidies, but here the idea is to offer two options to help determine what options homeowners will prefer.

The advantage of a loan program is that the City already has a system for paying and collecting funds: direct taxation through the property tax base (i.e. local improvement charges). Work done on the home or home property could be eligible for a loan and could be paid back through the tax bill. So if it is possible to prove through this program that access to such loans captures interest at the community level, then other municipalities could set up similar loan structures and programs.

1.2 Lack of full cost comparison of supply options

"The reason renewable energy appears to be expensive is due to existing barriers, which create a self-fulfilling prophecy."[12]

The consumer prices of electricity and heating have remained artificially low in Ontario because many of the externalized health, social, and ecological costs of fossil fuel and nuclear generation continue to be absorbed by present and future taxpayers, as well as by the environment. The lack of environmental and economic lifecycle evaluations has resulted in the cost-effectiveness of conventional sources, such as nuclear power, being markedly overestimated, and as a consequence, renewables appear more expensive.[13] This well-established problem is evident in the original supply choices made for the IPSP14 and represents one of the key reasons why Minister Smitherman has instructed the OPA to review its estimates regarding renewable energy and conservation.[15]

The lack of lifecycle analysis in the comparison of supply source costs has obscured the advantages of renewable sources in terms of their low-to-

12 Quotes come from the interviews, but due to privacy they are not attributed directly to the speaker.

13 Peters, R., Cobb, P. and Winfield, M. *Renewable Is Doable: Analysis of Resource Potential and Scenario Assumptions* (Drayton Valley, AB: Pembina Institute, 2007); Gibson et al. *An Analysis of the Ontario Power Authority's Consideration of Environmental Sustainability in Electricity System Planning* (Toronto: Green Energy Coalition, 2008), Submission to OEB EB-2007-0707; Harding, J. *Overnight Costs of New Nuclear Reactors* (Toronto: Green Energy Coalition, 2008), Submission to OEB EB-2007-0707. These can be accessed at *www.renewableisdoable.org* .

14 For details see: Government of Ontario, Ministry of Energy and Infrastructure. Press release, September 18, 2008. "Energy Plan to Strengthen Green Ontario." Accessed from: *www.mei.gov.on.ca/english/news/?page=news-releases&body=yes&news_id=9*

15 George Smitherman, Minister of Energy and Infrastructure, Office of the Deputy Premier. September 17, 2008. *Re: Amendments to Supply Mix Directive* Issued June 13, 2006. *www.powerauthority.on.ca/Storage/83/7831_Ministry_Directive_PSP_Sept_18_08.pdf*

negligible fuel cycle costs, lower environmental risks, and greater societal benefits, such as employment generation, public health, and energy security.[16] Requiring lifecycle costing to be adopted by energy planners would be one step in leveling the playing field.

Additionally, it must be understood that while the costs go up for fuels over the long term (the fuel price for conventional generation is one key factor that determines energy prices to consumers), renewables avoid this cost parameter, as sources such as wind power and solar power are free. Others, such as biomass, can be sourced locally thus creating new economic opportunities for Ontario's farmers and forestry operators. Unlike conventional sources, the cost of renewables is largely related to upfront costs (equipment, financing, and installation costs). Fortunately, the capital costs for renewable and conservation technologies will decrease over the long term, just as fuel costs for nuclear and fossil fuels will likely rise as demand increases and fuel sources become scarcer.

1.3 Unstable policy environment

"Consistent, long-term programs without interruptions are absolutely necessary for renewable energy (initiatives) to succeed."

When the regulatory environment is not clear or coherent, the public and investors do not know how to proceed. All policy experts interviewed agree that a stable regulatory environment is necessary to attract renewable energy investors by ensuring a fair return on their investment. This is precisely the goal of the Feed-in Tariff (FIT) policy that inspired Ontario's RESOP.[17] By creating a fair price for energy produced and 'fed' into the grid, RE system owners are guaranteed a quantifiable and consistent return on their investment. If the price is adequate, the system pays for itself and eventually yields additional profit for the owner(s).

The current freeze on all RESOP projects over 10 kW has halted these projects in their tracks. Uncertainty is reverberating throughout the RE sector with respect to whether or not projects, already in the works, will be able to proceed once the freeze is lifted. While the OPA's rationale for the freeze is to bring in anti-gaming measures, much criticism abounds with respect to their decision to stall the program almost entirely (whereas in Spain and Germany, program reviews are not grounds for a program freeze).[18]

16 For more details about the superior employment benefits of renewable energy see Kammen, D., Kapadia, K and Fripp, M. (2004). *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* Berkeley: RAEL available at *http://rael.berkeley.edu/publications?page=7*
For a comparison of different fuel sources for electricity generation in Ontario see Godin, M. (2007). *Analysis and Scenario Modeling of the Ontario Power System*. Toronto: WWF-Canada available at *www.pembina.org/pub/1496*

17 FIT systems are used as a key mechanism to expand the use of renewable energy in the leading jurisdictions of Germany and Spain. Through the use of FIT systems Germany is now the most advanced nation in the world in terms of renewable energy deployment and local manufacturing, and has achieved more than 240,000 jobs in the sector (Spain has also become a world RE leader and currently has 188,000 people employed in its renewable energy sector). For more details on how to design a FIT system see Ragwitz, M. et al. (2008). Evaluation of different feed-in tariff design options – Best practice paper for the International Feed-In Cooperation (2nd edition, update by October 2008). No city: Fraunhofer Institute. Available at: *www.feed-in-cooperation.org*

18 The OPA rationale seems to be that anti-gaming measures are meant to address the large amount of RESOP projects undertaken by commercial developers seeking an alternative to the more onerous Request For Proposals (RPF) process. Since the inception of RESOP developers have adapted to the new market opportunities and have been dividing large projects into 10 MW projects (subsequently taken up much of the available queue space on the existing local distribution grid).

The lack of a stable investment environment also discourages the establishment of a domestic manufacturing industry for renewable energy in Ontario.

A FIT initiative like Ontario's RESOP program, that uses a performance-based premium paid for each kilowatt hour (kWh) produced and delivered into the grid, creates a very modest yet stable investment environment.[19] Since system owners can be guaranteed a quantifiable return on their RE investment, it becomes significantly easier to gain access to finance and system owners have the needed security of knowing that the system will pay for itself. The government (and the public) in return receives clean electricity, and in addition, the government is not financially liable if a system has design flaws, fails to perform as expected, or is poorly maintained. When government support for a program like the RESOP is compromised, investment security evaporates and market stability is threatened. Investors and project developers do not know how to proceed and many projects and investment flows become stalled.

A clear illustration of this detrimental situation is the 'boom and bust' cycles that are periodically created by the federal RE tax credit system used in the United States. In that type of market, instability periodically reverberates throughout the industry and prevents a confident investment environment, which is imperative to encourage the establishment of a strong and stable domestic manufacturing industry for RE technologies. The German and Spanish FIT model of these leading nations is representative of an innovative and stable RE market. The FIT model has proved to be attractive to entrepreneurs and the investor community.[20]

Ontario's current freeze on the RESOP has compromised the certainty to invest. Entrepreneurs and investors have no choice but to wait for new rules or seek new opportunities outside of Ontario. The RESOP stoppage has already detrimentally affected a variety of projects, including several smaller and medium enterprises whose viability is in jeopardy.

2. Social Barriers

2.1 Techno-Institutional Lock-In or Path Dependency

"It's not easy to get an industry that has been doing things the same way for almost a hundred years to do something new."

Techno-institutional lock-in refers to a pervasive situation when established technologies create systemic market and policy barriers affecting the development and implementation of new technological alternatives. In Ontario, this reality manifests itself most clearly in the inability and/or unwillingness of planners and decision-makers to think beyond the boundaries of a power system currently

19 A performance-based premium, such as the Feed-in Tariff (FIT), encourages efficient systems because the FIT pays for the amount of power produced, rather than a lump sum for the system (that could be of any quality). A more efficient system will provide a higher return on investment, ensuring higher quality projects are entering the market and benefiting the long-term health of the renewable energy market.

20 For more details regarding the employment and ecological benefits of Germany's FIT system see Germany's progress report available at the site of the International Feed-In Cooperation
www.feed-in-cooperation.org/content/view/29/51/

dominated by a small number of large generating plants.[21] Due to the fact that Ontario's electricity sector has been focused on a system based on centralized power for almost a century, many of the key players involved in infrastructure projects (engineers, lawyers, financiers, decision makers, etc.) share an entrenched set of beliefs and attitudes regarding how the Province's energy needs 'ought' to be satisfied.

2.2 Lack of knowledge of and experience with renewable energy and distributed generation

"We need to equip people in the community to ask the right questions of those in power"

Ontario has limited experience with distributed generation, and consequently system planners are resistant to the adoption of a new yet superior system. Because the viability of distributed renewable generation has not yet been fully ingrained in the Province, many traditional utility planners continue to observe them as 'unreliable', 'intermittent', and 'expensive'.

There is a significant gap between increasing public enthusiasm for RE and knowledge of, or experience with the concept of energy autonomy, smart grid design, the latest technological developments, policy changes, or employment opportunities in the renewable energy sector. This gap can be attributed to the fact that there are only a few strategic RE networks in the province, and there have been relatively few opportunities for community power projects around which social capital could be built.[22] This reality is exacerbated by the small size of the provincial renewable energy industry, and the limited levels of support on behalf of all levels of government

There is also a skewed focus on certain technologies. For example, many people are attracted to photovoltaics (PV), even though solar thermal systems offer faster paybacks and significant energy savings. Awareness about more popular renewable energy technologies such as wind power is greater than other less iconic technologies such as ground source heat pumps or biomass applications (which at the present are largely ignored). In addition, there is limited understanding about the multiple benefits that renewable energy can provide (e.g. employment creation) and how RE systems can be used in novel and complimentary configurations (e.g. CHP, hybrid systems).

