The Sustainability Case for Community Power: Empowering Communities Through Renewable Energy

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I would like to thank my loving parents for all their support, not only throughout the MES program, but also throughout the path that has led me here today. Without their strength and belief in my accomplishments, I would not have been able to experience what I have been so lucky to experience to date. They have also provided me invaluable lessons and values that have created my passion for sustainability.

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Abstract

The purpose of this major research paper is to examine the potential impacts of community ownership models, referred to in this paper as Community Power (CP). It aims at assessing CP ownership models as a means of producing sustainable energy systems. The goal of this paper is to provide a working definition of CP that promotes the values of sustainability. CP is assessed using sustainability assessment framework model based on Gibson's and Jaccard's assessment criteria. The criteria employed include: potential risks to the environment and humanity, the scale, adaptive capacity and resilience of an energy system, avoided path dependency, intra and intergenerational equity, participatory and inclusive governance, efficiency, and cost-effectiveness. Following this assessment, the paper identifies barriers and trade-offs that the CP sector currently faces and provides policy recommendations for advancing CP in Ontario. The paper contributes to the understanding of the interconnections between energy systems and sustainability, and the use of CP as a tool to contribute to the sustainability of our energy systems and of our future in general. It also highlights the importance of community involvement in the development, ownership and management of the energy systems upon which we rely.

Foreword

This Major Research Paper (MRP) focused on community power, sustainability and energy systems and is based on a broader set of components and ideas that have guided my research within the MES program. The area of concentration for my program is "Sustainable Energy Policy in Canada", aimed at finding and implementing sustainable energy policy solutions based in renewable energy sources in Canadian provinces. This MRP has enabled me to have an in depth understanding of what factors can make an energy system sustainable as well as an understanding of alternative, non-conventional energy systems that can be applied in Ontario.

The importance of energy sustainability, in a broader context, was made clear to me after completing my 4^{th} year undergraduate thesis on electricity access and the construction of hydroelectric dams in India. This study led me to York University's MES program, where I have been able to further investigate these issues. The courses that I have taken and a number of experiences during the program have provided me with valuable knowledge and perspectives that have all contributed to my understanding of sustainable energy. These experiences include an internship with the World Wind Energy Association during the summer of 2010, participation in the 10^{th} annual World Wind Energy Conference, and participation in Ontario Sustainable Energy Association's 2^{nd} annual Community Power Conference. Working closely with these associations has led me to understand the importance my research for policymaking processes can have.

Having said this, the views expressed in this paper are the author's alone and may not reflect those of the above-mentioned associations or York University.

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Acronyms

CAE	Capacity Allocation Exempt
CEPP	Community Energy Partnership program
CP	Community Power
ECT	Economic Connection Test
FIT	Feed-In Tariff
GEGEA	Green Energy and Green Economy Act, 2009
GHG	Greenhouse Gas
IPSP	Integrated Power System Plan
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt hour
LTEP	Long Term Energy Plan
MW	Megawatt
OPA	Ontario Power Authority
PV	Photovoltaic
REFO	Renewable Energy Facilitation Office
UN	United Nations

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1. Introduction: Contextualizing Community Power

Thirty years ago, a white paper titled “Dispersed, Decentralized and Renewable Energy Sources: Alternatives to National Vulnerability and War” was published by the Carter administration; it stressed the importance of decentralized energy for national security and mitigating the effects of energy vulnerability (Energy Defense Project, 1980). Thirty years later, we are still strongly dependent on large, centralized energy systems and the threats of energy security and vulnerability still loom worldwide. The environmental threats posed by these energy systems have since grown to be an issue of grave importance. These problems, including issues of climate change, energy security, and energy poverty, all threaten the sustainability of our future.

It is impossible to speak of energy policy without placing an emphasis on sustainability. This is because energy is embedded in our day-to-day lives - socially, politically and economically - and the decisions that we make today concerning our energy systems will have serious long-term effects on our societies and ecosystems. In more and more jurisdictions worldwide, the shift towards electricity systems completely based on renewable energy is seen as a necessary step in order to achieve energy security, to strengthen and level off local economic structures and to reduce ecosystem degradation. In the end, these goals all point in one direction: sustainability.

Community Power has been described as an important mechanism to provide communities with decentralized sources of renewable energy and as a decisive step towards a sustainable future. Today, approaches summarized as Community Power (CP) are gaining momentum worldwide as policy makers, community groups and individuals realize the multiple benefits that can arise from this approach to harvesting clean renewable energy which includes the active involvement of local citizens.

Generally, CP can be described as an ownership model where projects are locally sited and locally owned. Projects can be decentralized and are based on renewable energy technologies. A CP project is characterized by the following elements, where the first 2 are mandatory, and where at least 2 of the last 3 criteria are fulfilled:

- **A community has the option of deciding which renewable technology to use to produce the energy service desired and to achieve the outcomes they wish to gain.**
- **Due to its decentralized nature, a community can choose the type of technology and size of energy system that best suits their needs and wants, and that can maximize generation benefits based on the location.**
- **A variety of local stakeholders, whether they are farmers, cooperatives, independent power producers, financial institutions, municipalities, schools, etc., own, immediately or eventually, the majority (50% or more) or all of a project.**
- **The community has the majority of the voting rights concerning the decisions taken on the project.**
- **The major part or all of the social and economic benefits from a project are returned to the local community.**

The CP movement has recently received a lot of attention in Ontario, Canada, since the adoption of the Green Energy and Green Economy Act 2009, which included a Feed-In Tariff (FIT) mechanism. The FIT has included provisions directed to enable CP projects.

By completing a sustainability assessment for energy systems, this paper argues that CP is a sustainable option for developing a new energy system in the province of Ontario and worldwide. It further analyses the policy framework in Ontario and concludes that the current policy environment does not maximize the sustainability benefits of CP.

1.1. Methodology and Outline

This paper assesses Ontario's attempts to implement CP as an ownership model to stimulate the introduction of sustainable energy into its energy mix. Employing a sustainability assessment framework model based on Gibson's (2007) and Jaccard's (2006) sustainability assessment criteria, the assessment will evaluate policy approaches that prioritize CP models. The criteria employed include: potential risks to the environment and humanity, the scale, adaptive capacity and resilience of an energy system, avoided path dependency, intra and intergenerational equity, participatory and inclusive governance, efficiency, cost-effectiveness, and minimization of trade-offs. A more in depth look at these criteria is provided in the sustainability section below.

In order to accomplish this assessment, the study will employ a variety of research methodologies including: a literature review on energy sustainability and CP; interviews with key CP proponents in Ontario in the governmental and NGO sectors; and a study of Ontario's current initiatives and experiences with CP. It will also be important to analyze successful CP experiences worldwide comparatively. The research will initially define CP and sustainability, and later move towards a more practical understanding of what CP is and how it can be implemented in order to maximize its contributions to sustainability in Ontario and globally.

The paper will start by detailing the effects of current global and local centralized energy systems have on the well being of the planet, and the benefits that a less centralized, CP approach can bring. Following this, the paper will attempt to define CP, based on ongoing discussions involving CP proponents worldwide, and based on already successful examples of CP in countries such as Denmark and Germany, and to a lesser extent, Japan, Australia and South Africa. Section 3 will outline the sustainability criteria that are put forward to assess CP. After having established the evaluative groundwork, an assessment of Ontario's current policy framework is undertaken to determine whether or not it supports CP as an ownership model for renewable energy systems. Ontario has been chosen as a case study as it has recently shown strong interest in this form of ownership and has numerous examples of community projects that can be analyzed. In this paper, four different community groups have been chosen for the relative comparability of their stages of development. This assessment will allow for the analysis of Ontario's Green Energy and Green Economy Act, 2009, and provide a set of recommendations for improvement.

1.2. The global context: environmental, economic, and social degradation linked to energy use

> "The environment has been the motivating concern for much public action in climate change, but this is not just an environmental issue. To succeed, we must establish a widespread understanding of the connection between climate change and issues of poverty, housing, health, security and well-being that are of concern to so many."- S. Hale, 2010.

Globally, the questions relating to the sustainability of large centralized energy systems are extensive. The world's dependence on large, centralized sources of oil and natural gas still remains strong despite the threats that they pose to national security, and despite the numerous reports, studies, and estimates on when, if not already, their limited capacity will hit a peak and eventually decline (Simms, et al,, 2009). The International Energy Agency's 2008 Medium Term Oil Report stated that there would be "a narrowing of spare capacity to minimal levels by 2013" (International Energy Agency (IEA), 2008). Conventional oil and natural gas are reaching, if they have not already, their peaks, and cheap and abundant supplies will cease to exist before we know it. As Harding (1968) explains, resources that are finite, such as oil, will steadily decrease as per capita use increases. Recently, the price of oil hit an all time high at $135 per barrel and some argue that the price of oil is bound to steadily keep increasing because the conventional supplies of oil are running out ("Double, Double Oil and Trouble", 2008). According to believers in the Peak Oil theory, most, if not all, of the world's crude conventional oil has been discovered, and production has reached its maximum potential (*Ibid*).

In addition to the risks related to the world's deepening dependence on a source of energy that is rapidly decreasing, there are several other energy related crisis that demand attention (Scheer, 2007), the first being the relationship between energy and the global climate crisis.

Several bodies of work suggest that climate change is the number one risk that our world faces today and there is no denying that energy and climate change are intimately connected (Rischard, 2002). The combustion of fossil fuels for energy production releases carbon dioxide into the atmosphere, which increases the planet's surface temperature. The amount of carbon currently in the atmosphere is somewhere in the neighborhood of 390 parts per million - the highest point at any time in the past 650,000 years - and growing at a rate of 2 parts per million annually (Homer-Dixon, 2009). According to the Intergovernmental Panel on Climate Change scenario for future emissions under a business-as-usual scenario, global surface temperatures can be expected to rise somewhere between 2 and 4 degrees Celsius this century, the highest the temperature has been in over 130,000 years (Pachaur & Reisinger, 2007). Renewable energy sources have been identified as being essential to cutting 60-80% of the world's greenhouse gases (Mallon, 2006). Climate change is already being felt around the globe with the list of climate changed induced catastrophic natural disasters growing everyday, including floods, storms, droughts, etc., jeopardizing the viability of our livelihood and subsistence. Economically, it has been estimated that climate change impacts has cost US$150 billion in 2010 alone.

Large centralized energy systems, such as nuclear plants, also pose a variety of environmental, social and economic threats. Nuclear reactors are never safe from accidents such as containment failures resulting in the release of radioactive substances into the atmosphere or waterways (Stensil, 2008). 64% of Canada's annual freshwater consumption goes to thermal power generation, including nuclear and fossil fuel plants. Most of this water returns to natural water sources releasing potential impurities into the environment (Natural Resources Canada, 2011). Further, despite the billions of dollars that have been invested in research, no plausible way of storing the radioactive waste has been proposed. Radioactive waste is currently either being stored above or underground and will likely remain there for hundreds of thousands of years (Greenpeace International, 2007). Nuclear power poses security threats. No Canadian plant has been designed to endure an aerial terrorist attack and all nuclear expansion projects increase the risk of nuclear proliferation (Greenpeace International, 2007; Stensil, 2008). Many have proposed nuclear energy as a solution to climate change mitigation. But this would essentially involve trading one uncertain, highly potential hazardous threat for another, which is a risk that cannot be taken (Greenpeace International, 2007).

Our society is completely dependent on energy, and in most cases, individuals have little or no idea where their energy comes from. With a growing population and rising incomes, energy demand is certain to increase even further.

1.3. Energy crisis in a Canadian context

Canada is considered the highest energy user and greenhouse gas emitting country per capita among industrialized countries (Town of East Gwillimbury, 2009). Its total electrical capacity is 124,240MW, representing the world's 6th largest electrical grid. Canada's energy mix is composed of hydroelctricity, which represents 59% of total installed generation capacity, coal, 22%, nuclear, 11%, combustion turbine, 6%, wind and tidal, 1%, and electricity generation using fossil fuels (coal, gas, oil) internal combustion, less than 1% (Statistics Canada, 2007). The Council of Energy Ministers estimates that under a business-as-usual scenario, energy consumption in urban areas will increase by about 75% by 2050 compared to 2006 levels of consumption (Council of Energy Ministers, 2009).

Over the next 20 years, Ontario's population will grow by 28% and most of this growth will also be seen in urban areas (Ministry of Energy and Infrastructure (MEI), 2009). This means that new infrastructure must be planned and built to accommodate this growth. It is, therefore, essential that adequate energy infrastructure is established in the most sustainable way possible. Ontario has recently published its Long Term Energy Plan. The Plan states that, by 2030, 12.8% of Ontario's energy needs will be met by renewable energy sources (wind, solar and bioenergy) (*Ibid*). The Plan demonstrates a clear dedication to large central plants (46% of Ontario's energy demand will be met by nuclear plants) and a conservative outlook on dispersed energy supply (*Ibid*).

While efforts to cope with the global energy crisis, which includes environmental stresses, climate change, access to reliable energy sources and growing energy demand, have largely relied on technological solutions, such as improved nuclear facilities and coal burning plants, these initiatives are not enough. These initiatives demonstrate an increasing dependence on centralized energy sources and an inability to break away and create a new, sustainable energy paradigm. A culture of sustainability needs to be embedded in society and a more in depth awareness of energy use needs to be established.

1.4. Decentralized and distributed energy mix- key to sustainable energy systems

Generally speaking, a centralized energy system is one that is based on the use of nuclear, natural gas, coal and hydro power sources, and is one that depends on a relatively small number of large energy intensive sources. Current centralized energy supply systems are extremely vulnerable to supply chain disturbances, natural disasters, and failures of ageing and complex infrastructure (Bouffard et al., 2008). The depletion of these primary resources, as well as the climate change impacts of fossil fuels is also important. These are all issues that are driving interest in more decentralized, sustainable forms of energy based on renewable primary energy resources.

Decentralized energy, which is synonymous with distributed energy, can be described as "a local supply of electricity or heat that is generated on or near the site where it is used" and the size of a decentralized project can vary from being very small (a few kilowatts) to very large (hundreds of Megawatts) (Woodman et al., 2008). Because of their flexible nature, and their adaptability to the required scale and location (a characteristic that is not proper of a non-renewable energy development), decentralized renewable energy systems present an opportunity for the quick deployment of renewable energy and a move towards a future less dependent on fossil fuels.

Decentralized energy has multiple benefits and can be an important tool to help local households, communities, businesses, schools, etc. become aware of their energy uses and impacts, which can lead to the reduction of carbon impacts. Further, decentralized energy can improve system reliability, security of supply, and increase overall system efficiencies through improved energy efficiencies and the minimization of energy transportation losses (Bouffard et al., 2008). This is because energy is produced at or near the site where energy is consumed (Scheer, 2007). Moreover, these systems have proven to be beneficial especially for low-income and energy poor communities, providing access to local energy sources. The more power that is built at the community level, the less there is a need to "import" energy resources from non-local sources, build lengthy and costly transmission lines (Bouffard et al., 2008; Weinrub, 2010).