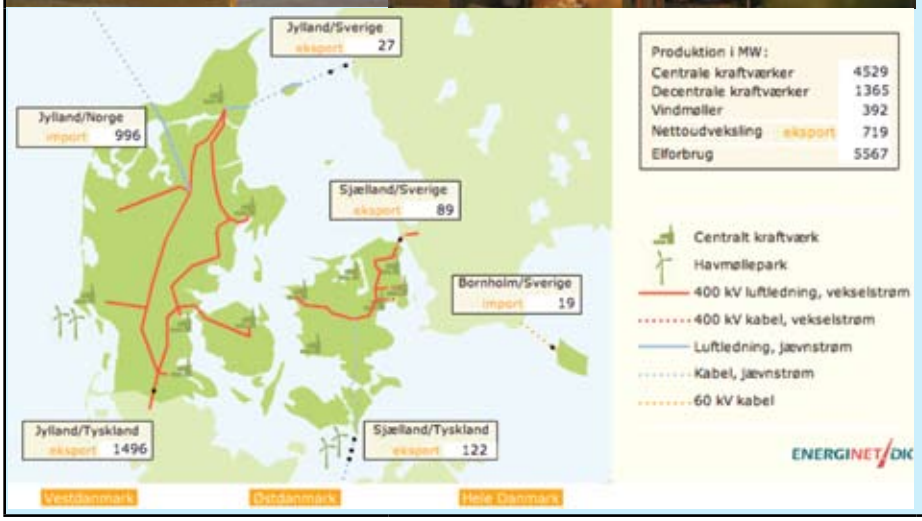
21 Path dependency is another term for Institutional-Technological Lock-in, but refers to the capacity of the technology itself to lock us into one energy path over another. For instance, nuclear power has extremely long lead times (long planning and construction times), as well as long facility life, and extremely high capital costs. All these factors combine to make it politically and economically risky to abandon the technology, even in the face of better, proven options.

22 Ontario has seen the formation of two complimentary networks focused in advancing the use of renewable energy in the province. The Renewable is Doable coalition is a network of environmental organizations (*www.renewableisdoable.com*) and the Ontario Green Energy Act Alliance is a network of environmental organizations, First Nations groups, academics, civil society organizations and renewable energy groups that are advocating for the adoption of a new renewable energy law in Ontario similar to the German Renewable Energy Act. For additional information see the alliance's site at: *www.greenenergyact.ca*.

Box 2: Denmark and distributed generation

It is widely known that Denmark generates 20% of its electricity using wind turbines; however, the significant functions of its combined heat and power (CHP) distributed generation plants are less widely understood. CHP plants provide over 50% of Danish electricity and enable grid operators to handle effectively a large penetration of intermittent renewable sources. CHP plants can be operated when their electricity is needed and the heat generated can be stored and used in a variety of residential, industrial and commercial applications. Matching CHP with wind power allows Denmark to have a reliable electricity system. Furthermore, in many areas of Denmark wind power generates more electricity than is needed locally and this technical experience is allowing grid operators to consider doubling the current national contribution of wind power.

Distributed RE Generation in Denmark
(Wind and CHP installations including heat storage)



Denmark's grid operator provides real-time information on how the entire country satisfies its electricity needs in its internet site: *www.energinet.dk/en*

2.3 Opposition to Renewable Energy

Opposition to renewable energy is often fueled by competing interests and limited knowledge of renewable energy technologies and also by a variety of widespread misconceptions such as the weak reliability of solar and wind technologies in Ontario, or anecdotic concerns about excessive noise and wildlife impacts (such as potential bird 'kills'). These misconceptions are enhanced and reinforced by a lack of policies aimed at ensuring that local communities benefit directly from the development of RE and the absence of guidelines that maximize the common good, public interest and long-term perspectives as key guiding principles for decision-making in the energy sector.

Box 3: Public acceptance facilitates technological innovation

This CHP plant, located in Northern Denmark, has used a ground heat pump for over 20 years to reduce the use of natural gas.

3 Institutional/Jurisdictional Barriers

3.1 Limited opportunities for new energy delivery systems such as community power cooperatives

"If communities cannot bring all the equity or share capital to the table, how will the rest of the financing be attained without compromising the core values of community power?"

Community power refers to organizations rooted at the local level e.g. municipalities, local distribution companies (LDCs), farm associations, First Nations, schools, churches, businesses, etc. that can initiate and benefit economically from renewable energy projects.

Community power projects currently face a number of challenges, in particular related to lack of financing opportunities and policies to enable communities to participate in energy production. While a limited amount of government funding for early stage financing and capitalization now exists through the Ontario Community Power Fund, most community groups are still unable to obtain equity and share capital to develop RE projects.

Ontario's RESOP also limits eligible projects to 10 MW per transformer, creating a barrier for community projects that include more than one 10 MW installation.[23] In many cases this size limitation has limited profitability and compromises project feasibility.

Current grid access arrangements in Ontario are also a significant barrier for allowing community-owned systems, as utilities are not obligated to connect

23 As an example consider the 20 MW project on Georgina Island, a joint venture between the Windfall Ecology Centre and the Chippewas of Georgina Island First Nation.

them. In contrast, utilities in Germany and Spain are obliged to connect RE producers.

Additionally, most community power projects prefer to incorporate as cooperatives in order to have the option of drawing-up an offering document to raise share equity from the local community through the Financial Services Commission of Ontario (FSCO). Through this system, they can avoid having to conduct a very expensive prospectus and having to hire a license brokerage firm to sell shares on behalf of the cooperative through the Ontario Securities Commission (OSC).

Unfortunately, the Cooperative Act stipulates that all cooperatives must conduct 50% of their business with members, meaning that 50% of the power generated from a cooperative power project must be sold to its members. This conflicts with the RESOP in terms of its requirement that all power be sold back into the grid. There is an urgent need for amendments to the Cooperative Act, which should be updated to recognize that doing business with the grid is equal to doing business with members.

3.2 Limited training opportunities

"In Canada, we don't truly have the ability yet to train renewable energy technicians, it's just starting."

Training in the installation, operation, and maintenance of renewable technologies is still fairly limited across Canada and receives marginal government support. This reality still persists even though the existence of a skilled labour force is widely recognized as an essential component to propel RE into the mainstream. The good news is that innovative programs at the college level are developing across Ontario. Currently, these programs are struggling to find the necessary funding to provide comprehensive training on a wide variety of fronts including: project management, installation, operation, maintenance, finance, manufacturing, and policy formulation.

In countries such as Germany, training programs are developed by manufacturers of wind turbines and are then systematically integrated into the mainstream curriculum. Proper government financial support is provided to recruit and train German renewable energy technicians on a regular basis. In Ontario however most developers are not yet ready to sponsor programs as they themselves are just getting their first projects off the ground. Therefore, government support is essential to facilitate the development of trained personnel and local know-how.

3.3 Conflictive mandates of utilities and local distribution companies (LDCs)

"There is an undue burden on utilities to deliver parts of a [RESOP] program that we are not in control of."

Although the OPA has full control over the RESOP, the actual responsibility for processing and financing extensive application requirements rests with utilities. Unfortunately, they currently lack a mechanism to recoup most of the costs associated with meeting them. Local utilities feel overregulated, and question the need, for what they perceive as a large degree of central oversight, which

is causing them to redirect an increasing amount of their budget to regulatory compliance. In addition, local utilities are being left out of key decisions and programs that directly impact their service areas. These issues have made it unnecessarily conflictive and difficult for them to address and fulfill customer needs and requests for the connection of renewable energy systems to the grid.

4. Political Barriers

There is increasing evidence concerning the growing incompatibility of the old electricity system with the new options offered by renewable energy. In countries such as Spain where wind and solar installations are becoming widespread, existing nuclear baseload is creating significant system challenges particularly in times of low electricity demand and high wind availability.

Knowledge about the operation and control of electricity systems and technological development in generation options and energy storage are evolving rapidly. The evolution of energy options is directly related to political decisions that determine what type of infrastructure frameworks are to become dominant and how market development will proceed. For example, both Germany and Spain have decided democratically to phase-out their nuclear facilities and promote the development of their renewable energy industries.

4.1 Failure of the Integrated Power System Plan (IPSP) to maximize renewables

"The government can't successfully promote renewable energy and nuclear together."

The fast approaching deadline for phasing out coal-fired plants has put pressure on the provincial government to come up with a viable plan to meet demand over the next 20 years. To fulfill the objectives set out in the Supply Mix Directive issued in 2006, the Ontario Power Authority (OPA) delivered the IPSP in late 2007.[24]

In regards to renewables, the first iteration of the IPSP prescribed 10,402 MW and 15,700 MW of renewable capacity to be operational by 2010 and 2025 respectively.[25] Renewable resources in the plan refer to hydroelectric, wind, solar and biomass energy. All feasible large and small hydro sources are said to be included on the basis that hydroelectricity is the most cost effective of the renewable resources. The amount of biomass, wind on small sites, and solar resources is limited to what the OPA estimates will be procured through the RESOP. Large wind sites, excluding potential offshore wind installations, have been used to provide the remaining resources required to meet the supply mix goal.

The OPA's original allocation of supply from renewables and conservation and demand-side management (CDM) falls far short of the potential indicated in the supply mix directive (which was taken as a maximum by the OPA). The original iteration of the IPSP also falls far short of what has been proven technically achievable in leading jurisdictions and also falls well below Ontario's renewable

24 Ontario Power Authority, Supply Mix Background Report, Supply Mix Advice and Recommendation, Section 1.2. *www.powerauthority.on.ca/Report_Static/157.htm*

25 Ontario Power Authority, "IPSP Now Online," *www.powerauthority.on.ca/Page.asp?PageID=122&ContentID=6244*

energy potential. Instead, nuclear power is considered as the predominant source for baseload power in the IPSP, and is slated to contribute approximately 14,000 MW of electricity over the next 20 years.