Electricity from decentralized energy is increasingly more cost effective, energy efficiencies are greater, and the economic returns are felt more at the local level (Weinrub, 2010). In order to understand the cost and efficiency opportunities that arise from these forms of energy, one must compare the cost of new renewable energy projects to that of new centralized energy facilities. A more meaningful cost analysis of decentralized CP projects will be done in the sustainability section below.

1.5. Societal mobilization and sustainable energy

> "It is possible for a social project to prevail if it is purposefully and tirelessly pursued by an impassioned following of just 5%. These will then bring an additional 25% of the society in tow. That is sufficient because the majority of people is habitually indifferent but, in principle, they are ready to go along with movements and forces behind them if these can offer the general public a persuasive prospect" – Gunnar Myrdal (Swedish Nobel Prize Winner/Sociologist)

Renewable energy projects can be locally divisive if benefits are not equitably distributed within communities that are affected by them (Walker, 2008). In many jurisdictions, including in Ontario, setbacks to the development of, for example, wind turbines due to the Not In My Backyard effect, or NIMBYism, are being seen. The term NIMBY has often been used in media sources to described circumstances where residents oppose new developments in their community (Gee, 2010; Kennedy, 2010). It has become a popular term used to describe those who oppose wind turbines for reasons such as perceived health hazards, potential destruction of view and potential lowered property values.

In many cases, these setbacks are due to the fact that the public is suspicious of climate related policy initiatives and where individuals are doubtful of governmental motives or when projects labeled as "community" do not deliver benefits to locals at all (Hale, 2010; Walker, 2008). Furthermore, individuals that live in close proximity of renewable projects, such as wind farms, and experience their effects, are more resistant to them if they perceive that absentee[1] owners or corporate interests are benefiting economically at their expense (Lantz et al., 2009).

Citizen involvement is important for a variety of reasons, including the fact that it legitimizes policy, reduces the risk of conflict, creates an additional source of ideas and information to consider, and creates a larger general awareness of environmental problems and how they affect socio-economic spheres (Kemp et al., 2005). In situations where individuals are sceptical of corporate interests in the development of renewable energy projects near their homes, institutionalized rules setting out standards for development processes and minimum requirements regarding community benefits may lessen the likelihood of this scepticism (Aitken, 2010).

[1] Absentee ownership refers to projects where ownership is completely outside of a local community and is often taken on by a private developer. In these cases, little or no financial benefits or compensation are returned into the community, despite the fact that the community living in the vicinity of the project is most affected.

One of the most commonly cited benefits of CP projects is the fact that they increase public support and awareness for renewable energy due to the economic, social, and environmental benefits that they can bring (Aitken, 2010; Bolinger, 2001; Commission for Environmental Co-operation (CEC), 2010; Embark, 2011a; Walker, 2008). Further, it has been observed that jurisdictions with high rates of wind development tend to be those where community involvement is greater and viewed as important (Aitken, 2010).

While in Canada there is a general consensus that environmental issues are important and political action is needed to protect its ecosystem, resistance to renewable energy policies remains. A shift towards a more sustainable energy system can be obtained through societal mobilization and awareness. Scheer (2007) argues that the mobilization of society is crucially important to realizing the potential of renewable sources of energy. Individuals are more likely to take action if they see that others are involved or if there is a community that they can become part in taking action. Community involvement is important, for this reason (Hale, 2010).

In Canada, over 80% of Canadians live in urban centers, resulting in a culture that is more concerned about how energy is used and not how it is sourced. Most Canadians are not aware of where their energy comes from and do not know what needs to be done in order to ensure that energy is delivered affordably, reliably and sustainably (Standing Senate Committee on Energy, the Environment and Natural Resources 2010). If a shift towards an energy system based on 100% renewable energy is to be achieved, then the decentralization of energy supply needs to be part of the strategy. Local governments can play an important role in enabling future energy mixes composed of a variety of improved technologies, flexible enough to combine the best attributes of centralized and decentralized energy (Bouffard et al. 2008; IEA, 2009). As will be discussed further on, CP may provide the foundation for this sort of paradigm shift towards an energy system based on sustainable energy.

2. Defining Community Power

CP is not a new phenomenon. In countries like Denmark, CP has been promoted by government since the mid 1970's. However, difficulties still arise when defining what the term actually means in the context of community owned projects. For this reason, the definition of CP needs to be clear. Clarity is needed in terms of who the community sector involves, who is supposed to benefit from CP, what the purposes of projects are, and what are the best policies and mechanisms to advance CP.

So far, there is no universally accepted definition of what CP is and there is no clear financial or policy model in place to facilitate the advancement of CP. In order to achieve widespread CP development, it is essential that it be defined, specific targets set, and clear policy guidelines put in place.

There is an increasing interest among policymakers in renewable CP projects. Policymakers at the local, regional, national or international level, who would like to enhance CP need guidance on how to define, in legal terms, "Community Power". Laws that are adopted to enhance CP need to include clear definitions. Organizations that are involved in community education need to know the purpose of their activities. Finally, it is important to define CP before opponents define and co-opt the term.

2.1. Working definition of Community Power: Ownership, benefits & control

Differentiation between communities of locality and communities of interest is often the way in which ownership models are distinguished in literature discussing community renewable energy ownership models (Mitchell et al., 1994; Walker, 2008). The former refers to members of a local community who may share a common interest, whereas the latter refers to a group of people who are not geographically connected, but do share a common interest (Walker, 2008). In the case of CP, and for the purpose of this paper, community is defined as a community of locality, where at least 50% of the stakeholders involved must be from the local community and forming part of the community group. These defining criteria may change as a policy framework strengthens and develops. However, it is important, particularly when CP projects are new to a region, to have community members who are in close proximity to a CP project benefit from them. This will strengthen social support for sustainable energy.

In a strict sense of the definition, a CP project should be fully owned by a local community or a co-operative and all of the project's benefits will directly be returned to the owners. However, such strict definition may not be practical, simply because in some jurisdictions and under certain economic conditions it will not be implementable . Hence it seems to be more practical to come to a broader definition of CP.

In such a broader approach, a CP project can be defined by a combination of the five factors described above: a project that is based on renewable sources, one that is decentralized in nature and not limited by size, the way in which the project's benefits are distributed and/or the way in which a project is owned and/or who has final power to take decisions. Several stakeholders, either individually or co-operatively, can take part in a project, as long as a certain, unspecified, portion of the economic benefits are returned to a community and the ownership does not necessarily need to be completely in hands of the community. Individuals, farmers, landowners, local rural-electric co-operatives, municipal utilities and local governments, or public/private partnerships can initiate and undertake projects.

Communities have different needs and wants, differ economically, politically, and socially. In addition, the particularities in each region need to be considered. For obvious reasons, a model that may be successful in Denmark will not be automatically successful in South Africa. Differences in community structures can be overcome through a variety of ownership models that adapt to the socio-economic conditions of a country or region. Furthermore, CP is not limited to small projects. Individual efforts should eventually become part of a larger community effort to put renewable energy on the grid. The key to success is to be clear on what the community aspirations are and figure out ways in which they can be met.

In reality, a mixture of these criteria can be met, and it seems to make sense to come to a definition that sets up minimum requirements and satisfies basic but different communities' aspirations.

Based on an in depth literature review on theoretical and practical experiences with CP, and the participation in a series of discussions at the 2010 World Wind Energy Conference, and the 2nd annual CP Conference organized by the Ontario Sustainable Energy Association that involved wind power and CP actors world wide, the following definition for CP has been adopted for the purpose of this paper.[2]

Table 1. Community Power Definition

Community Power can be defined as a combination of the above-mentioned elements, where the first two elements are mandatory, and where at least two of the last three criteria are fulfilled: • **A community has the option of deciding which renewable technology to use to produce the energy service desired, and to the outcomes they wish to gain.**   • **Due to its decentralized nature, a community can choose the type of technology and size of energy system that best suits their needs and wants, and that can maximize generation benefits based on the location.**   • **A variety of local stakeholders, whether they are farmers, cooperatives, independent power producers, financial institutions, municipalities, schools, etc., own, immediately or eventually, the majority or all of a project.**   • **The major part or all of the social and economic benefits are returned to the local community.**   • **The community has the majority of the voting rights concerning the decisions taken on the project.**

2 Some key literature that was referenced in order to define CP includes: Bolinger, 2001; CEC, 2010; Danish Wind Turbine Owners Association (DWTOA), 2009; Embark, 2011a; Farrell, 2011; Gsänger, 2008; Lantz et al., 2009; Lewin et al., 2008; Mazza, 2008; Walker et al., 2008; Weinrub, 2010.

Beyond the issues of ownership structure and benefit distribution, defining CP also raises questions about who should be involved in the planning, development, operation and management of CP projects and at what stage the community should be most present. While these questions require further discussion, it can be agreed that communities have very important roles to play at the planning and development stages of projects. Such involvement will help foster co-operation and support for projects and will create the momentum needed to get projects approved.

2.2. Ownership structures of Community Power projects

Ownership structures of CP projects can and will vary depending on the vision, values, and mission that a community group has. The choice of structure is key to success for a CP development. Each structure has its strengths and weaknesses and varies depending on the location and outcomes sought from the project. Each model differs in terms of financing, benefit distribution, and project governance. However, all are in line with the definition of CP. Table 2.1. outlines three commonly used ownership structures for CP projects.

Table 2. Ownership structures for Community Power Projects		
Ownership Structure	Description	Profit Sharing
100% Community Cooperative	Individuals who share the same interests come together to pool their capital through the purchase of shares. Community cooperatives represent the interests of the whole community and governance remains in the hands of this community, with a one-member, one-vote governance structure. For this reason, the cooperative needs to be clear on variables such as what the values are and who the members can include (i.e. do they need to be local investors or can non-local people buy shares?). Projects are financed, owned and governed 100% by the community cooperative.	Any profit earned by the project based on the sale of energy over the period of one year is distributed to each cooperative member depending on the amount of shares purchased by each, meaning that revenues in turn benefit each member (Bolinger, 2001).
Partnerships/Joint Ventures	This type of hybrid ownership structure often occurs when communities do not have access to sufficient capital, and, therefore, partner, in most cases, with private renewable energy developers, utilities, or other cooperatives, to enable project financing. In such cases, while a community may only provide a portion of the financing, ideally, ownership, control and decision-making should be relatively equal. In Ontario, in order for a development to qualify as a community project and qualify for Community Project provisions, community participation must be greater than or equal to 50% (Ontario Power Authority (OPA), 2010a).	Benefit distribution is usually dependent on initial investments made by stakeholders, however, this equity distribution can vary from project to project. For example, in the Middlegrunden Wind Farm, a joint venture project between a community co-operative and the municipal utility, assets are distributed on a 50/50 basis, despite the fact that the municipal utility provided slightly more than 50% equity on the project (Sorensen et al., 2002).
Landowner Pools	This type of ownership structure occurs when landowners who own adjacent land, band together to pool funds to install turbines, and maximize the use of their land. In these cases, access to equity is increased and risk is distributed among landowners.	The idea behind this model is to compensate all affected landowners and create a distribution of benefits dependant on the amount of land each owner provides, the number of turbines installed on their land, and the amount of land used for new roads or cable installment. It is up to the landowners to determine how these benefits are to be distributed exactly (Bolinger, 2001; CEC, 2010).

2.3. Building on Community Power's successes

CP is not a new phenomenon, and examples of different CP ownership models can be found worldwide. While CP has existed for several years and has been successful in Denmark and Germany, what is encouraging is the recent interest in and the adoption of community ownership type models in other countries including Japan, Australia, and South Africa. Where community projects have been successful, values that are embedded in the notion of CP, such as community benefits and public participation, are built into the fabric power developments, and are routine and institutionalized (Aitken, 2010). The concept is yet to be developed in other parts of the world but is slowly starting to gain momentum (See Appendix A for examples of CP projects around the world). Local financial benefits are necessary for the acceptance of new renewable energy projects, especially in light of local concerns over the drawbacks of renewable energy projects (i.e. noise and visual impacts of wind turbines, or economic impacts of solar panels). The following section will outline the sustainability case for CP and highlight these benefits further.

3. Potential contributions of CP to sustainability

Today, it is impossible to speak of energy systems that provide services, such as electricity and heat, and energy policy without placing an emphasis on sustainability. Because energy technologies are so long lived (usually 25 years or more of use), near term decisions can have serious long-term effects on the environment and on human populations. Consideration for sustainability is important in decision making since the current operating models do not consider long-term effects on the economy, society, and ecological bio-systems (Gibson, 2006). Promoting energy systems without considering sustainability will lead to the adoption of technologies that will exacerbate climate change, and will reinforce uncertainties in terms of availability to natural resources, reliability, and affordability (Elkind, 2010). The consideration of such issues is also critical from a security perspective. In this sense, sustainability and security can be interchangeable, where both notions take into account similar elements. Reliability in this case refers to the extent in which energy services are protected from interruptions that can be caused by natural disasters, system crashes and daily economic activity. Affordability refers to the economic availability of energy to society (*Ibid*). As Elkind (2010) notes, energy that is not affordable cannot be used. Sheer describes that most developing countries do not have access to fossil fuel sources, let alone access to affordable fossil fuels.

This section will analyze the sustainability potential of CP models. This analysis is necessary, as it is an essential way of determining whether CP models provide a low-risk, adaptable, resilient and cost effective option that can be easily adopted and, therefore, facilitate the widespread and rapid uptake of decentralized, renewable energy systems.

The term ‘sustainability’ or ‘sustainable development’, defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”, was first popularized by the 1987 Brundtland Commission’s report, “Our Common Future”, which made the case that environmental protection was necessary to promote economic development (Ayres, 2008). While the term emerged more than 20 years ago, uncertainty around what it means and how it can be applied still exists (Kemp et al., 2005). Today, the term ‘sustainable development’ is widely used and misconceptualized.[3] It is, however, widely accepted that the reduction of anthropogenic environmental stress is necessary in order to achieve long-term sustainability. Such environmental stress is primarily caused by the exhaustive extraction of natural resources and the large-scale emission of green house gases that the planet can no longer absorb (Ayres, 2008). Continuous economic growth can have serious consequences for the environment as it creates more demand for material products and natural resources, such as fossil fuels. The prospect of physical resource depletion is real and, while the exact date that oil will peak is still uncertain, continued high consumption increases the risk of a precipitous decline in future production within the next few decades (Ayres, 2008; Sorrell et al., 2009). In addition to the threat of peak oil, a number of studies suggest that

[3] The term ‘sustainable development’ is often used interchangeably with the term ‘sustainable growth’. Yet, these two terms are quite different: the former refers to a qualitative improvement in the quality of life, while the latter refers to a quantitative increase in physical scale. However, the drive for economic growth has been supported by the search for a more sustainable future; clearly these two goals may have separate avenues. An economy can grow without developing or it can develop without growing, or can do both or neither (Daly, 2007).

peak coal and peak gas may not be as far ahead as we think (Energy Watch Group, 2007; Laherrere, 2011; Mulligan, 2010).

According to Strahan, current conventional oil reserves are being dwarfed by non-conventional sources, expanding total global oil reserves at 9 trillion barrels, compared to the originally estimated 2.4 trillion barrels of conventional oil in reserve (Strahan, 2009). The discovery of these new non-conventional oil reserves could seemingly alleviate any concerns that currently exist around peak oil assumptions and the depletion of our fossil fuel sources. An important distinction needs to be made, however, between the production of conventional forms of oil (flow underground with relative ease) and non-conventional forms of oil (often heavy like the Canadian tar sands) (Hirsch et al., 2005). Extraction for non-conventional oil is often more difficult, requires more energy intensive methods, which make the cost of oil extraction higher, and can result in higher emissions due to extraction processes (Kaufman, 2006; Strahan, 2009). Many who dismiss peak oil predictions argue that improved technologies and higher prices will solve any oil supply problem (Eccleston, 2008). However new technologies have not been as efficient as we would like them to be as we are finding less new oil fields and unconventional oil is still difficult to extract. If new technologies can prolong a peak, this means that there would be separate peaks for conventional and non-conventional oil production. Nonetheless, every oilfield reaches a point of maximum production, which advanced technology can delay or extend, but not eliminate (Aleklett, 2006, p. 10).

It is important to keep in mind that renewable energy is not synonymous with sustainability. While many renewable energy systems carry some components of sustainability, such as the ability to use naturally regenerative sources, like the sun, it is also necessary to consider all of the social, economic, political and environmental aspects that are components and considerations of defining sustainability (United Nations Environment Programme (UNEP), 2011). Ensuring that sustainable development occurs requires criteria to help assess whether or not the path that we are on is sustainable. For this reason, it is important to establish a set of sustainability criteria in order to create a core basis of policy evaluation, analysis and assessment.

A detailed analysis of each sustainability criteria and how it relates to CP as a mechanism to promote sustainable energy systems will be completed. The analysis will lead to conclusions regarding whether CP offers the greatest potential benefits through sustainability and encourage net gains, while minimizing significant adverse effects such as environmental degradation and other societal costs. The section begins with a broad description of each sustainability criteria, followed by an evaluation of how CP measures against each criteria.

3.1. Sustainability criteria

A. Risk to the environment and humans

Criteria Explanation:

Essentially, the importance of this criterion is to determine the extent to which the energy system that is chosen maintains the integrity and well being of our current life support systems, such as ecosystems and the biosphere, and a "viable context for human life […] over the long term." (Gibson, 2005).

Some of the considerations for this criteria and its relationship to energy systems are somewhat obvious, such as eliminating the likeliness of nuclear meltdowns, greenhouse gas emissions, mining accidents, oil leaks, and health degradation caused by coal plant pollution. Other considerations are less obvious, such as the intimate interconnection between the established human social system (which includes political and economic institutions) and its effects on our ecological systems. Creating a more sustainable energy system would, therefore, mean a complete shift in, not only our physical energy infrastructure (i.e. electricity grids, generating plants and resource extraction), but social infrastructure as well.

B. Scale, adaptation and resilience of a system[4]

Criteria Explanation:

When analyzing an energy system, questions such as, 'can a technology supply the energy needed when and where we want it?' need to be asked, and considerations for what the existing energy infrastructure and possible future extensions can adapt to need to be understood. This means that new renewable energy generation will have to be fed into existing grid infrastructure or new, improved infrastructure will need to be developed

[4] Adaptaptation is defined by Nelson, et al. (2007) as the decision-making process and the set of actions undertaken to maintain the capacity to deal with future change or perturbations to a social-ecological system without undergoing significant changes in function, structural identity, or feedbacks of that system while maintaining the option to develop (pg. 397). Resilience is defined by Walker, et al. (2004) as the capacity of a system to absorb disturbance and re-organize while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks (pg. 6).

(Boyle, et al., 2003). An analysis of how this can be done most sustainably and efficiently is required.

A sustainable system that would adapt to supply and demand would also require a resilient design that is diverse, flexible and reversible. That is, according to Gibson (2006), it needs to prefer safe-fail over fail-safe technologies and needs to ensure availability and practicality in terms of adaptation to existing energy infrastructure.

In order to determine how a proposed energy system will impact and be embedded within an energy consuming community, resilience and adaptive capacity need to be considered. This criterion considers the current rates of electricity supply and demand, and the likeliness that a proposed system based on CP can meet and adapt to energy needs. Consideration of construction time, required additional transmission lines, roads, and the possibility of connecting a renewable energy project to a local grid are necessary.

C. Lower path dependency

Criteria explanation:

Path dependence and its relationship to the sustainability of an energy system is the degree to which a chosen energy option constrains future options for change, economic growth and technological evolution (lock-in forces), as explained by Mark Jaccard (2005). Further, Gibson (2005) notes that sustainability requires endless opportunities for creative innovation.

According to Jaccard (2005), the lock-in forces that encourage path dependency include:

- Dominant, mature technologies benefiting from fair competitiveness with one another and economies of scale;
- Existing institutions, legal frameworks, government policies, and industry standards; and
- Social values, as expressed through consumer preferences and political expectations.

When choosing what type of technology to use when creating new generation capacity, lock-in forces must be considered. Certain technologies have stronger lock-in potential than others and can have serious negative consequences for long-term sustainability, energy system improvements, and creating a level playing field in terms of cost competitiveness. An example of this can be seen with nuclear power, given its long-term life span, centralized nature, and high construction costs (Moody's Corporate Finance (MCF), 2008).

National and global policies that currently support unsustainable energy systems would need to be restructured in such a way that path dependence can be avoided. The extent to which policies stimulate a transition to a 'new economy' that encourages long-term thinking and respects ecological boundaries, is the overarching criterion of analysis (Jackson, 2009).

D. Inter and intragenerational equity

Criteria Explanation:

According to Gibson (2006), sustainability would require the reduction of gaps in sufficiency and opportunity between the rich and poor of today, while also favouring present options that would reduce future gaps and enhance future opportunities for sustainability. In this sense, social, economic and political equity, among all, needs to be achieved.

Further, a central component to this criteria is the consideration of how present decisions will impact future generations socially, environmentally and economically. For example, would decisions that support present energy demand and consumption pose risks to future generations? Proposed plans should, therefore, improve short and long term opportunities, and reduce long term costs, risks and burdens.

E. Participatory, inclusive and democratic governance

Criteria Explanation:

Gibson (2006) outlines this criterion as one that evaluates the degree to which capacity is built, and habitual inclinations of individuals to apply sustainability requirements through more open and informed deliberation processes are achieved. He further explains that a more comprehensive governance structure and participant mobilization are important in order to strengthen individual and collective understanding of ecology and community, and ultimately sustainability.

F. Efficiency & Cost effectiveness

Criteria Explanation:

There are 2 forms of efficiency that can be considered: economic efficiency and energy efficiency. Economic efficiency would be measured by the life cycle cost effectiveness of a chosen system to deliver energy services. From an energy efficiency perspective, efficiency is measured by the amount of useful energy achieved per unit primary resources used, such as coal. An energy system that achieves both types of efficiency is optimal and would contribute to more sustainable outcomes. Therefore, according to Gibson (2006), more can be achieved with less by optimizing production, permitting economic expansion with employment and wealth creation, and simultaneously reducing the demand for resources.

One way of comparing energy system options is simply to compare the current costs and pick the cheapest one. However, this method is too simple and is not sustainable, as simple cost comparisons often do not include positive and negative externalities that have yet to be monetized (Jaccard, 2005). These externalities are, among others, environmental costs, costs resulting from delays in reduction of carbon emissions, costs related with system failures, such as intermittency, risk of fuel price volatility and supply shortages, as well as consideration for social, cultural and economic benefits to local communities that can come from new, decentralized approaches of energy systems (Weinrub, 2010). For the most part, cost estimates for electricity generation are distorted by subsidies, and this should not occur.

Finally, in many cases, costs of generating energy from new generating sources are compared to costs of old generating sources, again distorting the analysis. Therefore, it makes more sense to compare options only for new power generation that will be built to replace old, retiring capacity (*Ibid*), and costs need to be compared on a level playing field. That is, comparing power generation costs only once existing subsidies and price distortions are understood.

Consumers naturally tend to prefer inexpensive energy, at least in the short run. However, low prices fail to convey the full impact of energy use and are incompatible with energy sustainability. This is because they encourage consumption and discourage investment in higher efficiency manufacturing, discourage new energy development, and make buyers vulnerable to price shocks from fossil fuel fluctuations (Krohn, 2009).

Trade-offs

Gibson (2006) describes that in order to achieve sustainability, positive improvements are needed to meet all the core requirements outlined in the evaluative criteria. He further explains, however, that, in practice, compromises and trade-offs are unavoidable and context specific. The fundamental objective should always be to achieve net sustainable gains when compromises are made, and that the most desirable option be chosen in an openly discussed and explicitly justified manner.

In this sense, trade-off rules are needed in order to determine which energy option is most desirable for a given population. All considerations for an energy system based on renewable sources, whether it is centralized or not, need to be conscious of trade-off rules. This would entail reflections on what the greatest potential for increasing energy productivity would be while still being aware of all possible significant environmental, social and economic adverse effects on present and future populations through an open and deliberative process.

Table 3 summarizes the sustainability criteria that have to be considered when assessing an energy system.

Table 3. Sustainability Criteria for Energy Systems

A. **Risk to the environment and humans:** The extent to which an energy system affects biophysical and socio-biophysical systems, and human health, or avoids negative impacts on each.

Evaluation considerations:

- The ability to reduce direct and indirect human threats;
- The ability to reduce direct and indirect environmental threats;
- The ability to reduce and avoid extractive damage and waste; and
- The ability to consider all extreme event risks, despite of their probability or likeliness.

B. **Scale, adaptability and resilience of a system:** The scale at which an energy system is able to adapt to electricity supply and demand, and its likelihood of maximizing resilience and minimizing system stress.

Evaluation considerations:

- The extent to which a system can adapt to a current energy system and respond to changing supply and demand requirements;
- The extent to which availability of a source is considered; and
- The extent to which resilience and flexibility are considered.

C. **Lower path dependency:** The degree to which an energy system can help overcome the current inertial lock-in forces of path dependence on large centralized energy systems, and create a platform for future innovation and constant technological improvement.

Evaluation considerations:

- The degree to which change in technology innovation and evolution is considered; and
- The degree to which long-term thinking and transition to new, zero-carbon economies are considered.

D. **Inter and intragenerational equity:** The level of consideration for present options that preserve and/or improve opportunities for all humanity and for future generations.

Evaluation considerations:

- The ability to build equitable livelihoods for all; and
- The ability to reduce gaps between the rich and the poor in the present and in the future.

E. **Participatory, inclusive and democratic governance:** The ability of an energy system to enhance democratic values and enable a more participatory and inclusive decision making process.

Evaluation considerations:

- The extent to which governance structures include individuals in decision making exercises;
- The ability to create societal awareness of sustainability options; and
- The ability to mobilize and engage societies to apply sustainability awareness in all communities.

F. **Efficiency & Cost-effectiveness:** Analysis of the feasibility of an energy system from an economic, social and environmental cost perspective.

Evaluation considerations:

- The extent to which more is achieved with less material, economic and energy input.
- The extent to which all positive and negative externalities, pre-existing subsidies, and price distortions are considered in cost calculations; and.
- Once the above mentioned considerations are monetized, the ability to meet energy to meet demand.

Trade-off rules also need to be considered to determine how the option of an energy project compares and performs relative to other proposed options in order to achieve a likely sustainable energy trajectory. No trade offs that involve significant adverse effects can be justified unless the alternative poses even more significant adverse effects. Questions that should be considered include: are trade-offs presented where stronger mitigation efforts would be feasible? Would any proposed trade-offs displace significant adverse effects from the present to the future? Have the trade-offs been discusses in and accepted through an open, participatory process?

Criteria developed based on:
- Gibson, R.B. (2005) *Sustainability Assessment: Criteria and Processes*. London: Earthscan.

- Jaccard, M. (2005) *Sustainable Fossil Fuels: the Unusual Suspect in the Quest for Clean and Enduring Energy*. New York: Cambridge University Press.

3.2. Sustainability Assessment Of Community Power

A. Risk to the Environment and Humans:

- The ability to reduce direct and indirect human and environmental threats:

CP establishes environmental awareness among individuals by creating clear linkages between energy generation and consumption. This is beneficial in mitigating negative environmental impacts of energy generation (St. Denis et al., 2009).

CP projects are based on renewable energy sources. While renewable energy sources generally perform well in terms of minimizing risks to humans and the environment, these risks still need to be considered. Risks associated with, for example, greenhouse gas emissions during life-cycle construction of a technology, air emissions related to biomass facilities, impacts on fish and wildlife related to small hydro, soil erosion from construction and access roads of larger projects, and environmental interruptions caused by large wind farms. Overall, however, renewable energy performs very well, specifically when compared to conventional electricity sources. Lifecycle assessments for energy services delivered though renewable energy indicate that, for example, greenhouse gas emissions are significantly lower than those associated with fossil fuels. The median values for all renewable energy sources range from 4-46g CO2 eq/kWh while those for fossil fuel range from 469-1001g CO2 eq/kWh (Edenhofer et al., 2011).

Table 4 compares the life cycle related GHG emissions and uranium waste impacts, including uranium mine tailings and disposal of radioactive waste, of various energy generation technologies, rating environmental impacts from "Low" to "High". Life cycle analysis of energy generation systems, from an environmental and cost perspective, is necessary in order to understand the full impacts of projects before their implementation.