As an attempt to obtain a more accurate estimate of the potential of renewable energy and conservation Ontario's Minister of Energy, Hon. George Smitherman, has instructed the OPA to review its estimates regarding these sources in Ontario.[26]

This review needs to consider that a system built around a large nuclear component will be locked into that specific design for several generations to come. This reality is due to the large, centralized, and non-modular nature of the proposed new facilities, which are expected to have 70 plus years of facility planning and operational lifecycles.[27] Allowing high dependency on a predominantly nuclear system compromises the development of opportunities for other technological advances (such as distributed CHP generation) and grid innovations (such as storage and forecasting) that enable renewable energy development. Furthermore, continued over-reliance in the existing paradigm denies future generations from having a wide range of potential energy futures free from non-renewable resources and their corresponding liabilities and risks.[28]

A recent report released by a coalition of environmental organizations provides a detailed analysis that illustrates how Ontario can phase-out its nuclear generators by developing renewable energy and conservation strategies.[29]

4.2 Building code limitations

The Ontario building code is outdated and poorly suited to accommodate current and future uptake of renewable energy and conservation technologies. While the existing Building Code mandates certain minimum levels of energy efficiency in house construction it does not set standards for increasing the contribution of solar or the incorporation of other renewable energy options (e.g. biomass, geothermal) and conservation measures (like passive solar design).

Furthermore, building codes do not mandate on-site energy generation using PV nor the use of solar thermal applications (as it is done in Spain and Israel). This is in spite of the fact that most commercial and residential building sites in Ontario are capable of employing active solar technologies particularly if buildings were to be designed and sited for solar use during the design stage.[30]

4.3 Outdated municipal zoning laws

At the moment, energy procurement is derived mostly from large mega-projects, and the provincial system has been built up around these large-scale generating

26 Ministry of Energy and Infrastructure. Energy Plan to Strengthen Green Ontario. September 18, 2008. Accessed from *www.mei.gov.on.ca/english/news/?page=news-releases&body=yes&news_id=9* on February 4, 2009.

27 Gibson et al. (2008). *An Analysis of the Ontario Power Authority's Consideration of Environmental Sustainability in Electricity System Planning*. Toronto: Clean Air Alliance available at *www.renewableisdoable.com*

28 Ibid

29 For more details see Rogers, P and Burda, C. (2008). *Plugging Ontario into a Green Future: A Renewable is Doable Action Plan*. Toronto: Pembina Institute available at *www.renewableisdoable.com*

30 For more details see Etcheverry, J., Gipe, P., Kemp, W., Samson, R., Vis, M., Eggertson, B., McMonagle, R., Marchildon, S., and Marshall, D. (2004) *Smart Generation: Powering Ontario with Renewable Energy*. Vancouver: David Suzuki Foundation. Accessed from *www.davidsuzuki.org/files/Climate/Ontario/Smart_Generation_full_report.pdf*

plants. The zoning laws reflect this bias. As a result, even small renewable energy projects are categorized as conventional generation facilities, and must follow the same procurement path and rules. This classification forces many urban properties (and farms) to be re-zoned as commercial, which increases taxes. In recognition of this problem, the City of Toronto's renewable energy bylaw amended this zoning requirement.[31] However, this zoning issue remains a barrier for many jurisdictions outside of Toronto, who have yet to develop and implement solutions for this obstacle.

Another zoning barrier is height regulation; whereas commercial buildings are often allowed to go over prescribed heights, residential homes are restricted from increasing the height of the building. For homes that have a flat roof, it is illegal to place high racks on the roof for solar panels. Although the city of Toronto is challenging this zoning restriction (and a ruling on this issue is expected soon), this issue exemplifies the unnecessary municipal barriers faced by residents that try to install renewable energy systems.

Ontario municipalities are also faced with the lack of right to "sunlight" or solar access legislation. Canada is one of the only developed nations that does not have solar access legislation.[32] Currently, solar installations on a house or a building are not protected by legislation that would prevent someone from building a structure that obstructs the installation's access to sunlight, thereby nullifying the investment). To avoid this serious problem zoning rights are needed to ensure solar access; this modification will ensure better construction protocols and will help minimize disputes.

4.4 Property tax penalties

Many renewable energy systems can change the taxation category of a property (e.g. from agricultural to commercial) or increase property valuation, and consequently, property taxes. These conditions can be a deterrent to potential system owners. To prevent these problems, RE systems can be exempted from taxation assessment changes or could be classified as appliances, which are not calculated in property taxes.

4.5 Complex and expensive permitting requirements

"The process for applying to connect a renewable system needs to be streamlined and made easier."

The permitting process for RE systems can be lengthy and onerous due to a lack of experience with these systems on behalf of municipal officials and LDCs. Building permits are required for small-scale renewable energy projects. These permits increase the cost of a RE system and add another level of difficulty in the already complex set of steps that people must take to install such a system in their homes or businesses.

31 City of Toronto. Renewable Energy Generation and Distribution: An explanation of Zoning Requirements for Renewable Energy Devices in the City of Toronto. Accessed from: *www.toronto.ca/building/pdf/renewable_energy_flyer.pdf* and City of Toronto. January 31, 2008. "Proposed Zoning By-law Amendment to Permit Renewable Energy Devices and Cogeneration Devices and allow for the Distribution of that Energy." Accessed from: *www.toronto.ca/legdocs/mmis/2008/pg/bgrd/backgroundfile-10467.pdf*

32 For an overview of the origins of solar rights legislation see Bomber, M. (2004). A overview of the current state of daylight legislation. *Journal of the Human-Environment System*, 7, 57-63.

As mentioned previously, the vast majority of the time-consuming and complicated application process for RE systems involves LDCs. Applications are not tailored to the size of projects; a homeowner installing a small 1-2 kW system is required to fill out the same form as a large firm developing a 10 MW project. Even small-scale proponents must open a separate account with their LDC in order to connect their renewable system at a cost of $10 per month.

While at first glance this amount may not appear to be excessive, it effectively takes away $120 per year of profit from a small system, which could be used to pay it off more quickly instead. This arrangement has the effect of discouraging homeowners and small cooperatives with tight budgets that may want to implement RE systems but instead currently become frustrated and/or overwhelmed with the complexity and numerous expenses of connecting to the grid.

It is important to note that without some of these permits, a municipality faces liabilities in case of system failure or injury. Municipal permitting departments should be better informed about the various types of renewable energy systems and encouraged to waive the permitting fees for small or socially desirable systems. Clearly, at the very least the current permitting and approval processes for installing and using renewable energy systems should be streamlined.[33]

4.6 Canadian Standards Association requirements

The current Canadian Standards Association (CSA) ratings on renewable energy equipment present a barrier for RE system purchasers that are required to buy CSA rated systems. Not all equipment is yet CSA rated and currently it takes 2 to 3 years to get CSA approval. Access to equipment at a standard that customers can trust should be more readily available. Additionally, this information needs to be more accessible to expedite project development and to facilitate comparison between similar quality products, and seasonal or all-season products.

4.7 Geographical limits to renewable energy development: the 'orange' and 'yellow' zones

The orange zones are large geographic areas that have been designated by the OPA to be off-limits for RE development and grid interconnection. Currently the orange zones coincide with many prime wind sites on Lake Huron and in Northern Ontario. The grid in this Southwestern region has been reserved for the Bruce nuclear plant, effectively freezing out the development of the prime wind sites located on Lake Huron and the region in general. The yellow zone, which includes parts of the GTA, is where RE connection is somewhat limited. There are currently transmission limits for the yellow zone as of May 13th 2008, when the RESOP program was largely frozen for transmission reasons. On this date it was decided that yellow zones are to be treated as orange zones.

The OPA's zoning excludes many prime RE energy areas and projects from the energy market, including small projects promoted by the RESOP. It makes little sense to exclude these as they as they can be part of the distribution system

33 For more details regarding the process of installing renewable energy systems in Ontario see OSEA (2006). The Community Power Guidebook. Toronto: Ontario Sustainable Energy Association. Available at the publications section of *www.ontario-sea.org*

and do not impact the grid. Furthermore, these small projects serve local loads and help to decrease local line losses and should be allowed to proceed (as the orange/yellow zones are justified by macro-scale grid issues, and micro-installations can produce as much power as that lost in transmission).

Since small projects can actually help stabilize high voltage grids, improve the efficiency and reduce the losses on the system, they also provide a local injection of power where needed and should therefore not be segregated. Distributed generation and grid upgrades do not pose insurmountable technical problems and need to be viewed and planned for as necessary system improvements.

4.8 Utility Requirements

Connection Impact Assessments: project developers must go to the LDCs with a study that shows the impact a project will have. The LDC indicates how much it will cost to connect it, and subsequently the LDC and the project developer make an agreement for payment. Some LDCs are requiring project proponents to have dedicated lines for renewables under the RESOP, creating a capital expenditure that negates any financial return.[34]

4.9 Environmental Assessment Requirements

An Environmental Assessment (EA) requires that potential projects identify any possible negative impacts on the environment stemming from the proposed project, and potential actions to be taken to mitigate these negative impacts. The EA is required before a project is approved. What is important to note about this process is that it does not take into account the largely benign impacts that RE projects often have on the environment. This is particularly relevant for the enactment of the Green Energy Act, which would identify environmentally and socially sensitive areas where renewables should not be developed, and to streamline the approval process in all other regions.[35]

5 Infrastructural Barriers

5.1 Outdated grid forecasting capabilities

Currently, Ontario's grid operators are limited by the lack of technologies that enable new strategies for network operation such as: accurate RE forecasting and on-line dynamic security assessments that can be provided by wide-area monitoring and protection systems.[36]

34 For an overview of the interconnection arrangements of other leading renewable energy jurisdictions see Klein, A., Plunger, B., Held, A. Ragwort, M., Reach, G. and T. Faber. (2008). *Evaluation of different feed-in tariff design options – Best practice paper for the International Feed-In Cooperation (2nd edition, update by October 2008)* Brussels: IFC. Available at *www.feed-in-cooperation.org/content/view/58/72/*

35 There are many exemptions for renewable projects, including exemptions for wind under 2 MW, all solar photovoltaic, biomass under 5 MW, landfill gas/biomass under 25 MW, waste biomass under 10 MW, cogeneration under 25 MW, generation onsite under 25 MW, and all energy technologies not designated in the Regulation and all emergency generators. For more details see Ministry of the Environment Environmental Assessment and Approval Branch. (2001). *Guide to Environmental Assessment Requirements for Electricity Projects*. Available at: *www.ene.gov.on.ca/envision/gp/4021e.pdf*

36 For more details see Ensslin, C., Burges, K. Boemer, J. (2008). *Market Introduction Perspectives of Innovative Technologies Supporting Integration of RES-E. Berlin: German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety*. Available at: *www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_market_introduction.pdf*

Their report indicates that better standard monitoring equipment and more open communications are required for tomorrow's grid. Their research has implications for Ontario, and Ontario should consider the implementation of high-temperature superconducting (HTS) devices, which can improve network operation and prevent losses, through improving

The development of demand-side management facilitates the matching of instantaneous generation with demand, which also enables integration of renewable energy systems (RES). If new RE systems are connected to the distribution grid, more responsibility will be required at the sub-systems level, therefore, measures such as "intentional islanding" or purposeful fragmentation of the grid during times of system stress can be implemented, greatly benefiting grid managers.

Box 4: Smart grids for just-in-time forecasting and matching renewable energy resources



Spain has implemented some of the most sophisticated renewable energy control centers in the world, which facilitate forecasting and the matching of hydroelectric and wind resources to ensure a reliable and clean supply of electricity (middle photo courtesy of Red Eléctrica de España).

5.2 Ontario has not yet transitioned to a Smart Grid system.

Energy development needs to be treated as an essential and strategic public service and not solely as a commodity. And at the same time, energy companies must be able to make money from reducing demand and not just from selling energy.

Traditional utility roles can inhibit the shift to renewable sources. Utilities have a narrow mandate that must be expanded to include the ownership of distributed resources like renewable, conservation and storage technologies. Currently it is also difficult for utilities to have combined heat and power (CHP) projects because these plants do not fit the traditional utility role, and current rules and incentive systems do not allow them to fully benefit from RE, conservation, CHP and storage opportunities.[37]

The current focus on the centralized generation and transmission of electricity results in barriers for smaller, distributed generation sources. Under the present arrangement, electricity consumers are paying for the Bruce to Milton line that is reserved for nuclear capacity while a farmer with a biomass-powered system (or a wind turbine) has to pay to connect to the grid. This is a significant barrier, and is indicative of the preferential treatment that nuclear generation enjoys and the public subsidies involved in delivering nuclear power to the GTA.

Currently, Hydro One Networks has a maximum capacity on its' transformer stations of 60%. This 60% cap stems from the current focus on uni-directional flow in the distribution networks. Reviewing this cap would allow the addition

system stability when RES (and distributed generated sources) are added (HTS can transition rapidly between very low to high resistance to ensure this stability advantages).

37 Litster, Peter. (2008). Barriers to Significant Uptake of Combined Heat and Power Production in Ontario: A Major Paper submitted for the degree of Master in Environmental Studies at York University, Toronto, Ontario, Canada. For a summary of this research see:
www.cospp.com/display_article/338177/122/ARCHI/none/none/1/CHP-in-Ontario-laying-sound-foundations/

of more renewable sources onto the grid and help prevent the need for expensive upgrades.[38]

The smart meter program is a step in the right direction as information technologies and enhanced communications are key to the success of a decentralized energy network. Similarly, more intelligent controls in the grid allow power to be rerouted so demand or intermittency issues can be controlled before they can become a problem or cause outages. Currently, transmission communication centres are virtually blind to emerging outages in the distribution network, until the failure is called in. Adding intelligent controls to the distribution network would protect vulnerable industries and energy consumers from system disruption—an increasingly important task in modern society (where we are ever more digitalized and interconnected). Substantial savings can be realized by avoiding outages, and intelligent controls and storage systems are ideal for managing this issue.

Current pricing practices need to be amended so prices are determined at the meter and not at the generating unit (because not all energy sources are equal, and the distance from source, i.e. use of wires, must be incorporated into the price of the energy). Such pricing would reward many renewable sources that tend to be sourced close to load and can be combined to create a reliable electricity system (see Box 6).

Box 5: Smart Grid Integration

Advances in telecommunications, materials science, renewable energy systems, conservation strategies and computer science are enabling the swift development of new smart grids that can satisfy electricity needs in a reliable and clean manner.

Spain has become a leader in smart grid integration and has recently developed advanced control systems that facilitate the efficient development and maximization of wind and solar installations (image by Alex Doukas and photo courtesy of Red Eléctrica de España)

38 For more information see: European Commission. (2005). Towards Smart Power Networks: Lessons learned from European research FP5 projects. Accessed from: *http://ec.europa.eu/research/energy/pdf/towards_smartpower_en.pdf*

5.3 Lack of innovative storage solutions and hydro integration

The addition of storage technologies at the generating source, along the grid or at the load source are required for: allowing more renewable sources to enter the grid, smoothing loads, stabilizing the grid, increasing energy autonomy, protecting against forecasting errors, shifting peak demand, and to minimize expensive grid upgrades. Likewise, better forecasting needs to be combined with rapid-cycle energy storage to smooth intermittency, increase power quality, and to better integrate renewable resources into the grid.

As it stands there are no practical incentives or financial mechanisms in place in Ontario (or at the federal level) that would enable storage options to be rapidly expanded to support large deployments of wind and solar power.

Many companies (e.g. high tech industries) and institutions (e.g. hospitals) require not only the prevention of power outages but also the assurance that power quality can be maintained (as changes in voltage can be just as damaging financially as outages). Storage technologies cannot only help to support RE systems within those settings but can also smooth output to ensure power quality.

Box 6: Energy Storage in Ontario

Halton Hills Hydro is currently testing a storage facility to evaluate its potential for residential, commercial and rural applications. This and other efforts are hampered due to the lack of widespread incentives or innovation programs in Ontario.

5.4 Lack of Local Distribution Company (LDC) participation and limited innovative ownership models

In today's energy system, LDCs are considered wiring companies, and have narrow mandates that do not allow them to own generating sources. This limited view bans LDCs from owning DG and storage systems.

As 'creatures' of the municipalities, LDCs are further impacted by the limited experience municipalities have with RE systems or energy issues even though they are now required by the Energy Conservation Leadership Act to develop energy plans.[39]

Municipalities and LDCs have a lot of control over distribution lines and can therefore help develop new arrangements for accommodating bi-directional power flows, storage facilities, and new DG sources of generation (e.g. CHP and RE). However, the narrow mandate of the LDCs and the lack of experience of

39 For details see *Energy Conservation Leadership Act*, 2006. Available at: *www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_06e03_e.htm.*

municipalities complicate their participation in the development of new initiatives and incentives to foster innovative local models of RE generation, which are essential to develop a growing RE market in Ontario.

Box 6: Innovative Ontario Municipalities

The city of Markham has developed an affiliate to develop its own CHP plants as its LDC cannot develop any generation plants of its own. CHP plants help displace NG currently widely used for heating single buildings, and can also enable a municipality to expand and balance RE capacity in the system. Markham already has the first component that characterizes Danish electricity systems (i.e. CHP plants) and is therefore well positioned to develop renewable energy systems (see Box 3)

Part II: Solutions to renewable energy barriers and the map to a sustainable system based on renewable generation:

To overcome the barriers identified in the previous section and to ensure that renewable energy sources are developed to their full potential in Ontario, will require concerted action and innovation by government, private sector, educational institutions, local organizations and individuals. The items listed below are aimed at providing clear complimentary paths for the rapid development of RE in Ontario.

1 Ontario should set higher renewable energy targets

Currently all European nations are considering aggressive RE targets for primary energy by 2020. The current review of the IPSP's renewable energy and conservation potential ordered by Minister Smitherman should be used to set aggressive RE targets for Ontario.[40] RESOP premiums need to be adapted to ensure that targets are properly met and that RE development proceeds in a sustained manner to ensure market stability and investment certainty.

40 George Smitherman, Minister of Energy and Infrastructure, Office of the Deputy Premier. September 17, 2008. *Re: Amendments to Supply Mix Directive Issued June 13, 2006*.
www.powerauthority.on.ca/Storage/83/7831_Ministry_Directive_PSP_Sept_18_08.pdf

2 A clear and strong Ontario Green Energy Act should be implemented

The experience of leading RE jurisdictions such as Germany and Spain clearly indicates that having a strong framework to prioritize the development of renewable energy as a long-term area of strategic concern creates a favourable investment environment, which is essential to attract finance and maintain sustained RE development locally. Germany and Spain have become leading global manufacturers of RE systems and have developed world class RE expertise through the enactment of innovative RE legislation that facilitates the use of their domestic energy markets as a foundation to develop local RE projects.

Legislation in Germany and Spain has resulted in a stable investment environment that, coupled with proactive policy initiatives aimed at developing local capacity and financing options, helps to consistently grow local RE options and know-how. Currently in Ontario an effort to develop and enact strong RE legislation is gaining momentum and could result in the adoption of a Green Energy Act comparable to the RE laws that have propelled Germany and Spain to their current leadership positions.[41] Some of the recommendations provided below could form part of the proposed legislation as they have been shown to be effective components and the key guiding principles behind effective RE acts.[42]

3 Ontario's Renewable Energy Standard Offer Program (RESOP) needs to evolve into a stable feed-in tariff system

The current review of Ontario's RESOP represents a unique opportunity to implement a stable feed-in tariff system that at the very least provides fair prices differentiated by technology and other factors deemed socially and/or technologically desirable.