Table 4. Life cycle risk potential of energy generation systems (Laleman et al., 2011; MCF, 2008)

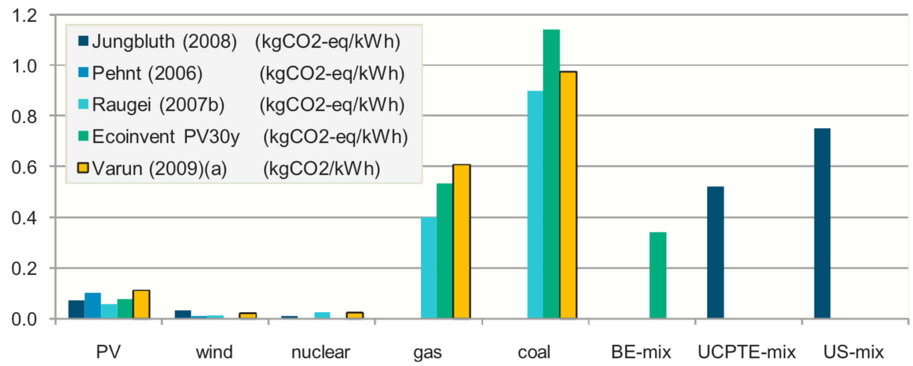
Risk Substance	Natural Gas	Coal	Nuclear[5]	Wind	Solar
NOX	Medium	High	Low	N/A	N/A
SOX	Low	High	Medium	N/A	Low
CO2	Medium	High	Medium	Low	Medium
Mercury	N/A	High	N/A	N/A	N/A
Uranium Waste	N/A	N/A	High	N/A	N/A

Most CO2 emissions from wind turbine projects are yielded from the construction and decommissioning phases where transportation is used. Very little emissions impacts are yielded from the operational phases of a turbine's life cycle (Gagnon, 2002; Tremac et al., 2009). Solar electricity systems, however, do have a greater impact on the environment if a life cycle analysis of a photovoltaic (PV) cell is considered. The global warming potential (the amount of greenhouse gases that are emitted during the life cycle of a system) of PV-electricity is about 10 times lower than electricity from coal plants, however, it is significantly higher than wind or even nuclear. Overall, however, as newer PV technologies are developed, global warming impact diminishes (Laleman et al., 2011).

[5] Estimates on GHG emissions impacts very tremendously from source to source and depending on the type of nuclear energy technology being assessed. According Winfield, M. et al. (2006), in many figures are underestimated due to incomplete studies based on life-cycle assessments.

Table 5. outlines CO2-eq emissions that are related to electricity generating sources according to various authors.

Table 5. CO2-eq Impacts of electricity generating sources



(Laleman et al., 2011; Jungbluth et al., 2008; Pehnt, 2006; Raugei, 2007; Varun, 2009)

Renewable energy strategies are essential to cutting 60-80% of the world's greenhouse gases, and CP can help achieve this cut (Mallon, 2006).

- The ability to reduce and avoid extractive damage and waste:

In addition to GHG emissions impacts, environmental impact assessments need to consider impacts on water, such as contamination due to runoff from waste at all stages of project development from mining of primary sources to the disposal of materials. In the case of nuclear energy, it has been estimated that 575,000 tonnes of tailings per year can be attributed to mining and milling of uranium. In addition, nuclear power plants have led to the heavy contamination of groundwater with radionuclides (Winfield et al., 2006).

The question of waste disposal is large when considering nuclear power. According to Winfield et al., approximately 85,000 waste fuel bundles are generated by Canadian nuclear reactors per year. More importantly is the question of how to store this waste safely and over a long period of time. It has been estimated that nuclear waste needs to be stored for one million years (*Ibid*).

Because CP projects are based on renewable sources, fuel extraction, use, and waste disposal are typically not an issue. Therefore, during energy generation, there are no extractive damages or hazardous wastes created.

- The ability to consider all extreme event risks, despite their probability or likeliness:

The extreme event risks that are associated with fossil fuel sources (e.g. large scale oil spills, mining accidents, gas explosions, nuclear meltdowns) are not associated with renewable energy sources. While some have expressed concern about the possibility of risks due to, for example, malfunctions in wind turbine construction, these risks are nowhere near as threatening as the above mentioned risks linked to energy production from fossil fuels, where thousands, if not millions, can be affected.

Generally, CP projects have low extreme event risks and their decentralized structures limit the potential for fatalities (Edenhofer et al., 2011).

B. Scale, Adaptation and Resilience of a System:

- The extent to which a system can adapt to a current energy system, and respond to supply and demand requirements:

CP projects can adapt to current existing infrastructure and can be interconnected to distribution grids directly depending on their size and location (Bolinger et al., 2004). If properly sited, a CP project can actually help relieve overloads in transmission lines by providing power to the load and supporting the line voltage (Energy Trust of Oregon (ETO), 2004).

In many jurisdictions, adaptation of renewable energy to existing infrastructure is difficult due to planning and permitting processes. Mazza (2008) notes that when local investment dollars are at stake, CP projects benefit from local community support which tends to facilitate permitting processes in a region. Further, as the ETO (2004) explains, community projects can be a good stepping-stone to gauge whether a site has potential for future expansion. ETO also explains that "The ability to rapidly scale up a site from a few turbines to several hundred is valuable in today's political environment where policies facilitating wind development change dramatically from year to year.".

Renewable energy and, to a greater extent, if decentralized and geographically distributed under a CP model, can be brought online relatively quickly to accommodate demand (Weis et al., 2010). This has been the experience in jurisdictions worldwide that have extensive experience with renewable energy. During the periods between 2004-2009, global renewable energy capacity grew at a rate of 10-60% annually (REN21, 2010).

Countries, such as Germany, have proven that the rapid uptake of renewables is possible, and even more so through CP ownership models. Between 2000-2004, Germany was able to create 14,000MW of renewable capacity (Scheer, 2007). In 2010 alone, Germany installed 7,400MW of solar energy. As noted previously, 50% of Germany's renewable energy developments are community owned, proving that a CP approach to renewable development aids in the rapid implementation of renewables.

Edenhofer et al. (2011) explains that long term integration of renewable energy includes attention to social aspects such as capacity building, which can be achieved through CP frameworks.

- The extent to which availability of a source is considered:

One of the principle arguments against renewable energy as a main source of base-load electricity is its intermittent nature. While this is a major concern, there are ways of mitigating it that would allow for more reliant availability. Mitigation methods include decentralization, storage technologies and smart grid planning.

Through support garnered with CP ownership models, more decentralized energy units will arise. Decentralization aids in the availability of energy as it is geographically dispersed. Geographic diversity enhances renewable energy production since it increases the probability that energy will be generated in different locations at a given point in time (Mazza, 2008).

Energy systems based on renewable energy need to be coupled with storage technologies in order to respond and to enable adaptation to fluctuations in energy availability. Storage technologies do exist and include pumped storage plants, compressed air for energy storage, and rechargeable batteries (*Ibid*).

Grid strengthening and upgrades to incorporate more renewable energy would also be required for the deployment of energy from renewable sources. This would need, however, further investment. For the integration of wind energy, grid upgrades have been quoted at around 10% wind energy generation costs for a system that has a 30% wind energy share (Krohn, 2009). It can, therefore, be assumed that as economies of scale in wind are achieved, the cost will lower. It is also important to note that in many jurisdictions that are currently dependent on centralized energy sources that have been functioning for 30-40 years, upgrades to the grid system will be required regardless of whether decentralized renewable technologies are added or not.

- The extent to which resilience and flexibility are considered:

Renewable energy systems can be deployed either in large centralized energy networks or at the point of use in rural and urban environments, that is, in a decentralized manner (Edenhofer et al., 2011). CP ownership models encourage decentralized energy systems. Generally speaking, rapid responses to electricity demand are facilitated when supplies of electricity are located at the point or near the point of maximum energy demand (Boyle, 2004). Decentralization can provide for a more resilient system in the sense that it can strengthen a local power distribution grid by putting a multiplicity of smaller generation sources, which decreases the likelihood of large amounts of electricity coming from a central plant from going offline at once.

C. Lower Path Dependency:

- The degree to which change in technology innovation and evolution is considered:

Renewable energy technologies have room for technological improvement and are still experiencing significant advancement and cost reductions (MCF, 2008). While conventional energy systems are reaching similar levels of optimization, renewable energy technologies are at the start of their development, allowing for massive levels of optimization in the future (Scheer, 2007). Initial installations of technological innovations are often costly, however, cost normally declines as individuals, enterprises and sectors gain experience and perfect the technologies (Löschel, 2002).

The cost of renewable energy has become more competitive over the last 30 years. This trend is likely to continue in the future, suggesting that these technologies can become adopted more aggressively (RETI Coordinating Committee, 2008). The rapid development of wind power in Europe has demonstrated the effects on decreasing its cost over the last 20 years. Technological development of renewable energy can be encouraged through annual rate and price decreases that are constantly achieved through the development and achievement of markets of scale.

- The degree to which long-term thinking and transition to new, zero-carbon economies are considered:

Long term thinking in terms of transitioning towards a zero-carbon economy would include the emergence of new firms, industries, markets and technologies, and social demands (Hospers, 2005). CP combines the social demand to minimize environmental and human risk and to create economic, political and social equity, and strong technological innovation and cost reduction potential through the use and promotion of renewable energy technologies needed to trigger such a shift.

D. Inter and Intragenerational Equity:

- The ability to build equitable livelihoods for all:

Local project development allows for local capacity development and education. The current renewable energy market is dominated by large developers who are able to put projects up in prime locations and create an uneven playing field for project development. This is because larger developers have the upfront financial and technical capacity needed to deliver renewable energy. CP has the potential to bring together a more diverse set of individuals who could be involved in renewable energy development (Mazza, 2008).

CP options of energy production do provide superior benefits to communities involved, including economic security and opportunity, energy security, and greater societal equity, by diversifying the number of people and institutions that can participate and benefit from renewable energy development (*Ibid*). Ultimately, renewable energy projects are a source of jobs and economic development, and those projects that have a community element are shown to have an increased impact at all stages of development, construction and operation on jobs and economic development (Lantz et al., 2009). Economic benefits to communities of locally owned wind projects have shown to be triple that of projects that are put in place by outside or "absentee" developers, and create nearly twice as many local jobs per MW of energy capacity installed (Martin, 2011b; Mazza, 2008; Weinrub, 2010). This is due to the increased utilization of labour and materials, returns on investment to stakeholders from profitable projects, and the reliance of local banks for construction finance and operating loans (Lantz et al., 2009). In this sense, local projects not only create direct jobs, but also create indirect and induced jobs (employment due to increased local spending and investment) that can be sustained over a long period of time (Weinrub, 2010). Furthermore, by giving a community the opportunity to own/invest in a project that they would otherwise not be able to be involved with, avenues of opportunity are opened, and equitable distribution of benefits is achievable.

- The ability to reduce gaps between the rich and the poor in the present and in the future:

CP emphasizes energy sufficiency and sustainability for all, rich and poor. A more decentralized system through CP models creates energy supply that is closer to energy demand, and therefore a community that is more aware of their energy needs and a greater social responsibility to consume energy more efficiently. In this sense, the development of a renewable energy project based on a CP model would encourage thinking sustainably about energy usage, including energy efficiency and applying more conservation measures on day-to-day energy use. Ultimately, this would minimize the need of, for example, future added energy capacity.

E. Participatory, Inclusive and Democratic Governance:

- The extent to which governance structures include individuals in decision making exercises:

Energy systems as promoted through CP models have proven to garner support for renewable energy through more democratic avenues of decision-making. One element of CP is the fact that it involves local control, where voting rights rest in the hands of the community involved. In this sense, a community-based organization made up of local stakeholders has the ability to express their concerns, needs and wants from a project and have a say in decisions taken. Therefore, through a CP approach, all stakeholders, from individuals, to professionals, to experts, to government officials, are involved in a more democratic decision making cycle. Because customer owned projects are located closer to customers, customer values are responded to, making for a more democratic system.

- The ability to mobilize and engage societies to apply sustainability awareness in all communities:

CP led renewable energy projects not only incorporate local citizens' ideas, but also engages them as active stakeholders in all areas of energy production (St. Denis et al., 2009). The true success of a CP can be seen by the extent to which a "culture of sustainability" has been adopted through an open process of governance and informed citizen engagement. The active participation of community members at all stages of project development and management provides a better understanding of where energy comes from and how it can be more efficiently used. CP allows for individuals to make a clear link between generation and consumption, which in turn leads to sustainability awareness (*Ibid*).

F. Efficiency & cost-effectiveness:

- The extent to which more is achieved with less material, economic and energy input:

Decentralized energy systems are more efficient than those that are not, and this is due to the proximity of energy production to energy consumption (Scheer, 2007). Furthermore, energy from renewable sources, such as wind and solar, is converted into useful electricity in one single step. This is not the case for energy produced from conventional forms, such as fossil fuels. Due to energy conversion from primary energy sources to useful electricity, as well as high electricity losses through transmission and distribution networks, low efficiency levels of 30-40% are attributed to coal plants (Boyle et al., 2003).[6] Wind energy efficiencies have been estimated to be much higher with energy losses ranging between 10-14%, resulting in 86-90% efficiencies (Krohn, 2009).

- The extent to which all positive and negative externalities, pre-existing subsidies, and price distortions are considered in cost calculations:

Possibly the most important economic benefit of renewable energy is that it does not expose our economies to externalities such as fossil fuel price volatility, hazardous waste disposal, or greenhouse gas emissions, risk reductions that are not fully accounted for in

[6] Efficiency is measured as the ratio of useful output to the required input. It can be as high as 90% in the case of hydro power, and as low as 10% for internal combustion systems. Inefficiencies can be avoided through smart design, however in most cases it is inherent in energy conversion processes.