Close examination of the experience of European countries, such as Germany, Denmark, and Spain, which have significantly accelerated their deployment of renewables, clearly indicates that stable and adequately priced feed in tariffs (FITs) have played a pivotal role in their success. While Ontario has already taken a critical first step by implementing the RESOP, the program has yet to offer the appropriate premiums upon which significant RE capacity can be built. In addition, to ensure that this crucial program becomes a strong market beacon that consistently attracts global finance to our province will require that additional innovations are incorporated.

In Germany and Spain FITs are regularly studied and reviewed to ensure sustained market development. The experience of these leading jurisdictions indicates that Ontario's RESOP can be greatly enhanced by:

a. The incorporation of tiered pricing differentiated by technology and project size: this modification ensures clear market signals regarding preferred technology, scale, location, and type of generation. Different premiums can be used to encourage new storage options, forecasting, greater distributed generation and greater participation of community power proponents that cannot move around the province to take advantage of the highest/best resource areas or areas where grid capacity is deemed feasible.

41 For additional details see *www.greenenergyact.ca*

42 Such as the *German Renewable Energy Sources Act*, 2004 (EEG)

b. Expanding eligible technologies to include biogas technologies solar thermal, geothermal, and energy storage technologies.

c. Ensuring obligatory connection to the grid. In areas where insufficient grid capacity exists to facilitate a project, grid capacity must be expanded and modified, including projects in remote areas.

d. Enhancing and facilitating priority connection to the grid. Clear measures and proper compensation systems are required to ensure that LDCs and Hydro One constantly expand necessary connections to distribution and transmission lines.

e. Rapid Measures to relieve queues are required so proponents that create a bottleneck in the distribution or grid lines are not allowed to unreasonably stop other projects ready for installation.

f. Hook-up fees and interconnection fees must be waived. At present, these fees are set by the LDCs, yet a Green Energy Act could mandate that all utilities can recuperate costs to fast track renewable development in areas not deemed to be environmentally or socially unacceptable.

It is important to emphasize that while properly designed premiums will greatly increase market interest and provide support for the installation of renewable technologies, this program alone is not sufficient to achieve a total market transformation and requires strong complimentary measures such as innovative forms of financial support such as zero or low- interest loans, rebates, and grants.

The current freeze on the RESOP program must be lifted to eliminate the current market confusion that dissuades many developers from exploring Ontario as a location to invest in. Programs like the RESOP must remain stable in the future so that developers are encouraged to invest in Ontario and to achieve job creation. Furthermore, the concept of an orange zone or a yellow zone must be lifted due to the fact that the transmission stations in these zones can handle small-scale systems (particularly if these systems can supply local loads). Until macro-level grid issues are resolved, these regions must be opened to local distributed generation projects in recognition that these projects can alleviate strain on the grid.

4. Innovative financing opportunities should be implemented at the appropriate level of government

"Much of the rapid growth of renewable energy in Germany has been fueled by a large low-interest loan fund."

The creation of a zero or low-interest loan fund is not a financial substitute for tariffs that offer the opportunity to earn fair profit on renewable energy investments. Rather, it serves a complimentary role for a well-designed and functional RESOP system.

In Germany, a fund created for that purpose disburses attractive loans through private banks and holds loans on a revolving basis. This means that as loans are paid off with interest, the fund is regenerated. Loan terms can be up to 20 years with an interest rate typically 1% below the prime rate. Payments can also

be waived during the first three years of the loan. This type of loan program is vital in order to increase market liquidity and to encourage the deployment of technologies that can remain out of reach for community groups such as farmers and First Nations and also for homeowners.

Municipalities have a number of financing options available to them. The Toronto Atmospheric Fund (TAF) is a model funding source at the municipal level. Making such a fund structure available to other municipalities would be an excellent means of supporting RE development. The use of local improvement charges (LICs) to finance RE projects is another vehicle for municipalities to make off balance sheet loans for RE.[43] LICs are currently used by many municipalities to finance infrastructure improvements (normally sidewalks and roads) that benefit a specific neighbourhood. In the case of renewable energy projects LICs could be used to finance renewable energy projects, and like the typical projects LICs finance, would be paid back through the property tax bill of the neighbourhood or individual that owned the property and installed a renewable energy project.

Green mortgages could also be used to refinance a home to incorporate the costs of adding a renewable energy system. With lower utility bills, banks would see the benefit in providing the loan, because the incremental up-front cost of such systems can be repaid through utility bill savings. This concept also applies to new homes as green mortgages are essential for allowing people to finance a more cost-efficient home powered by renewable systems (that once installed provide homeowners with long-term utility bill savings). Additionally, Green Bonds at either the federal, provincial, or municipal level would be an effective mechanism to generate additional financing for RE projects.

Also a yearly top-up of the Ontario Community Power Fund represents an important strategy to enable growing access to finance, in particular for community power project proponents. Such support is imperative for these groups to participate in energy production and to create local jobs.

5 Renewable energy sources should be prioritized by the Province as a strategic resource for the Province's welfare

This includes obligatory connection to the Grid, including remote areas, and priority access to the grid, including access to new projects delivering baseload power. Municipalities must set reasonable standards and provide straightforward and inexpensive approvals for installations that meet those standards. In addition, new permitting needs to be supported by innovative zoning arrangements that instead of precluding RE development, act as additional incentives for local initiatives to become widespread.

Provincial recognition of RE development as a strategic concern needs to be coupled to recognition of the right to connect to the grid and by ensuring priority RE access to transmission and distribution.

The high costs of connecting or developing the grid should not be born by renewable energy project developers because they are considered as providers

43 For additional information see: Pembina Institute, May 2004. "Using Local Improvement Charges to Finance Building Energy Efficiency Improvements: A Concept Report." Accessed from: *http://pubs.pembina.org/reports/LICProgramFinal%20ReportMay27042.pdf*.

of a strategic service to all Ontarians. This recognition creates a practical and leveled-playing field with centralized generators who have benefited from decades of government and ratepayer support.

Grid development must be strategically planned to ensure that RE resources can be developed to their full potential throughout Ontario and to fast-track new connections with neighbouring provinces.

6 The Integrated Power System Plan (IPSP) should be re-designed to provide first priority for renewable energy

The IPSP needs to be modified to reflect the Supply Mix Directive's priority to maximize the province's feasible and cost-effective renewable energy potential. A recent joint study by WWF-Canada and the Pembina Institute titled Renewable is Doable: A Smarter Energy Plan for Ontario (RID) provides two alternatives scenarios that exclude both coal-fired and nuclear generation. Given that the OPA has not provided alternative scenarios to their IPSP, save for identifying minor options with regards to individual energy resources, RID serves as an alternative to long-held assumptions concerning Ontario's supply mix.

The fundamental difference between RID and the IPSP is that the former does not assume centralized nuclear power to be an inherent component of Ontario's power system. Rather than follow in the footsteps of past provincial power system planning, RID presents two scenarios in which targeted investments in a diverse assortment of energy efficiency and renewable energy technologies achieve the Ontario government's goals of phasing out coal-fired generation and achieving reductions in greenhouse gas emissions.[44] The alternative scenarios presented in RID aim to enhance the resilience, cost effectiveness and overall sustainability of the system through distributed generation, modularity, and demand reduction strategies.

Linear planning such as that used by the IPSP needs to be replaced by non-linear modeling that yields a variety of potential configurations for Ontario's electricity system to thereby develop better understanding and consensus about the most effective strategies to achieve sustained and widespread RE development and more sustainable energy options.[45]

7 The Province and relevant local authorities should mandate that new buildings and renovations provide a specific percentage of power needs from renewable sources

The Province and relevant local authorities should amend the Ontario Building Code to mandate that a constantly growing percentage of all new buildings and renovations incorporate renewable energy production.

The amendment should be put in place to ensure that all new buildings and major renovations satisfy a growing part of their energy needs by developing RE

44 Godin, M. July 2007. Renewable Is Doable: A Smarter Energy Plan for Ontario, Report No.2. *Analysis and Scenario Modeling of the Ontario Power System*. (Toronto: Portfire Associates). Accessed from: *http://pubs.pembina.org/reports/RID_report2_final.pdf*

45 Linear planning usually establishes a few static scenarios to guide development; non-linear modeling instead identifies different variables that can be quickly updated to see system wide-effects (e.g. the introduction of a new RESOP tariff or a breakthrough technology or system-wide changes on demand patterns). Non-linear dynamic modeling requires the use of software designed for that purpose (e.g. STELLA) and aims at identifying and building consensus regarding policy options that can be adapted to achieve desirable outcomes.

sources, and to simplify the approval process for the installation of RE systems. Model legislation includes Spain's Solar Ordinance, and Britain's Merton Rule.

Spain provides one of the world's best examples of how municipal legislation can be used to enhance the use of solar thermal energy in new buildings (the 'Barcelona Ordinance' was adapted as a national measure aimed at ensuring that all new Spanish buildings implement solar systems).[46]

This innovative policy can be adapted to suit Ontario's conditions and can include modifications of the building code to ensure that a variety of renewable energy sources are considered prior to construction.

As mentioned in Part I, zoning guidance is imperative. The New Provincial Policy Statement, 2005 (PPS) indicates that renewable energy systems should be allowed in multiple zones.[47] Yet many developers' efforts have been met with frustration because in reality such allowance is not easily observed. The province should provide clarity to the municipalities in regards to renewable energy systems, so that the municipalities may be guided as to how RE systems are to be classified in accordance with their official plans and zoning by-laws.

8. The Province and relevant authorities, in cooperation with municipalities and Local Distribution Companies should begin the transition to Smart Grid infrastructure

A "smarter" system with enhanced communication capabilities is crucial for establishing distributed renewable generation throughout the province.[48] New control center capabilities, such as those employed in the transmission system need to be added to the distribution system in order to eliminate current blind spots that inhibit more thorough management of the grid. In addition, development of forecasting capabilities to ensure greater integration of intermittent RE needs to be fostered (for example by securing secondments from leading jurisdictions, organizing training opportunities in the world's most advanced control centers, and providing incentives/requirements to install complimentary parallel control centers in Ontario).

Local distribution networks should be islanded or become distinct from neighbouring distribution networks. Flow must undoubtedly be maintained between them, but power that is generated locally should be used predominantly within the local distribution network. If as much power as possible is produced locally and consumed in this network, less electrical power will have to flow back to the transformers, increasing efficiency through reducing line losses. Flows will only occur if a local surplus of energy is generated. Municipalities, as owners of

46 All new residential buildings are now required in Spain to have solar thermal systems and new buildings that receive government support are required to implement solar thermal and solar PV systems. See Schaefer, B. September 2006. Case 16: Barcelona Solar Ordinance. Create Acceptance.
Accessed from: *www.createacceptance.net/fileadmin/create-acceptance/user/docs/CASE_16.pdf*.

47 Ministry of Municipal Affairs and Housing. Provincial Policy Statement (2005), Section 1.8.3: *"Alternative energy systems and renewable energy systems shall be permitted in settlement areas, rural areas and prime agricultural areas in accordance with provincial and federal requirements. In rural areas and prime agricultural areas, these systems should be designed and constructed to minimize impacts on agricultural operations and to provide extra income and new economic opportunities to farmers and farming communities."* Accessed from: *www.mah.gov.on.ca/Page1485.aspx#1.8*

48 For more information of current proposals to develop smart grid strategies in Ontario see Smart Grid Forum (2009). *Enabling Tomorrow's Electricity System: Report of the Smart Grid Forum*. Available at: *www.theimo.com/imoweb/pubs/smart_grid/Smart_Grid_Forum-Report.pdf*

LDCs, must also open distribution grids to the concept of bi-directional flows.

A clear step to achieve such changes is to ensure that the price of power charged to the end user reflects not only the amount used but also the distance traveled.

The Ontario Energy Board does not allow LDCs to produce power as mandated in the Energy Competition Act of 1998; in fact the province only allows LDCs to distribute electricity. [49] System benefits must be united with system ownership. This requires that the role of the LDCs be expanded. Otherwise, innovation will continue to be effectively prevented. In 2004 the Province passed Bill 100, the *Electricity Restructuring Act* that enabled LDCs to participate in demand-side management programs. This expanded role was a move in the right direction, and another Bill further opening the roles of LDCs to produce renewable power is required for the effective transformation of Ontario's electricity system into a clean system that will employ thousands of people.[50]

Box 7: Smart grids: renewable energy and sustainable transportation

The development of smart grid strategies will enable not only to have access to clean electricity in Ontario but will also provide the foundation for powering innovative sustainable transportations options

9. Storage should become a priority for expanding and firming up renewable sources

Research and innovation is needed to identify and develop storage solutions. Partnerships must be built between industry, the OPA, and educational institutions in order to most effectively identify where and what type of storage is needed in order to best firm up renewables. The focus must be on both demand and carbon reduction. Further resources are required for research and development, with a focus on furthering the transition to the commercialization level.

It is not just about reducing the costs associated with many energy storage technologies, but ensuring the benefits that are derived from these projects are monetized and accrue to the system owner. Under current structures, public ownership may be ideal, seeing as many of the benefits of storage are experienced at the societal level.

49 For more details see: *Ontario Energy Board Act*, 1998. Accessed from: *www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_98o15_e.htm*

50 For more details see: *An Act to amend the Electricity Act, 1998 and the Ontario Energy Board Act, 1998 and to make consequential amendments to other Acts*, 2004.
Accessed from: *www.e-laws.gov.on.ca/html/source/statutes/english/2004/elaws_src_s04023_e.htm*

Many of the barriers met by renewables that we have listed here also apply to energy storage. Energy storage must be prioritized as an important enabling technology linked to renewables.[51]

Energy storage technologies should be incorporated into the RESOP and CESOP through making the technologies covered in these programs dispatchable, and increasing the quality of power entering the grid from these sources. Furthermore, if the roles of LDCs can be expanded to own generation, LDCs could finance these projects.

Putting a price on carbon may also benefit energy storage technologies by assisting in prioritizing energy storage over fossil fuel based back-up generators.

10. The Province should implement groundbreaking strategies to develop a strong local manufacturing industry for renewable technologies

"There must be a commitment at all senior levels that renewable energy is part of an industrial policy to solve the current manufacturing crisis."

Ontario's struggling auto and manufacturing industries have the opportunity to capitalize on the development of renewable and conservation energy technology manufacturing and development. This calls for a transformation of Ontario's auto manufacturing sector towards the manufacturing of renewable and conservation technologies, and plug-in hybrid vehicles.

This evolution of Ontario's productive capabilities can produce many good quality jobs, as well as create new domestic markets for other important local industries such as steel manufacturing.

Because the creation of local RE technological capabilities, manufacturing, skills, and jobs has not yet been a part of a strong industrial and innovation strategy Ontario needs to foster more actively the development of expertise and know-how' for example through 'train the trainer initiatives and new local capacity development programs focused on the needs of the renewable energy sector.[52]

11. The PST exemption for Renewable Energy Developers should be renewed

The PST exemption that was available to Ontario renewable energy project developers expired on January 1, 2008, and should be renewed. This policy failure severely impacts the returns on new renewable projects. Tax credits reduce investment risk through freeing up more funding for projects.

51 For more information on storage options see: Peters, R., O'Malley, L. (2008). *Storing Renewable Power*. The Pembina Institute. Drayton Valley, Alberta. Available at: *www.pembina.org*

52 The decision of local renewable energy companies, such as ARISE Technologies of Waterloo, Ontario, to base their manufacturing plants abroad (ARISE sited a plant in Germany), points to a significant policy vacuum and highlights the need for municipal, provincial and federal governments to develop more ambitious strategies to develop strong domestic markets and strong incentives for Canadian as well as international companies to set up shop in Ontario.

12. New Educational and Training initiatives should be implemented to develop local capacity and to establish effective international partnerships with leading jurisdictions

Ontario currently has just a few renewable energy programs at the community college level (e.g. Centennial College, St. Lawrence College, Seneca College, Humber College) and at the university level (e.g. Queen's University, Waterloo University, York University).[53]

In addition, the Living City Campus at The Kortright Centre for Conservation hosts the Power Trail, Canada's largest renewable Energy and sustainable technology education and training facility as well as the headquarters of the World Green Building Council.

All of these programs require new funding to increase their activities and to create new opportunities for training Ontarians.

The private sector, Ontario Municipalities, the provincial and federal governments have a unique opportunity to foster favourable conditions for the development of these and other educational initiatives and to create new collaborative opportunities with leading international institutions (e.g. Nordic Folkecenter for Renewable Energy)[54] and emerging organizations (such as the International Renewable Energy Agency)[55].

A very effective strategy is to create opportunities for secondments and 'train the trainers' initiatives so leading organizations such as the International Feed-in Cooperation can rapidly help develop policy capacity and know-how in Ontario.[56]

Secondments can help foster a new generation of renewable energy champions and can smooth the way to achieving renewable energy targets on time.

13. Streamline the approvals and permitting processes

Zoning laws, permitting requirements, Canadian Standards Association requirements, Connection Impact Assessments, and Environmental Assessment requirements present many obstacles to the speedy fulfillment of Ontario's current and future renewable energy requirements.

Protection of the environment and the move towards a sustainable energy network are complimentary goals whereby the processes required on the part of RE project developers can be streamlined while maintaining the utmost protection for the environment. Expediting the process will bring Ontario a clean energy future that provides system reliability and eliminates many of the pollutants inherent to conventional sources of generation.

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53 For details about these programs see the St. Lawrence College website: *www.sl.on.ca/index.aspx?iPageID=139&iMenuID=6&progId=559* *http://eto.senecac.on.ca/renewable/photovol.html*; and Humber College's website: *www.humber.ca/appliedtechnology/program/sustainable-energy-and-building-technology-co-op*

54 St. Lawrence College of Kingston has started a partnership with international Renewable Energy Learning Centres such as the *Nordic Folkecenter for Renewable Energy* through the World Wind Energy Institute. For further details see the site of the World Wind Energy Institute at *www.wwei.info*.

55 The International Renewable Energy Agency (IRENA) is a new organization that will be launched in January of 2009 and will focus in local capacity development and technology transfer for additional information see *www.irena.org*.

56 See op.cit. note 5.

To both protect the environment and speed up the uptake of renewable energy Ontario needs to:

1. Determine areas where environmental protection is required, differentiated by technology and backed by legitimate and peer-reviewed scientific data,
2. Where possible streamline class environmental assessments to consider the impacts and benefits of proposed projects and engage the public in the process,
3. Compile all required permits and approvals into one application process, with designated time limits in processing these applications,
4. Replicate Toronto's renewable energy bylaw for other municipalities to facilitate implementation of renewable energy systems in homes, businesses and communities.

The Road Forward

Since 2004 Ontario has lost over 230,000 manufacturing jobs and many commentators are noting than an unemployment crisis of historic proportions is currently developing in Ontario as the economic woes of North America grow.[57]

To solve this problem and to ensure the province's prosperity the Ontario government must create attractive market conditions for re-directing energy expenditure away from polluting sources and imports, and towards local self-reliance (energy security), job creation, and environmental protection.