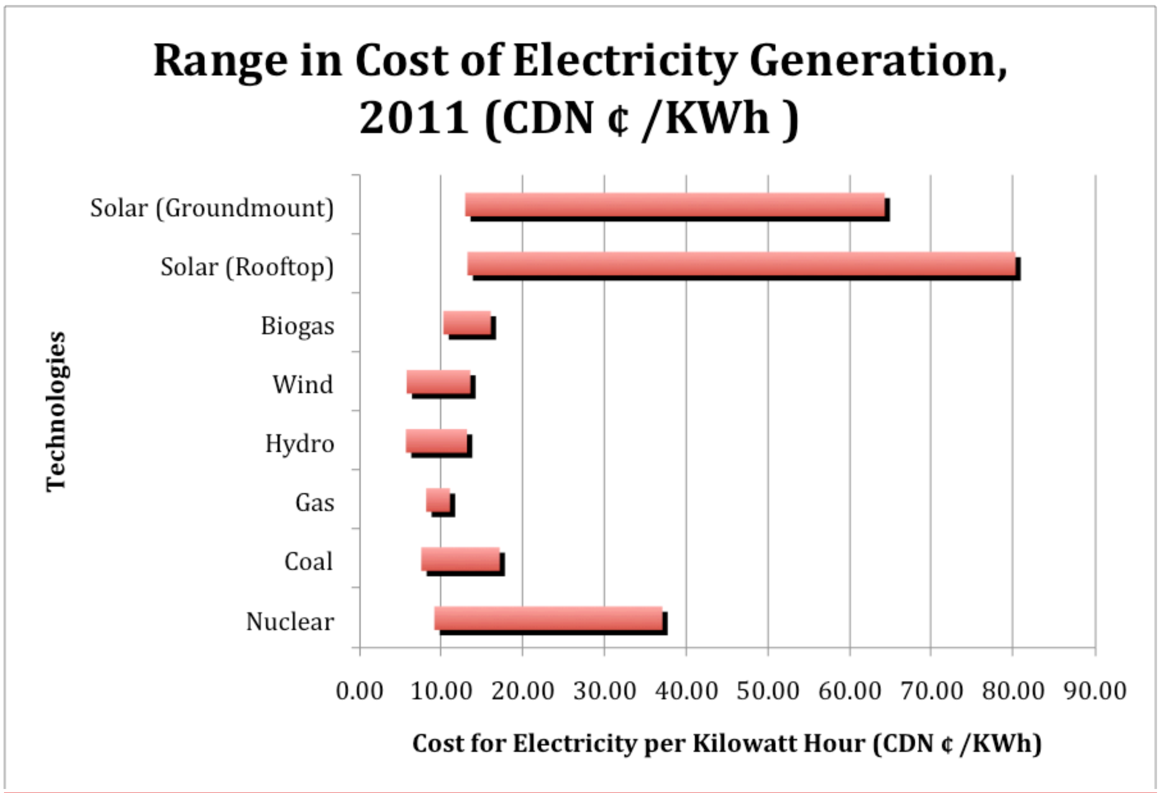
the standard methods of calculating energy prices (Krohn, 2009). Generally, the costs of conventional electricity production are determined by the following 4 components: fuel cost, cost of CO2 emissions, operation and maintenance costs, and capital costs. In the case of most renewable energy systems, only 2 of the 4 components exist: operation and maintenance costs, and capital costs. Over 75% of the total cost of energy generated from a wind turbine are up front costs related to operations and maintenance, and capital costs for planning and turbine equipment (*Ibid*). This means that ongoing fuel and emissions related costs are not present and making this type of energy generation more affordable in the long run. As more renewable based energy systems are added, energy production costs decline. This is because of the replacement of conventional generation with renewable generation, which leads to the reduction of variable costs, such as fuel, GHG emissions and waste disposal (Mazza, 2008).

- Once the above mentioned considerations are monetized, the ability to meet energy demand:

Monetizing external costs of all energy supply systems would improve the cost competitiveness of renewable energy. Further, the levelized cost of an energy technology is not the only determinant of competitiveness, economic, environmental and social aspects need to be considered as well as the technology's contribution to meeting energy needs (Edenhofer et al., 2011).

As Valentine (2006) points out, wind power is not necessarily more expensive than fossil fuel generating sources if external costs are internalized. In fact, wind power would be economically superior, even compared to new coal. Table 6 suggests that, in many cases, renewable energy does not cost more than conventional power generation, and prices for new renewables fall in the range of cost for new gas, coal and nuclear. In the case of biogas, wind and hydro power, prices can be cheaper than new conventional sources.

Table 6. Range in cost of electricity generation by source[7]



[7] 2011 power generation costs ranges are based on numerous sources. The ranges repsent the highest and lowest costs for each energy source. All costs that came from resources that did not provide costs in Canadian dollars were converted. Costs extracted from Weinrub (2010) are based on estimations extracted from Figure 2 on page 12. The cost for solar groundmount is cited at 12.87-20.49¢/kWh by Weinrub (2010) and at 44.3-64.2¢/kWh under the Ontario Power Authority's FIT price schedule. Solar Rooftop prices are cited at 13.15-19.54¢/kWh by Weinrub and at 53.9-80.2¢/kWh in the 2010 OPA (2010) FIT price schedule. Biogas figures were taken from the OPA's (2010) FIT Price Schedule, at 10.4-16¢/kWh. Wind prices are quoted at 5.71-10.96¢/kWh by Weinrub (2010) and at 13.5¢/kWh by the OPA (2010). Small hydro prices are cited by Weinrub (2010) at 5.62-13.06¢/kWh, by Weis (2010) at 13.5¢/kWh, and in the OPA's (2010) FIT Price Schedule at 12.2-13.5¢/kWh. Natural gas is cited at 8.1-14.78¢/kWh by Weinrub (2010) and at 11¢/kWh by Weis (2010). Coal was cited between 7.5-13.6¢/kWh by Weinrub (2010). Nuclear was cited between 9.1-18¢/kWh by Moody's Investment Services (2008), 10.49-13.82¢/kWh by Weinrub (2010), at 20¢/kWh by Weis (2010), and at 37¢/kWh by Gibbons (2011).

3.3. Trade-offs Analysis:

CP is a desirable model for advancing the development of renewable energies in the sense that, if planned properly, and if all sustainability criteria are applied from the beginning of the planning stage, it can contribute to sustainability gains. This would require serious attention to what the trade offs could be and deliberating through an open process how the model can best deliver net progress towards meeting the sustainability requirements. The trade-offs that need to be considered are integration issues, intermittency of energy services, environmental impacts, costs associated with projects and social acceptance.

Integration issues are dealt with in both centralized and decentralized energy systems (George et al., 2011). For centuries, centralized energy sources have provided, in most cases, reliable energy. The reality is that fully decentralized systems based on are not always desirable and those that are based on renewable energy are not easily adaptable; decentralization should be considered as part of a holistic solution (Bouffard, et al., 2008). Energy systems of the future will be those that are flexible enough to allow for a spectrum of hybrid technologies that combine attributes of centralized and decentralized systems. To achieve a more integrated system, current energy structures need to evolve away from the current unidirectional and inflexible generation, to a bidirectional and variable generation, where control is distributed (*Ibid*). Barriers to this shift can be overcome, as mentioned previously, through more dedication to research and development on smart grids, grid flexibility and storage needs to be done.

Intermittency in energy supply is another consideration with renewable energy systems, such as those based on wind and solar technologies. There are solutions to mitigating the impacts of variability, which include storage, however, these technologies are still in their infancy, technically underdeveloped and costly (Boyle, 2004). In addition to storage solutions are programs such as demand side energy management programs, smart meters and increasingly efficient appliances, which help diminish the need for added energy capacity and aid in the management of energy supply. With increasing penetration of renewables into electricity grids, integration and intermittency issues need to be further explored.

There are environmental impacts that can be associated with renewable energy generation systems, from greenhouse gas emissions produced during manufacturing of certain technologies, such as solar PV panels, or those that are produced from biogas and biomass. Further, in some cases, construction of renewable energy systems does implicate destruction of natural landscapes or interruption of natural migratory paths (CEC, 2010). All of these environmental impacts need to be considered and assessed in depth before an energy system is decided on.

Limits on costs also need to be overcome. These costs would include network infrastructure investment, system operation and losses, manufacturing costs, adjustments to existing energy supply systems, modification of institutional and governance frameworks, and continuous investment in research, development and demonstration (Edenhofer et al., 2011). Bolinger et al. (2004) notes that as more CP projects are built, the quicker development costs decrease with the emergence and development of local capacity and experience.

Progress in increased renewable energy capacity has been slow and this, in large part, is due to lack in social acceptance and public trust towards these types of energy systems. According to Rogers et al., the most commonly cited reasons for opposition are inappropriate scale of development, an unacceptably high ratio of local costs to local benefits and a lack of adequate communication and consultation with local residents by developers (Rogers et al., 2008). Various studies have shown, however, that people would welcome renewable energy projects if there were more opportunities for involvement (Devine-Wright, 2005; Gross, 2007). Creating fairness around proposed projects and civil society support is essential is a demand for sustainable energy is to be achieved (Aitken, 2010).

CP is a desirable model for renewable development because it helps minimize trade-offs through open and transparent decisions making processes that would not exist in renewable development if the model were not present. As Gibson explains, no trade-off that involves significant adverse effects can be justified unless the alternative is the acceptance of an even more significant adverse effect. While some trade-offs do need to be considered, ultimately, CP does contribute to the net gains of sustainability compared to other models of energy development. Costs and environmental risks do exists under the CP model of renewable energy development, however, these risks exist in all energy projects and energy technologies, and in most cases they are immensely more significant and have serious long term implications. All current and future impacts, either environmental, economic, or social need to be made visible to those that are directly and indirectly affected in order for the most desirable option to be chosen. If plans under a CP model use a comprehensive sustainability assessment, CP increases local economic development, local skill development, democratic governance, and local environmental awareness. Each of these components is increased under a CP model in comparison with situations where external developers are involved in project development, and where profit and benefits are removed from a community. Active participation is essential in minimizing the social frictions that can exist around renewable projects and CP is a model that can provide this participation. Moreover, through CP models, distributed forms of energy generation through renewable sources can be taken on at a variety of different scales, located in a multitude of geographic areas, and is very flexible.

4. Ontario's experiment with Community Power

Ontario has had experience with CP since 1999, when the first community owned and North America's first urban sited wind turbine was envisioned by Windshare. Since the turbine was erected in 2001, it has served as a symbol of CP for the province and has provided a solid example that other CP projects can compare to.

This section examines how Ontario has been involved in CP to date, and whether sufficient mechanisms have been implemented to advance the inclusion of CP in its electricity mix.

4.1. Ontario and Community Power: facts and figures

To date, there are several CP projects in development in Ontario. However, only one community wind project is in commercial operation, Windshare's Exhibition Place turbine. Through the Feed-in Tariff (FIT) program, which will be discussed further, a total of 231 CP applications have been received, representing only a small fraction (3.69%) of the total number of applications received in the FIT program. Table 4.1. breaks down the number of applications and contracts executed through the FIT program by general projects and those that qualify as CP projects (OPA, 2011).[8]

Table 7. FIT Status Report, May 27, 2011- Percentage of Community Power Projects

[8] The OPA releases bi-weekly reports that break down by technology, size (FIT vs. Micro FIT), and type (Community, Aboriginal or regular) the number of applications that have been received and what stage of the FIT process they are in.

	Total Applications	Total Applications (MW)	Contracts Executed	Contracts Executed (MW)
Total FIT Projects	6,255	17,381	1,531	3,550
Community Power Projects	231	1,475	60	305
Percentage of CP to Total FIT Projects	3.69%	8.49%	3.92%	8.59%

All of the current CP projects in development take on different ownership structures, from 100% Co-op models, to charitable organizations, to the coming together of farmers to create landowner pools. Table 4.2 describes four CP groups that are currently going through the process of developing a CP project. The Table describes the ownership model that the group adheres to. Some of these projects are at the beginning stages of organizational development, while others have already been accepted by the FIT program. Two of the projects have decided to adhere to a hybrid, joint venture model of community ownership that has enabled information and cost sharing. Toronto's Windshare turbine also used a joint-venture model and partnered with the local utility that provided 50% of the capital needed for the project development and who owns half of the project (TREC Windshare Co-operative, 2002). The Barrie Windcatchers attempted to follow the same model, to enable project finance, but has, to date, not been successful (Martin, 2011d). For reasons of comparability, all four groups are involved in the development of a community owned wind farm.

Table 8. Examples of wind Community Power projects in Ontario			
Wind Project	**Size**	**Ownership Model**	**Comments**
Pukwis Wind Co-op Wind Farm	54MW	Community Co-op/Aboriginal land pool joint venture	- Joint venture project between the Chipewas of Georgina Island First Nation and Winfall Ecology Centre. - The Co-op is comprised of members within the Greater Toronto Area. - Financed by equity raised through Co-op share offerings.
Lakewind Wind Farm	20MW	Co-op/Co-op Joint Venture	- WindShare Co-op and Countryside Energy Co-op have partnered in this project. - Have applied to the FIT program and are currently awaiting approval of Economic Connection Test. - Have still not started to collect shares for this reason. - Project intends to be a 100% CP Co-op , however this might change.
LIFE Co-op St. -Agatha Wind Projects	2MW	100% Community Co-op	- 5 year old Co-op that is in the early stages of project development. - Currently completing FIT application and encountering many roadblocks concerning FIT rules. Main roadblock concerned where their members/investors reside (Martin, 2011c).[9] - 100% Community Co-op that is not looking to partner with anyone for the St. Agatha wind development. While they have spoken with the local utility about joint venture possibilities, this does not seem like a likely scenario for the project.
Barrie Windcatchers	1.5-2.5MW	100% Community Co-op	- 3 year old Co-op, completely pre-feasibility stage and is now attempting to secure a site and complete the FIT application. - The Barrie Windcatchers are

[9] In order to qualify as a community project under the FIT program and for funding under the CEPP, investors have to be from Ontario. This particular project initially had investors from other provinces and countries, which is now not the case.

			currently operating under a 100% Community Co-op model, however, they are looking to partner with either the City of Barrie, or Power Stream (used to be Barrie Hydro) in order to facilitate the financing of the project.

While CP projects are being embraced by Ontarians, the reality is that only a handful of organizations are seeking the benefits of such an approach to sustainable energy. In order for renewable energy to become a significant part of Ontario's energy mix, this type of approach needs to be adopted by hundreds, if not thousands of organizations. The adoption of CP projects on a large scale would help mitigate the current social frictions and create the overwhelming support needed to further develop the renewable industry in the province. The following section investigates the current policy mechanisms that exist in Ontario that relate to CP.

4.2. Energy policy and Community Power in Ontario: general overview

4.2.1. Ontario's Long Term Energy Plan

Ontario's Long Term Energy Plan was officially published in November 2010. The Plan sets out a 20-year action Plan for Ontario's energy system and envisions extreme changes over that time period. According to the Plan, Ontario has positioned itself to work hard to achieve energy conservation goals and to plan a sustainable energy system. Ontario will aim to reach an overall electricity reduction target of 7,100MW (MEI, 2010), a target that is quite ambitious compared to other jurisdictions. It has also set out to meet the following targets, detailed in Table 9., in terms of its energy mix. The Plan demonstrates a clear commitment to nuclear refurbishment, and undermines the ability of renewable energy's full potential.

Table 9. Ontario Projected Installed Capacity, 2010 & 2030				
Production Form:	**2010 Capacity (Projected, MW)**	**2010 Capacity % (Projected)**	**2030 Generation (Projected, MW)**	**2030 Capacity % (Projected)**
Nuclear	11,446	31	12,000	25
Gas	9,424	25.5	9,200	19
Coal	4,484	12	0	0
Hydro	8,127	22	9,000	19
Renewables (Wind, Solar Bioenergy	1,657	4	10,700	22
Conservation	1,837	5	7,100	15
Total	36,975	100	48,00	99.8

(Figures retrieved from MEI, 2010)

4.2.2. Ontario's Green Energy & Green Economy Act

Bill 150, Ontario's Green Energy, 2009, entered into effect on May 14th, 2009. The goal of the act is to facilitate the implementation of renewable energy systems by encouraging the implementation of "regulation to assist in the removal of barriers to and promote opportunities for the use of renewable energy sources, and to promote access to transmission systems and distribution systems for proponents of renewable energy projects." (Bill 150, 2009). From its inception, the goal of the GEGA was to create more sustainable manufacturing, economic, and community opportunities in the province.