Worldwide experience clearly indicates that investment in renewable energy will create local and system-wide reliability and also the highest job creation of any of the energy options. Moreover, funds put towards renewable energy will go much further in terms of job creation in comparison to fossil fuels and nuclear power (as these polluting options are capital intensive, not labour intensive), while at the same time also leading to comparatively higher environmental protection and higher energy security. Ontario particularly needs to avoid repeating the type of financial liability created by decisions such as the Darlington nuclear plant, which was priced at $3.95 billion and finally came in at $14.4 Billion in actual cost.[58]

With investments of over US$ 65 Billion (as seen worldwide in 2007 for new renewable energy systems, excluding large hydro) pouring into the industry yearly, renewable energy systems are ready to be deployed today if strong policy support and political will is present.[59] Particularly, policy support and financial mechanisms for improving Ontario's grid, and for adopting energy storage technologies to firm up renewable power and enhance power quality is needed to ensure that these technologies and techniques can evolve. These steps are essential to ensure that Ontario will become endowed with the infrastructure needed for becoming a leading renewable energy power.

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57 For example see Walkom, T. (2009). Global slump hits home. *Toronto Star*, February 7. Available at: *www.thestar.com/News/Canada/article/583903* or Campbell, C., Scoffield, H. and Chase, S. (2008). Job losses won't alter stimulus plan, Harper says. *Globe and Mail*, February 6.
Available at: *www.theglobeandmail.com/servlet/story/RTGAM.20090206.wjobs07/BNStory/specialComment/*

58 Etcheverry et al., 2004. Smart Generation: Powering Ontario with Renewable Energy. David Suzuki Foundation.
Accessed from: *www.davidsuzuki.org/files/Climate/Ontario/Smart_Generation_full_report.pdf*

59 REN21 Renewables 2007 Global Status Report. Accessed from: *www.ren21.net/globalstatusreport/default.asp*

To become the leader in North America, Ontario must move to provide fair incentives for renewable projects. The German Renewable Energy Sources Act (EEG), 2004 has proven to be the world's most effective renewable energy market mechanism to meet both the dual challenges of job creation and climate protection.[60] As part of Ontario's Next Generation of Jobs Program, Ontario must continue to build a network of green collar jobs.[61] Further opportunities for the province can be had through providing access to government land for developers for the development of clean renewable projects, particularly brownfield sites.

In order to expedite innovation and market transformation, Ontario must expedite and facilitate professional secondments.

To achieve prosperity and a better future for Ontario, Ontario also needs to explicitly target the development of its renewable energy sector in the 2009 budget by aligning the tasks of job creation, climate protection and economic prosperity. The 2009 budget also should establish funding to improve market liquidity and to: facilitate access to zero interest loans for renewable energy systems in residences and small businesses; provide for new funding to develop renewable energy training initiatives in colleges and universities (essential to develop local capacity and to meet the growing RE market needs); provide new funding to create municipal funds (similar to the Toronto Atmospheric Fund) that allow municipalities and LDCs to provide revolving loans for renewable energy systems in schools and other municipal buildings; and replenish the Community Power Fund so it can be expanded to more communities and First Nations groups.

The new ministerial directive issued to the OPA by Minister Smitherman in September 2008 provides a promising opportunity to summarize and publicize Ontario's real renewable energy potential (this target review should include considerations of current advances in energy storage, smart grids, the Helimax wind study commissioned by the OPA and lessons from Germany and Spain on well-organized deployment of renewable energy sources).[62] In sending the OPA back to the drawing board to revisit Ontario's renewable and conservation potential the province is taking a step in the right direction to ensure the rapid development of domestic resources.

With the RESOP program under revision there is a unique opportunity to develop an essential policy tool that can create a strong domestic RE market that fosters innovation, establishes a new manufacturing base and adds new local jobs while ensuring the reliability of Ontario's electricity system. To achieve these benefits, the RESOP premiums need to be extended to key technologies and systems that are in essence complimentary components of a sustainable energy paradigm (energy storage, dispatchable renewables, and CHP).

In addition, the Green Energy Act proposed for Ontario –if properly formulated— can position our province as a global renewable energy leader.[63]

60 For more details see the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), "Renewable Energy Sources Act (EEG) Progress Report".
Accessed from: *www.bmu.de/english/renewable_energy/downloads/doc/40638.php*

61 For more details see the Government of Ontario's Next Generation of Jobs Fund.
Accessed from: *www.ontariocanada.com/ontcan/en/nextgen_main_en.jsp*

62 Helimax Energy Inc. March 2006. "Analysis of Future Wind Farm Development in Ontario." A report prepared for the Ontario Power Authority. Accessed from: *www.powerauthority.on.ca/Storage/50/4535_D-5-1_Att_1.pdf*

63 For more details see the Green Energy Act Alliance: *www.greenenergyact.ca*

Conclusion

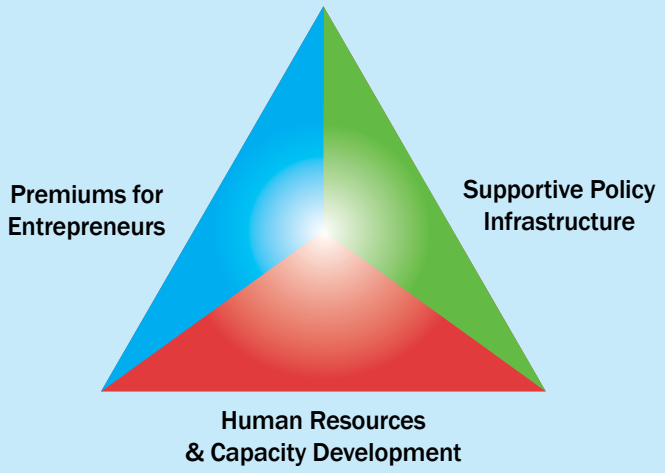
There are many barriers faced in enhancing RE deployment. In laying them out in this document, the authors hope to facilitate effective discussions that will move the renewable energy file forward. The recommendations that conclude this document are what we view as essential components to facilitate the way forward (yet we acknowledge the list is not exhaustive and that it will evolve as time progresses). We would like to thank research participants for their time and effort in sharing their experiences and knowledge with us.

Public knowledge of the multiple benefits that a grid powered by renewable energy can deliver to Ontarians in terms of employment, environmental benefits, and energy security, would greatly assist in the crucial process of moving Ontario from learning from theory to learning by doing. In addition, a more exhaustive study of the specific strategies and actions required for implementing a successful Green Energy Act is necessary for ensuring a better energy paradigm and a more prosperous Ontario.

If market forces are properly harnessed by implementing a supportive policy environment local renewable energy industries could become a crucial new source for manufacturing jobs in Ontario and an engine to improve the quality of life of all Ontarians.

Figure 2 below provides an overview of all the crucial components required to make Ontario the leading renewable energy jurisdiction in North America.

Figure 2: Key Policy Elements to Develop Renewable Energy in Ontario



The development of the components summarized in Figure 2 are also essential to ensure local participation in renewable energy development and form the basis of all roadmap recommendations.

Roadmap Recommendations for 2009

1. Implement a strong Green Energy Act to ensure that renewable energy development is prioritized throughout the province and to send a clear international market signal to attract investors.
2. Use legislation to ensure that renewable energy and conservation resources are prioritized to become the primary sources of new supply in the Province, and to ensure that the province adopts ambitious targets and timelines for renewable energy development (i.e. 10,000 MW by 2015, and 25,000 MW by 2025).
3. Ensure a thorough and rapid completion of the ongoing revision of the RESOP, so that this crucial program becomes as attractive to local and international investors as the German and Spanish renewable energy programs.
4. Ensure that the IPSP revision of the potential for renewable energy and conservation in Ontario is informed by: the latest advances in technology (e.g. storage, RE grid integration, smart grids); by the empirical market response shown by Ontario's RESOP; and by the program results of Germany and Spain.

Roadmap Recommendations for Budget 2009

5. Provide new funding (e.g. loan guarantees) to facilitate access to zero interest loans for financing renewable energy systems in residences and small businesses throughout Ontario.
6. Re-focus existing budget commitments to develop new renewable energy training initiatives in colleges and universities and to fund professional secondments (essential to develop local capacity and meet growing RE market needs).
7. Provide new funding to create municipal funds (similar to the Toronto Atmospheric Fund) that allow municipalities and local distribution companies (LDCs) to provide revolving loans for renewable energy systems in schools and other municipal buildings (in addition to #1 above).
8. Replenish Ontario's Community Power Fund so it can be expanded to more communities and First Nations.

Additional Roadmap Recommendations

9. Develop a new Ontario based effort to collaborate actively with leading international renewable energy agencies (e.g. International Feed-in Cooperation, International Renewable Energy Agency) so local capacity can be developed in a sustained manner and to position Ontario as a leading international 'know-how' jurisdiction.
10. Start a province-wide renewable energy promotion program that builds on the Every Kilowatt Counts program to promote Ontario's renewable energy programs and to increase awareness about the multiple benefits of renewable energy.

11. Create a highly visible province-wide network of education and demonstration centres and projects (fixed-site and mobile) to ensure that Ontarians can see and experience renewable energy and other environmental technologies in action. Existing model examples of these initiatives include the Toronto and Region Conservation's Living City Campus at Kortright Centre for Conservation and the Evergreen's Brickworks Site.

Biographies of Authors

José Etcheverry Ph.D. is an assistant professor in the Faculty of Environmental Studies at York University. José has also taught environmental policy at Simon Fraser University and the Center for Environment at the University of Toronto. His current research is focused on renewable energy technology transfer, training and education, climate change and energy policy. In 2006, José was appointed by Dr. Hermann Scheer to become one of the chairs of the World Council for Renewable Energy. He serves as President of the Canadian Renewable Energy Alliance, a board member of the Windfall Ecology Centre, as well as a Canadian correspondent for the global Renewables Status Reports, published by Worldwatch Institute on behalf of Renewable Energy Policy Network for the 21st Century.

Lynda O'Malley is a Masters Degree Candidate in the Faculty of Environmental Studies at York University, where she is studying policy options for renewable energy solutions, particularly energy storage and distributed generation. Lynda has worked with the Pembina Institute on their energy storage primer, Storing Renewable Power. She has also published in Renewableenergyworld.com.