Within the act, the following provisions demonstrate support for community involvement in renewable energy projects:

a. Establishment of the Renewable Energy Facilitation Office (REFO).
b. Facilitation of distributed generation.

c. Incorporation of Renewable Energy Co-ops in the Co-operative Corporations Act.
d. New community involvement goals.
e. Mandate for a FIT program.

a. Establishment of the REFO

The REFO office was established to aid in the development of renewable energy projects. The Office offers consultation services for project proponents who do not have the background knowledge or the legal expertise necessary to successfully implement a project (Bill 150, 2009; Ministry of Energy (MoE), 2011).

b. Facilitation of distributed generation

The Electricity Act, 1998, was amended in several ways through the implementation of the GEGEA. These amendments facilitate the addition of distributed energy into Ontario's electricity mix. Firstly, the Electricity Act is amended by adding a subsection to Section 26, which states that priority access be given to renewable energy generation facilities. In this case "transmitters and distributors shall provide priority connection access to its transmission system or distributor system for a renewable energy generation facility that meets the requirements prescribed by regulation." (Bill 150, 2009, p. 19-20). Further, the Electricity Act is amended to state that the Minister of Energy may direct the OPA to establish measures that facilitate the development of renewable energy facilities, transmission systems and distribution systems.

The GEGEA also amends the Ontario Energy Board Act, 1998 by adding the following paragraph:

> "To promote the use and generation of electricity from renewable energy in a manner consistent with the policies of the Government of Ontario, including the timely expansion of reinforcement of transmission systems and distribution systems to accommodate the connection of renewable energy generation facilities."

Distributed generation and smart grid planning is further recognized through the Ontario Energy Board Act, 1998. The Act states that the establishment, implementation and promotion of a smart grid in Ontario should be promoted and achieved.

c. <u>Incorporation of Renewable Energy Co-ops in the Co-operative Corporations Act</u>

The Co-operative Corporations Act is amended to authorize the incorporation of renewable energy co-operatives. A renewable energy co-operative is defined as: a co-operative that restricts its business to generating and selling electricity produced by renewable sources, and where surplus arising from the Co-op at the end of each fiscal year will be allocated to its members (Bill 150, 2009, pp. 18 & 59).

d. <u>New community involvement goals</u>

The importance of community involvement for the promotion of renewable energy is acknowledged through amendments to the Electricity Act, 1998, which adds the following:

> "The Minister (of Energy and Infrastructure) may issue […] directions that set out goals to be achieved during the period to be covered by the program, that include goals relating to […] the involvement of members of the local community in the development and establishment of renewable energy projects." (Bill 150, 2009, p. 18).

e. <u>Mandate for a FIT program</u>

The GEGEA set out a mandate that aimed for the establishment of a FIT program. The FIT program and how it affects the promotion of CP in the province will be discussed in the following section, as it merits its own description and analysis.

4.2.3. FIT in Ontario

Having been successfully implemented in 63 jurisdictions world wide, notably in countries such as Germany, Spain and Denmark, FIT programs have increasingly gained recognition as the best policy mechanism, to date, to encourage and support the development of renewable energy systems as electricity providers both from a large scale and a CP perspective (Mendonça, 2007). The basic purpose of a FIT is to create a support mechanism that will enable the market development of renewable energy technologies specifically pertaining to electricity generation. The FIT supports this development through specific key elements of the policy design. These elements include: price, by providing a fixed tariff that is based on the technology and size of the installation, and which ensures that profitability is guaranteed to electricity providers; guaranteed, priority grid access to any renewable energy technology over conventional forms of electricity production; and duration, by setting a time limit, usually 20 to 25 years, on how long the FIT payments are received by the producer (*Ibid*).

Ontario's FIT program is fostered under Ontario's 2 year old GEGEA. The FIT program was announced in May 2009 and was officially launched in September 2009. The Ontario

Power Authority, which is the responsible authority for implementing and overseeing the FIT program, started receiving applications on October 1st, 2009 (OPA, 2010a).

Ontario's FIT program sets out the following provisions that are specifically in place to facilitate the development of CP projects:

a. A price adder for projects that include community ownership;
b. Reduced security payments; and
c. Opportunities for funding through the Community Energy Partnership Program.
d. Fast tracking for distributed generation (Farrell, 2011)

a. <u>Price Adder</u>

A price adder is an additional amount in ¢/kWh paid to projects with at least 10% local ownership. This provision was included in order to minimise cost barriers that community groups face and to level the playing field for groups that are interested in developing renewable energy projects but would otherwise be excluded or unable, financially, to do so (OPA, 2010b). The calculated price is based on the amount of community participation in the project. For example, a project with 1% equity ownership receives 2% of the price adder (Farrell, 2011). This means that a project with 10% community ownership would receive 20% of the maximum price. In order for a project to receive the full bonus, they must have at least 50% local ownership.

Table 4.4 outlines the maximum price adder that can be received, according to technology, and Table 4.5 outlines percentage of adder bonus based on the level of community participation.

Table 10. Community price adder						
Renewable Fuel	**Wind**	**Solar PV (ground-mounted)**	**Water**	**Biogas**	**Biomass**	**Landfill Gas**
Maximum community price adder (¢/kWh)	1.0	1.0	0.6	0.4	0.4	0.4

(Source: OPA, 2010b)

Table 11. Community price adder eligibility	
50 to 100 % control	Eligible for the full price adder
40 to 49 % control	Eligible for 80 to 98 percent of the price adder
25 to 39 % control	Eligible for 50 to 78 percent of the price adder
10 to 24 % control	Eligible for 20 to 48 percent of the price adder

(Source: OPA, 2010b)

b. Reduced Security Payments

Security payments are required at 3 project milestones in order to be eligible under the FIT Program: at the time of application, at the time of contract issuance, and following the notice to proceed (OPA, 2010b). Normally, security payments are high, and would not be affordable to individuals or CP project proponents. They are set at $10-20/kWh, $20-50/kWh, and $10-25/kWh respective to each stage of security payment. CP projects that have at least a 50% local participation level are eligible for reduced security payments that are significantly less than the costs cited above: $5/kWh at each of the 3 stages (OPA, 2010b).

c. Opportunities for Funding under the Community Energy Partnership Program

The CEPP is managed by the Community Power Fund, which was established in 2007 with the purpose of supporting CP projects through a number of financing instruments.

Through the CEPP, grants of up to $200,000 are available for CP projects that are smaller than 10MW, and $500,000 to projects that are larger than 10MW. The purpose of the fund is to help CP projects through the initial stages of a project, which include application processes, screening, and project monitoring (Community Energy Partnership Program (CEPP), 2011).

To date, the CEPP has awarded grants to 33 CP projects with a total capacity of 44MW, and totalling $2.5 million (CEPP, 2011).

d. Fast Tracking for Distributed Generation

The FIT program facilitates local ownership and distributed generation through the identification of Capacity Allocation Exempt (CAE) projects. Projects that have been identified as CAE have a streamlined process for grid integration (Farrell, 2011). CAE status pertains to those projects that are less than or equal to 250kW and that are connected to distribution lines less than 15 kilovolts (kV), and projects that are less than or equal to 500kW and that are connected to distribution and transmission lines that are greater than or equal to 15 kV (OPA, 2010b).[10]

[10] Transmission and electricity is divided into 3 categories: 1. Distribution for bringing power to homes and businesses (3.3-25 kV), 2. Sub-Transmission for moving electricity over short distances (33-132 kV), 3. Transmission for moving bulk electricity over larger distances (>110 kV) (Farrell, 2011).

4.3. Ontario's policy framework- Does it promote Community Power?

4.3.1. Identification of trade-offs

Ontario has taken some groundbreaking steps towards achieving a more sustainable energy mix through the promotion of CP with the adoption of the GEGEA, a progressive FIT system, and through commitment to renewable energy in its Long Term Energy Plan. Yet, despite the promotion of CP in the GEGEA, Ontario has received a relatively small number of CP project applications under the FIT program. The current policy framework does not maximize the potential gains of sustainability, as current CP policies have not yet fully made their potential understood. Similar to the trade-off issues that were identified previously, the following trade-offs are currently being faced in the province:

a. Grid Integration.
b. Cost.
c. Government uncertainty and non-inclusive decision making.
d. Social friction.

A. Grid integration

CP project proponents find that there are often complex regulatory processes to follow, which, in many cases, lead to delays in grid connectivity, or halt projects entirely. Although there are mechanisms in place, such as the REFO or classifications, such as CAE, the CP process is still difficult.

Complex procedures can make it difficult to connect to the grid, and in Ontario, as in many jurisdictions, CP projects have problems with local grid interconnection (Mazza, 2010). An example of this would be the Economic Connection Test (ECT). The intent of the ECT is to ensure that the cost of connecting a project is reasonable (OPA, 2010a). Where projects would otherwise be up and running, there have been cases where they have been halted by the ECT processes, which has proven to be a big hurdle to overcome. Many of Ontario's current projects have been halted by the ECT. This is because prior agreements giving connection priorities to nuclear plants, such as Bruce Nuclear, or larger renewable energy projects, such as Samsung's 2,500MW wind project, exist, taking away from CP project potential. As Mazza notes, standardizing procedures for interconnection and making them more predictable will increase the chances of getting more CP projects up and running (Mazza, 2008).

Further integration issues include uncertainty about which projects will be able to connect or not. Since introducing the FIT, the OPA has received more applications that it has been able to handle and utilities are getting connection requests for more projects than they are able to accommodate. This has lead to huge setbacks and delays and, in many cases, disappointments where projects that were initially offered a contract, where later told that they would not able to connect (Hamilton, 2011).

B. Cost

For many CP projects, costly processes early on in project development can pose problems and can cause delays or the inability for projects to move forward. When asked if funding available through provincial and federal programs is enough, different CP project proponents have different experiences.

Renewable energy CP projects are quite capital intensive at all stages of development, from initial organization startup to technology purchase and construction. As mentioned previously, the CEPP provides grants for CP projects in the province. Up until recently, the maximum grant available was of $200,000 to projects under 10MW, but this has recently changed to accommodate larger projects, increasing the maximum grant size to $500,000 for projects larger than 10MW in capacity. In addition to the CEPP grant funding, project proponents can look for initial startup capital through the Ontario Co-operative Association and the Canadian Co-operative Association who provide grants for organizational development.

These avenues of funding are very important for CP projects since CP Co-ops can only start accumulating capital from members once an offering statement is achieved from the Financial Service Commission of Ontario (CEPP, 2011).[11] Because Co-ops can only raise a maximum of $200,000 capital before an offering statement is achieved, Co-operatives often find it difficult to cover all of the upfront costs, which include a $500 FIT application, plus a security deposit of $5/kW, planning approvals, pre-feasibility studies, business plans, and so on (*Ibid*). Further, once the offering statement is announced, a Co-operative has one year to collect the capital needed in order to start the project. In many cases, this is not enough money to begin with or enough time to get a project started (Martin, 2011c). CP groups need to be given, not only more avenues of funding, but also more time to raise the capital needed to start a project, and get it off the ground to start producing returns.

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[11] An offering statement is required to be approved by the FSCO before a co-op can sell securities such as shares, loans and debentures. A successful offering statement application requires in depth pre-feasibility studies and business plans to be presented, which all are very costly and time consuming (CEPP, 2011).

The current debate in Ontario concerning renewable energy is mostly centered around costs. The rate for roof mounted solar PV under the microFIT program is set at 80.2¢/kWh, a rate that has caused much uproar among Ontario rate payers, politicians and communities. Creating differentiated tariffs based on location would control costs of renewable energy and deter the concentration of project development in few specific areas, would eliminate windfall profits to developers in areas where only strong resources exist, and would enable greater distribution of renewable energy across the province through avenues other than large development (Martin, 2011a). This, however, would also increase grid connection costs.

The 80.2¢/kWh, which is the highest rate offered through the FIT program, applies only to rooftop solar PV to projects under 10kW. Therefore, this rate needs to be kept in perspective. These projects represent 0.001% of the total installed generation in Ontario, none of which are CP projects. On average, a typical household in Ontario pays roughly 13¢/kWh, 0.4¢ of which can be accredited to the implementation of renewable energy since 2010 (ECO, 2011). More importantly, this additional 0.4¢/kWh is bringing economic activity and skills development to the province and is “allowing homeowners, communities and aboriginal groups to participate directly in the greening of Ontario’s energy system.” (Hamilton, 2010b). Policy makers, media and individuals need to step away from this single issue narrative and focus more on how the GEGEA can benefit sustainability and energy autonomy.

In addition to the debate about high rates for renewable energy, renewable energy opponents have noted substantial costs of building additional transmission and distribution networks to accommodate new distributed generating facilities (Daschis et al. 2011). While this point is valid, Ontario's energy infrastructure has been neglected for decades, and regardless of what type of energy is added to the province's mix, much of our transmission and distribution network will need to be rebuilt, newly created or upgraded (MEI, 2010). In reality, a distributed energy portfolio based on renewable sources would be feasible and not require significant upgrades to the transmission system, what it would require is policy modifications to improve access to the current grid. There are several regions that have great potential for wind integration. However these regions are severely limited because transmission lines are already at capacity or in reserve for other types of energy generation (Burda et al., 2008). For example, the transmission network in the Bruce region is currently locked up by the Bruce B nuclear station (*Ibid*).

Energy will be more costly regardless of its source, at least for the time being while we transition towards a more sustainable energy base. The idea that the FIT will embed large costs into the future energy mix may have some partial validity (Nathwani, 2011), but the truth is that electricity prices will rise if the province is to rid itself of dirty coal and upgrade the energy mix to a more sustainable one.

C. Government uncertainty and non-inclusive decision making

There are several signals that have lead to general uncertainty about government commitment to CP models and their capacity in renewable energy development. These signals include commitment to nuclear power in Ontario's LTEP, and unexpected changes in the FIT program.