Jenny Taylor is pursuing a Masters in Environmental Studies at York University. Her research is focused on ethics and technology, particularly the role of ethical processes in renewable energy deployment. Jennifer has an undergraduate degree from Lakehead University in Environmental Studies in Forest Conservation and a graduate diploma from Concordia University in Environmental Impact Assessment.

Biographies of Interviewees

Mike Brigham the owner of two small import/distribution businesses in Toronto, but his real interest lies in renewable energy. In 1985, he installed his first solar electric system on his Georgian Bay cottage, which was shortly followed by four more PV systems he designed and installed for neighbours and friends, all of which are still operating some twenty years later. Mike and his wife recently designed and had built for them, an innovative home in Toronto which uses about 65% less energy than a standard home and of course utilizes solar thermal and PV systems. Mike has been a Windshare member since 2003, a board member of the Toronto Renewable Energy Co-operative since January 2007 and TREC's SolarShare Project Manager since August 2007. A key personal goal of his is to find a way of building medium and large-scale community-owned solar PV systems, leading in turn to Ontario achieving 1,000 MW of solar PV by 2017.

Deborah Doncaster is the Community Power Fund Executive Director since its

founding in 2007. Previously, she was the founding Executive Director of the Ontario Sustainable Energy Association (formed in 2001). Under Deborah's leadership, OSEA accomplished the delivery of a Standard Offer Contract Program for Ontario. She was also one of three Project Developers with the Toronto Renewable Energy Co-operative and worked on their Exhibition Place turbine project on Toronto's waterfront. Deborah holds a Master degrees in Law from Carlton University and a Masters in Environmental Planning from York University.

Marion Fraser is currently the President of Fraser & Co., a consulting firm in Toronto, Ontario. Marion has a long history in the renewable energy and conservation fields. She has an illustrious career with over 25 years of experience in energy management and is widely recognized as one of the most prominent practitioners of sustainable energy policy and program designers in Ontario.

Jack Gibbons is the Chair of the Ontario Clean Air Alliance and Director of Pollution Probe's Energy Programme. He has written prolifically on energy issues. In the past, Mr. Gibbons has been a Toronto Hydro Commissioner, a member of the Ontario Energy Board staff, Senior Economic advisor at the Canadian Institute for Environmental Law and Policy, and an Economist with Energy Probe. Mr. Gibbons studied economics at the University of Toronto (B.A), Queen's University (M.A.), and at the University of British Columbia.

Brent Kopperson is the founder and Executive Director of Windfall Ecology Centre, a non-profit environmental organization dedicated to building sustainable communities. Brent is also founding director and past Chair of the Ontario Sustainable Energy Association (OSEA) and has served for 3 years as an NGO adviser to the Canadian government at United Nations climate change treaty negotiations (Kyoto Protocol). Brent is a founding Director of the Canadian Renewable Energy Alliance and the Community Power Fund. He is also the Chair of Green Communities Canada, a Director of the World Wind Energy Association and Co-Chair of the 2008 World Wind Energy Conference.

Judith Lipp PhD has a doctorate in energy policy and is currently the Executive Director of the Toronto Renewable Energy Cooperative (TREC), a not-for-profit, co-operative, which builds community-based renewable energy projects and educates the public about the importance of renewable energy, energy efficiency/ conservation and the community power model. Judith has more than 9 years of research and consulting experience in sustainable energy issues, spanning four continents. She received her her PhD from Dalhousie University where she examined the role of public policy in promoting renewable electricity, drawing lessons from other jurisdictions in the Canadian context. Judith has authored more than 20 publications including a study for the Nova Scotia Department of Energy assessing the policy needs for enabling community energy in the province. She also co-authored GPI Atlantic's Energy Accounts for the Nova Scotia Genuine Progress Indicator Index and Prepared A Vision and Strategy for Green Power in Atlantic Canada for Pollution Probe.

Ryan Little is the Co-Founder and Vice President of Business Development of StormFisher Biogas, an Ontario-based renewable energy utility that converts food processing by-products into gas and electricity. Prior to co-founding StormFisher, Ryan launched a firm that would eventually become the world's first business-to-

business e-commerce application for the energy industry, where he would garner the distinction of being Canada's youngest CEO of an incorporated company. Ryan holds a BA from Queen's University and an MBA from the Richard Ivey School of Business at the University of Western Ontario. He is regularly featured in business publications, speaks to audiences worldwide about social and environmentally-conscious entrepreneurship, and is the recipient of several awards, especially for his work in the charitable sector.

Mark Lutes is the staff lead for the sustainable energy project for the David Suzuki Foundation's climate change and clean energy program. Mark has a nearly 20-year history of working for climate protection in Canada and Brazil. His vast experience ranges from participating in the international negotiations for the United Nations Framework Convention on Climate Change to working with non-governmental organizations in both Brazil and Canada on both global warming and deforestation issues.

Paul McKay is an investigative journalist who has written extensively on electricity in Ontario. He has written for the Ottawa Citizen, the Kingston Whig-Standard, the Globe and Mail, and the Toronto Star. He has also served as a senior policy advisor to the Ontario Minister of Energy. In 1983 he published *Electric Empire: The Inside Story of Ontario Hydro*. He has won numerous awards, including the National Newspaper Award in 2001.

Joyce McLean is the Director of Strategic Issues at Toronto Hydro Corporation and most recently, the Director of Environmental Affairs at Toronto Hydro Energy Services. Educated in political science, marketing and journalism, she has spent over 25 years in the environmental field, and was Toronto Hydro's project manager for North America's first urban wind turbine at Exhibition Place, Toronto, which is co-owned by WindShare.

Rob McMonagle has been active in the solar industry since 1978.He founded Prometheus Energy, one of the pioneer firms in renewable energy in Canada. Prometheus' solar installations included Canada's first residential grid-connected solar system. Prometheus Energy was sold to Kitchener's ARISE Technologies in 2001. From 2002 to 2006, Rob was Executive Director of the Canadian Solar Industries Association (CanSIA). In 2007 he was recruited by the City of Toronto to work as a senior energy consultant and in that capacity was responsible for developing Toronto's Sustainable Energy Plan (which was approved by city council in June 2007). Rob has served on the board of the Solar Energy Society of Canada, the Canadian Solar Industries Association, and the Energy Action Council of Toronto. He received CanSIA's Solar Leader Award in 2007.

Roger Peters is a professional engineer with 30 years experience in energy efficiency and renewable energy in Canada as a consultant, researcher, writer, policy advisor, and advocate. In 2005, Roger helped to create the Canadian Renewable Energy Alliance, a joint initiative of Canadian NGOs who support a global transition to renewable energy. The Alliance published a model Canadian Renewable Energy Strategy in 2006 and is actively engaged in prompting more Canadian support for renewable energy, including the use of renewable energy tariffs. Roger has significant international experience in Asia, Latin America and Africa on energy efficiency and rural energy projects, and has authored reports on energy efficiency strategy, innovative financing, feed-in tariffs, and power storage.

Janet Sawin PhD is a Senior Researcher with the WorldWatch Institute, where she focuses on climate change and global renewable energy trends and policies. Janet is also beginning a new role as Research Director/Lead Author for the REN21 Renewables 2008 Global Status Report Update. She earned her Master's and Doctoral degrees from the Fletcher School of Law and Diplomacy at Tufts University. Her doctoral thesis examined the impact of government policy—including the early German and Danish feed-in tariffs—on the development and diffusion of renewable energy technologies. She has extensive experience in renewable energy policies and trends, and authored the background paper on National Policy Instruments for the German government in preparation for the International Conference for Renewable Energies that took place in Bonn, Germany, in June 2004. Janet was recently nominated by the US government to work on the upcoming IPCC Special Report on Renewable Energy and Climate Change Mitigation (to be released in 2010).

Kristopher Stevens is the Executive Director of the Ontario Sustainable Energy Association. He frequently speaks on renewable energy and community power across Ontario, and has experience on three continents in the corporate, public, and non-profit sectors. Kris specializes in stakeholder engagement, renewable energy policy, corporate communications, and strategic planning. His diverse career has ranged from being an Executive Recruiter for fortune 500 multinationals to radio host in South Korea. He also has worked as a researcher in economic reform in Africa and recently completed a Master degree focused upon energy and planning. In his role as Executive Director of OSEA, he leads the OSEA team in actively championing Community Power and the evolution of Ontario's electricity sector towards 100% renewable sources.

Volker Thomsen is an accomplished international private sector entrepreneur that most recently completed a successful term as the President and CEO of St. Lawrence College in Kingston, Ontario. He is an outspoken advocate for progressive education, healthy sustainable living, and the use of appropriate technologies and renewable sources like wind, ground-source and solar power. He has taken a leadership role in organizing the 2008 World Wind Energy Conference and is currently actively involved in numerous organizations and projects to push the green agenda forward.

Tim Weiss is a professional engineer and the Director of Renewable Energy and Efficiency Policy at the Pembina Institute. His research focus is on technical and policy options to advance efficient and sustainable energy systems in Canada. Tim has written numerous reports and manuals on renewable energy and energy efficiency on issues at national, provincial and municipal levels as well as issues specific to First Nations' and northern contexts. He has assisted more than 20 communities with their renewable energy projects.

Workshop

This report is intended as a background document to help inform attendants to a workshop that will be held in Toronto March 3 2009. The workshop will provide an opportunity to refine the roadmap recommendations to thereby help advance the development of renewable energy in Ontario. For workshop details and additional background information see the roadmap website at: *www.RenewOntario.org*.

Description of Roadmap Website

Ontario's renewable energy roadmap will be supported by a website intended to facilitate its evolution as a key policy tool for increasing the use of renewable energy. The site will also help enhance access to key documents and information sources that informed the development of the roadmap and will also be used to facilitate interactions between workshop attendants and Ontarians interested in renewable energy development. Last but not least, the roadmap site, *www.RenewOntario.org*, will help to improve and update the policies, barriers, and recommendations discussed in this document