Support for nuclear energy is often legitimized by the argument that it does not emit GHG emissions. Ontario's plan to phase out coal-fired plants and rely on nuclear energy as base load power, as described in the LTEP, demonstrates a commitment to a "cleaner" energy future. However, adverse affects and risks related to nuclear energy need to be considered. The LTEP undermines the ability of renewable energy and puts too much emphasis on nuclear power to cover Ontario's future energy needs. Through the LTEP, the province has committed itself to the refurbishment of existing nuclear plants and the addition of new nuclear plants over the next 20 years. According to the UN's Intergovernmental Panel on Climate Change, developed countries such as Canada need to reduce their greenhouse gas (GHG) emissions by 2020 by up to 40% below their 1990 levels. Ontario will fall short of these targets if it continues to rely on the overestimated outcomes of nuclear stations. In order to fill in the energy gap between 2014 and 2025, the OPA proposes to increase GHG emissions while we wait for new nuclear stations to come online or while reactors undergo risky life extension repairs. These plans threaten Ontario's 2014 and 2020 climate change targets (Greenpeace International, 2007). The province's commitment to nuclear energy is hindering the development of quick-to-deploy green energy solutions that can not only address the possible electricity gap but could also bring Ontario closer to meeting its GHG reduction targets (Stensil, 2008). This is due to nuclear energy's high path dependant nature, which will lock-in Ontario's energy path to a centralized energy system that is limited to changes and adaptation, and deters efficiency and cost- effectiveness for generations to come (Winfield et al., 2010). This commitment caps the long-term development of renewable energy in Ontario at 10,700MW, which falls short of the rates occurring in other jurisdictions. The deployment of renewable energy systems will significantly slow past 2010 in order to make space on the energy grid for nuclear projects (*Ibid*).

An environment of policy instability has been created within the province due to sudden policy changes and ambiguity towards renewable energy technologies. On February 11, 2011, the Ontario government called a stop on all offshore wind power projects, citing insufficient scientific studies on the type of technology and energy production. Several offshore wind projects were in the planning stages and one had even received a FIT contract, which has been cancelled. The nascent, but growing, wind industry in Ontario has been taken aback by this decision, which creates uncertainty in the sector and supports unfounded ideas amongst renewable energy opponents in the province (Blackwell, 2011a). Further, such a decisive step may even signify larger ramifications for renewables in general. Manufacturers of renewable energy equipment who have recently set up in the province are now concerned that all incentives will soon disappear (Blackweel, 2011b).

Uncertainty is also being created by sudden changes in pricing. In early July of 2010, the provincial government suddenly announced that they would modify the pricing structure of the microFIT program. The concern is how this decision affected the 10,700 applicants that had already applied under the previous financing structure and what type of ramifications the decision would have on current and future investors (Hamilton, 2010a). These changes were made by the OPA and the Ontario government without consultation or transparency. This decision undermines the integrity and the entire ideology upon which the FIT program is based and upon which communities have trusted to invest in, that is, to invest in renewable energy because of stability in policy and price (*Ibid*).

Ontario is at a crossroads in terms of the future direction of its energy mix and critical decisions need to be made about long-overdue investments in its aging infrastructure that requires almost complete reconstruction (Mccarthy, 2011; Winfield et al., 2010). Questions about what type of energy system will minimize risks and technology lock-in, and optimize present and future opportunities need to be taken into account. The government's commitment to nuclear and the unexpected changes send out unclear messages to potential investors in renewable energy and create an unwelcoming environment for the already struggling renewable energy sector.

D. Social friction

The combination of the above-mentioned barriers has lead to strong social friction and objection towards renewables in Ontario. In Ontario, the NIMBY phenomenon is probably one of the strongest than in any other jurisdiction. With organizations such as Wind Concerns Ontario supporting the anti-wind movements and having been successful in creating a moratorium on offshore wind development, the battle for renewable energy to remain a prominent energy option in the province seems like a great challenge.[12]

Much of the resistance that is being seen is due to inadequate and transparent development processes that have been employed where stakeholder engagement or community involvement is not extensive. While the GEGEA was created under very idealistic motives of including individuals and communities in project development, it seems as though realistically, these goals are not being achieved.

Ontario needs a plan that will help transition to a sustainable energy future without the threats of social opposition and discontent. There is a need to address social, political and economic concerns, which will require an understanding of what communities need and want (Nathwani, 2011). CP is a tool that can be used to aid in the this transition as it is a mechanism that enables citizens to understand why a transition is needed and benefit from it at the same time.

The way that the current FIT is organized favours the interests of large, corporate enterprises that are likely to have the upfront capital needed to invest in large, centralized projects, that are located in areas where the best renewable resources are available. As a result, the CP sector has essentially been overrun and flattened by commercial developers

[12] Wind Concerns Ontario is a citizen organization representing 57 community organizations and whose mission is to "protect the health, safety and quality of the people of Ontario from industrial wind turbines" (Wind Concerns Ontario, 2011).

who create high levels of concentration of, for example, wind farms. The high concentration of projects in relatively limited areas is cause for dissatisfaction of communities located in close proximity to the projects and who do not see any benefits (Martin, 2011a).

If Ontario's current political framework, specifically pertaining to its CP policies, applied a more comprehensive set of sustainability criteria throughout it's energy planning process, these trade-offs would be minimized, and CP would provide a solid model for developing renewable energy in the province and more individuals would be able to get involved in community projects. More specifically, grid integration issues would be dealt with more comprehensively. The OPA has been taking steps to minimize this issue through more thorough assessments of projects. For example, rule changes by the OPA pertaining to CAE projects have been put in place to ensure that potential connection issues are identifies as early as possible during the application and contracting processes (OPA, 2010a). Debates around costs would be more transparent and better understood. That is, life-cycle assessments and comparisons of technology costs would be made publicly available and the economics of renewable energy would be better understood. Choices made about available energy options in the province need to be well though out and all risks need to be considered, including potential for technology lock-in and impacts on future adaptability. Most importantly, social friction would be minimized through the active engagement of stakeholders through the entire planning process. Through a more democratic and transparent decision making process, the proposed compromises and trade-offs would be addressed, which would ensure that the most desirable energy option be chosen.

5. Conclusion: Optimization of Ontario's sustainable energy policy through CP

The goal of CP should be to provide a community with a decentralized source of renewable power that will embody the principles of sustainability and empower a community through substantial returns on investment that will go towards economic and social development in that community. Decentralized power that can be delivered through CP frameworks has proven to be beneficial on many fronts. These benefits include, contributing to a secure and benign form of energy, especially in low-income and energy poor communities providing access to local energy sources, or contributing to the development of local economic and social projects. Furthermore, CP experiences have demonstrated that this type of approach, which not only promotes the use of clean energy but also involves a more democratic and participatory approach to energy governance, contributes to the popular support of renewable energy from communities that would otherwise be prone to "not in my backyard" movements. All in all, an energy system based on this type of ownership approach to develop renewable energy can be one that is defined as sustainable. This type of approach to harness non-conventional energy sources based on renewable energy sources does assume certain trade-offs, however, these trade-offs are generally more desirable than those involved with conventional energy sources. Furthermore, these trade-offs can be minimized with further attention and funding through R&D in storage technologies, by diversifying energy supply sources and through geographic distribution, and by engaging and including community members at all levels of project development.

The already decentralized character of most renewable energy technologies leads to a much wider geographical distribution of energy generation units More and more citizens will have such generators in their neighborhoods and it will be of crucial importance that these citizens have a positive attitude towards these units if a large-scale switch to renewables is to be achieved. Involvement of local communities appears to be a very important pre-condition for the broad social support of renewable energy. One way to achieve this is through community ownership, or CP. CP projects can, therefore, be classified as an approach to provide a sustainable energy source.

Demand for individuals to take part in this type of renewable energy ownership model exists, however this demand is yet to be satisfied. Many individuals are looking for opportunities to take part in the development of a more sustainable energy future, and CP enables involvement from those who otherwise would not be able to invest in a renewable energy project on their own (Martin, 2011b). CP is critical if Ontario is to see the development of more renewable energy projects and to mitigate the social friction that exists. Presently, there are too many people who only hear the perceived negative aspects of the addition of renewables to our energy mix. If these people were given the opportunity to get involved, this situation would change.

While Ontario's policy landscape has provided an inadequate basis upon which to build a culture of sustainability through CP, some achievements do need to be recognized. Projects being developed under a CP model would not be possible in Ontario had it not been for the implementation of the GEA and the FIT. FITs are an option successfully used in Europe to promote community wind. Advanced renewable energy tariffs that guarantee grid access and a high rate for CP could be one of the most powerful tools to promote CP in the province (Mazza, 2008). FITs enable participation at the individual or community level (Gibbons, 2005). The establishment of FITs in Ontario through the GEA needs to be recognized as an important initial stepping stone towards further development in sustainable energy. The OPA's commitment to the FIT program is laudable and its management and guidance to CP groups are strong. Continued efforts to encourage the advancement of the program and CP projects under the OPA's management need to persist. Efforts made through the REFO to aid in the development of CP projects have been useful and further support in the ongoing development of CP projects from this office is necessary. Consideration needs to be given now to how the GEA and the FIT program should evolve to further strengthen this policy foundation and support innovation in the field.

5.1. Community Power policy recommendations

The experience of CP proponents and those that have been involved in the creation of CP projects has lead to the following recommendations on how to improve the sustainable energy policy landscape by further promoting CP in Ontario:

1. **Creation of a CP FIT with priority access to grid:**

FIT policies are essential for enabling community level proponents to be involved in renewable energy projects. Creating a specific FIT for CP projects that eliminate barriers to grid connection for CP projects would serve 3 purposes. Firstly, this would show government commitment towards renewable energy projects developed by communities. Secondly, this would provide the stability needed to develop investor confidence in the CP renewable energy sector. Lastly, providing a CP FIT and priority access to the grid would help level the playing field for individuals and community groups wanting to get involved in renewable energy projects, showing that larger interests are not the only ones being served.

2. **Differentiated Tariffs based on location are needed:**

A differentiated tariff based on the location of wind generation needs to be established in order to encourage wind development in a larger area of the province. This would provide a greater opportunity for Community Groups to take advantage of lands that would otherwise not be cost effective for projects under regular tariff circumstances. Further, a differentiated tariff based on location would help with the distribution of projects and help control high costs that are now associated with renewable energy.

3. **Stability in Renewable Energy Policies:**

Stability is needed in the political landscape concerning renewable energy. This means that governments need to commit to tariff rates and provisions until proper revision periods are mandated, and the province needs to commit to the Green Energy Act for at least 10 years. FIT prices should include yearly, expected degression rates for new installations, as is the case in current jurisdictions that have an advanced FIT system, such as Germany, to enable further renewable development is necessary (Mendonça, 2007).

4. **Creation of a CP Network to build organizational strength and capacity:**

Those undertaking CP projects need to understand the importance of organizational capacity and credibility. Initial organization of a CP Group can be quite daunting, and it is crucial that groups be extremely organized from the very beginning of the CP Development. The knowledge necessary to organize locally owned schemes that are so commonplace in Denmark and Germany is not yet present in Ontario (Toke, 2005). While grants for feasibility and planning costs do exist through mechanisms such as the CEPP, in some cases this is not sufficient. Most community projects are usually first time projects for a group and, therefore, significant attention to capacity building is necessary (Shoemaker et al., 2006), and attention to minute details must be avoided at the early stages of project development. A network of proponents that have experience in developing a CP project needs to be created. This network would serve as a knowledge-sharing hub where important documents can be shared, and recommendations in terms of organizational structures can be given.

5. **Hybrid projects should be encouraged:**

More hybrid organizations through joint-venture partnerships will benefit in the development of CP projects, keeping in mind, that benefits and project involvement need to consider the communities' aspirations. Pairing renewable energy co-operative structures with other organizational entities, such as the traditional private sector, charities and for-profit organizations, provides for stronger organizational structures and financial support. This is because in many cases such organizations already exist and already have a strong foundation to work on. Further, in the case of the private sector, capital is much easier to access, especially at the beginning stages of a project.

6. **CP needs to be given time to raise capital needed:**

A different regulatory stream needs to be implemented specifically for CP projects in terms of security payments. The way in which the FIT program is framed at the moment where project proponents need to pay large upfront costs, despite reduced security payments, makes it difficult for CP proponents to be involved in renewable energy projects. CP projects need to be given time and increased opportunities to raise capital from its stakeholders; even before share selling is permitted.

Ontario's government needs to understand the importance of CP and the role it can play in the development of renewable energy by helping overcome planning, economic, and social objections. The province also needs to understand the benefits of CP and how to communicate them in order to embed sustainability into people's lives. If implemented properly, energy systems based on renewable energy have a large potential of mitigating climate change as well as provide wider benefits by providing social and economic benefits and by reducing negative impacts on environmental and human health.

To achieve sustainability of our energy systems, capacity needs to be built at all levels of society in an inclusionary manner. Clear goals, not only in terms of how much

Renewable Energy we want and by what timeframe, but also in terms of establishing mandates that define ownership structures that differ from those that are currently promoted by large players, are also needed. By pairing sustainability evaluative criteria with ownership models and goals, a sustainable energy path can be assured, one that can alleviate society from the threats of national and energy security, economic instability and climate change, and one that can deliver energy in a reliable, cost effective, efficient and democratic manner. If fostered and implemented appropriately, CP can provide a useful mechanism that can ensure that our future energy path is sustainable.

6. Appendices

Appendix A: Examples of Community Power projects around the world

Country	**Experience with Community Power**
Denmark	CP has been promoted by government through various initiatives and incentives since the mid 1970's. Most of Denmark's wind energy is community owned. Today, residents of Danish communities representing over 150,000 households own 86% of Denmark's total installed wind capacity.[13] Many community ownership models in Denmark follow 'partnership' frameworks that operate similarly to cooperatives where individuals pool together their funds through the purchase of shares to buy the turbines needed in the area. Revenue earned from the project is distributed according to the number of shares an individual holds.[14] Denmark's Middlegründen wind farm is the most cited example when making a case for CP. Initiated in 1996 by the Copenhagen Environment and Energy Office and a group of local citizens, the Middelgründen Wind Cooperative was formed in 1997. Today, the 40MW Middlegründen Wind farm located off the coast of Copenhagen is owned jointly by the Middelründen Wind Cooperative and the local utility, both owning an equal share of 50% of the project.[15]

[13] Vikkelsø, A. (ed.) (2003). *The Middelgrunden Offshore Wind Farm*. Copenhagen: Copenhagen Environment and Energy Office.

[14] Tempier, M. et al. (2006). *Renewable Energy Financing Case Studies: Lessons to be learned from successful initiatives*. Vancouver: Commission for Environmental Cooperation.
. (2006)., & Danish Wind Turbine Owners Association (DWTOA) (2009). Co-operatives: a local and democratic ownership to wind turbines. Retrieved online, March 20, 2011 from http://www.dkvind.dk/eng/index.htm. Wind cooperatives in Denmark had the incentive of tax-rebates allowing for tax free income to community investors, as well as a Feed in tariff program that guaranteed a set price for wind energy for 10 years. Unfortunately, Danish renewable energy policy has changed significantly over the passed few years, and such incentives no longer exist. Due to these changes, corporate and utility owned wind farms now surpass cooperatively owned projects. In light of these developments, the 2009 Renewable energy Act was passed, imposing a 20% minimum local citizen ownership obligation for all new wind projects.

[15] Sorensen, H. et al. (2002)., & Tempier, M. et al. (2006). With 8,650 members to the Middelgründen cooperative, 40,500 shares were sold at roughly CAN$788 per unit. It was important that the Cooperative sell the totality of its shares before commissioning the project as cooperatives in Denmark cannot contract any debt. On a yearly basis, profits are equally divided amongst shares.

Germany	Germany has followed Denmark's example and has come up with similar community ownership models that have strongly influenced the widespread development of decentralized wind energy. In Germany, for example, over 50% of all renewable projects are community owned,[16] and, in the case of wind developments, 90% of installed turbines were owned by citizens, representing over 200,000 individuals acting as shareholders in wind projects.[17] Community ownership in Germany often occurs as a partnership between an electric utility or wind developer and local individuals wanting to invest in a nearby project, forming a limited liability partnership.[18] The Hollich Citizen Wind Park is a classic example of a community ownership model in Germany, where a limited partnership of investors joined a limited liability company, in this case the Wind Farm Hollich Vermaltung, to establish a community owned and run wind project. To date, the partnership has attracted 217 members, all local shareholders from the Steinfurt region in Germany. Over 14MW of wind power has been installed.[19]
Japan	Japan's experience with community owned wind started in 2001 when its first community funded 990 kW turbine was installed in Hamatonbetsu, Hokkaido, Northern Japan.[20] Today, there are 12 community owned turbines located across Japan, which total 17,770kW of output capacity. Most of these projects have been financed through investment fund models, where citizens from all over the country can directly invest in a given project. While these projects represent a small portion of Japan's total installed wind capacity, they are still examples to look up to and follow in the region.
Australia	CP in Australia has only recently started to receive some attention with the development of the Hepburn Wind project. The Hepburn Wind project is Australia's first and only CP project, composed of 2 turbines with a combined capacity of 4.1MW. The project is owned by the local community through the Hepburn Community Wind Park Co-op, which manages and operates the park, and provides the financial returns of the project to its 1,600 members.[21]

[16] CEC, (2010).
[17] Grepmeier, J. et al. (2003).
[18] Embark, (2011a). Partnerhips often take place as limited partnerships (KG) with a limited liability company (GmbH) (GmbH & Co. KG). The GmbH is usually a wind developer and KG is typically made up of local people wanting to invest in a project.
[19] Renewable Energy Partnership (2004). To Catch the Wind: The potential for community ownership of wind farms in Ireland. Retrieved online, April 12, 2011 from www.seai.ie/uploadedfiles/FundedProgrammes/File1ToCatchthe**Wind**.pdf., & Embark, (2011a).
[20] ISEP (2011).
[21] Embark (2011b).

South Africa	South Africa's first community led project is in the development stages. Following a Trust Fund ownership model, and working in partnership with a wind developer, the Seeland Community Development Trust hopes to establish a 25MW wind farm where the local community will own a significant amount of the project, and where revenues from which will be used to contribute to social development projects in the region.[22]
Ontario	Since 1999, when Ontario's first community owned, and North America's first urban sited wind turbine was envisioned, interest in community owned turbines has risen and the creation of wind cooperatives around the province has gained momentum. In many cases, community ownership models in Ontario have been joint venture agreements, or partnerships, between cooperatives and local utilities or developers, where ownership, maintenance and operation costs, and revenues are shared 50/50. To date, less than 5% of the executed renewable energy projects under Ontario's FIT program are community owned.[23]

[22] Martin, S. (2010). Anonymous Correspondance. June 27, 2010. World Wind Energy Association, Bonn.
[23] OPA (2011). Percentage based on the Ontario Power Authority's Bi-weekly FIT and microFIT report, May 27, 2011

Sustainability Assessment Of Community Power	
Evaluation Criteria	**Community Power Assessment**
A. Risk to the Environmental and Humans:	
The ability to reduce direct and indirect human and environmental threats	CP establishes environmental awareness among individuals by creating clear linkages between energy generation and consumption. This is beneficial in mitigating negative environmental impacts of energy generation (St. Denis, G. et al. 2009). CP projects are based on renewable energy sources. While renewable energy sources generally perform well in terms of minimizing risks to humans and the environment, these risks still need to be considered. Risks associated with, for example, greenhouse gas emissions during life-cycle construction of a technology, air emissions related to biomass facilities, impacts on fish and wildlife related to small hydro, soil erosion from construction and access roads of larger projects, and environmental interruptions caused by large wind farms. Overall, however, renewable energy performs very well, specifically when compared to conventional electricity sources. Lifecycle assessments for energy services delivered though renewable energy indicate that, for example, greenhouse gas emissions are significantly lower than those associated with fossil fuels. The median values for all renewable energy sources are ranging from 4-46g CO2 eq/kWh while those for fossil fuel range from 469-1001g CO2 eq/kWh (Edenhofer, O. et al. 2011, pg. 16). Renewable energy strategies are essential to cutting 60-80% of the world's greenhouse gases, and community power can help achieve this cut (Mallon, K. 2006).
The ability to reduce and avoid extractive damage and waste	Because CP projects are based on renewable sources, fuel extraction, use, and waste disposal are typically not an issue. Therefore, during energy generation, there are no extractive damages or hazardous wastes created.
The ability to consider all extreme event risks, despite their probability or likeliness	The extreme event risks that are associated with fossil fuel sources (e.g. large scale oil spills, mining accidents, gas explosions, nuclear meltdowns) are not associated with renewable energy sources. While some have expressed concern about the possibility of risks due to, for example, malfunctions in wind turbine construction, these risks are nowhere near as threatening as the above mentioned risks linked to energy production from fossil fuels, where thousands, if not millions, can be affected. Generally, CP projects have low extreme event risks and their decentralized structures limit the potential for fatalities (Edenhofer, O. et al. 2011).

B. Scale, Adaptation and Resilience of a System:	
The extent to which a system can adapt to a current energy system, and respond to supply and demand requirements	CP projects may be able to adapt to current existing infrastructure and can be interconnected to distribution grids directly depending on their size and location. This would avoid the construction of substations (Bolinger, M., et al., 2004). If properly sited, a CP project can actually help relieve overloads in transmission lines by providing power to the load and supporting the line voltage (ETO, 2004). In many jurisdictions, adaptation of renewable energy to existing infrastructure is difficult due to planning and permitting processes. Mazza (2008) notes that when local investment dollars are at stake, CP projects benefit from local community support which tends to facilitate permitting processes in a region. Further, as the ETO (2004) explains, community projects can be a good stepping stone to gauge whether a site has potential for future expansion. ETO also explains that “The ability to rapidly scale up a site from a few turbines to several hundred is valuable in today’s political environment where policies facilitating wind development change dramatically from year to year.”. Renewable energy and, to a greater extent, if decentralized and geographically distributed under a CP model, can be brought online quickly to accommodate supply and demand (Weis, T. Et al. 2010). This has been the experience in jurisdictions worldwide that have knowledge with renewable energy. During the periods between 2004-2009, global renewable energy capacity grew at a rate of 10-60% annually (REN21, 2010). Countries, such as Germany, have proven that the rapid uptake of renewables is possible, and even more so through CP ownership models. Between 2000-2004, Germany was able to create 14,000MW of renewable capacity (Scheer, H. 2007). In 2010 alone, Germany installed 7,400MW of solar energy. As noted previously, 50% of Germany’s renewable energy developments are community owned, proving that a CP approach to renewable development aids in the rapid implementation of renewable. Edenhofer et al. (2011) explains that long term integration of renewable energy includes attention to social aspects such as capacity building, which can be achieved through CP frameworks.
The extent to which availability of a source is considered	One of the principle arguments against renewable energy as a main source of base-load electricity is its intermittent nature. While this is a major concern, there are ways of mitigating it that would allow for more reliant availability. Mitigation methods include decentralization, storage technologies and

	smart grid planning. Through support garnered with CP ownership models, more decentralized energy units will arise. Decentralization aids in the availability of energy as it is geographically dispersed. Geographic diversity enhances renewable energy production since it increases the probability that energy will be generated in different locations at a given point in time (Mazza, P. 2008). Energy systems based on renewable energy need to be coupled with storage technologies in order to respond and to enable adaptation to fluctuations in energy availability. Storage technologies do exist and include pumped storage plants, compressed air for energy storage, and rechargeable batteries (*Ibid*). Grid strengthening and upgrades to incorporate more renewable energy would also be required for the deployment of energy from renewable sources. This would need, however, further investment. For the integration of wind energy, grid upgrades have been quoted at around 10% wind energy generation costs for a system that has a 30% wind energy share (Krohn, S. ed. 2009). It can, therefore, be assumed that as economies of scale in wind are achieved, the cost will lower. It is also important to note that in many jurisdictions that are currently dependent on centralized energy sources that have been functioning for 30-40 years, upgrades to the grid system will be required regardless of whether decentralized renewable technologies are added or not.
The extent to which resilience and flexibility are considered	Renewable energy systems can be deployed either in large centralized energy networks or at the point of use in rural and urban environments, that is, in a decentralized manner (Edenhofer, O. et al., 2011). CP ownership models encourage decentralized energy systems. Generally speaking, rapid uptake of renewable in a resilient manner and responses to electricity demand are facilitated when supplies of electricity are located at the point or near the point of maximum energy demand (Boyle, G. 2004). Decentralization can provide for a more resilient system in the sense that it can strengthen a local power distribution grid by putting a multiplicity of smaller generation sources, which decreases the likelihood of large amounts of electricity coming from a central plant from going offline at once.
C. Lower Path Dependency:	
The degree to which change in technology innovation and evolution is	Renewable energy technologies have room for technological improvement and are still experiencing significant advancement and cost reductions (Moody's Corporate Finance, 2008). While conventional energy systems are

considered	reaching smaller levels of optimization, renewable energy technologies are at the start of their development, allowing for massive levels of optimization (Scheer, H. 2007). Initial installations of technological innovations are often costly, however, cost normally declines as individuals, enterprises and sectors gain experience and perfect the technologies (Löschel, A. 2002). The cost of renewable energy has become more competitive over the last 30 years and this trend is likely to continue in the future (RETI Coordinating Committee, 2008), suggesting that these technologies can become adopted more aggressively. The rapid development of wind power in Europe has demonstrated the effects on decreasing its cost over the last 20 years. Technological development of renewable energy can be encouraged through annual rate and price decreases that are constantly achieved through the development and achievement of markets of scale.
The degree to which long-term thinking and transition to new, zero-carbon economies are considered	Long term thinking in terms of transitioning towards a zero-carbon economy would include the emergence of new firms, industries, markets and technologies, and social demands (Hospers, G-J. 2005). CP combines the social demand to minimize environmental and human risk and to create economic, political and social equity, and strong technological innovation and cost reduction potential through the use and promotion of renewable energy technologies needed to trigger such a shift.
D. Inter and Intragenerational Equity:	
The ability to build equitable livelihoods for all	Local project development allows for local capacity development and education. The current renewable energy market is dominated by large developers who are able to put projects up in prime locations and create an uneven playing field for project development. This is because larger developers have the upfront financial and technical capacity needed to deliver renewable energy. CP has the potential to bring together a more diverse set of individuals who could be involved in renewable energy development (Mazza, P. 2008). CP options of energy production do provide superior benefits to communities involved, including economic security and opportunity, energy security, and greater societal equity, by diversifying the number of people and institutions that can participate and benefit from renewable energy development (Mazza, P. 2008). Ultimately, renewable energy projects are a source of jobs and economic development, and those projects that have a community element are shown to have an increased impact at all stages of development, construction and operation on jobs and economic development (Lantz, E. & Tegan, S. 2009). Economic benefits to communities of locally owned wind projects have shown to be triple that of projects

	that are put in place by outside or "absentee" developers, and create nearly twice as many local jobs per MW of energy capacity installed (Weinrub, A. 2010, Mazza, P. 2008, Kopperson, B. 2011). This is due to the increased utilization of labour and materials, returns on investment to stakeholders from profitable projects, and the reliance of local banks for construction finance and operating loans (Lantz, E. & Tegan S. 2009). In this sense, local projects not only create direct jobs, but also create indirect and induced jobs (employment due to increased local spending and investment) (Weinrub, A. 2010). By giving a community the opportunity to own/invest in a project that they would otherwise not be able to be involved with, through community ownership models, avenues of opportunity are opened, and equitable distribution of benefits is achievable.
The ability to reduce gaps between the rich and the poor in the present and in the future	CP emphasizes energy sufficiency and sustainability for all, rich and poor. A more decentralized system through CP models creates an energy supply that is closer to energy demand, and therefore a community that is more aware of their energy needs and a greater social responsibility to consume energy more efficiently.
E. Participatory, Inclusive and Democratic Governance:	
The extent to which governance structures include individuals in decision making exercises	Energy systems as promoted through CP models have proven to garner support for renewable energy through more democratic avenues of decision-making. One element of CP is the fact that it involves local control, where voting rights rest in the hands of the community involved. In this sense, a community-based organization made up of local stakeholders has the ability to express their concerns, needs and wants from a project and have a say in decisions taken. Therefore, through a CP approach, all stakeholders, from individuals, to professionals, to experts, to government officials, are involved in a more democratic decision making cycle. Because customer owned projects are located closer to customers, customer values are responded to, making for a more democratic system.
The ability to mobilize and engage societies to apply sustainability awareness in all communities	CP led renewable energy projects not only incorporate local citizens' ideas, but also engages them as active stakeholders in all areas of energy production (St. Denis, G. et al, 2009). The true success of a Community Power can be seen by the extent to which a "culture of sustainability" has been adopted through an open process of governance and informed citizen engagement. The active participation of community members at all stages of project development and management provides a better understanding of where energy comes from and how it can be more efficiently used. CP allows for individuals to make a clear link between generation and consumption, which in turn leads to sustainability awareness

	(St. Denis, G. et al, 2009).
F. Effiency & Cost-effectiveness:	
The extent to which more is achieved with less material, economic and energy input	Decentralized energy systems see more efficiency than those that are not, and this is due to the proximity of energy production to energy consumption (Scheer, H. 2007). Furthermore, energy from renewable sources, such as wind and solar, is converted into useful electricity in one single step. This is not the case for energy produced from conventional forms, such as fossil fuels. In the case of coal, low efficiency levels of 30-40% are achieved, with most of the electricity being lost as heat in electricity distribution systems.[24] Usually, wind energy developers estimate 10-14% energy losses in energy production from wind turbines, causing for 86-90% efficiencies (Krohn, S. Ed. 2009).
The extent to which all positive and negative externalities, pre-existing subsidies, and price distortions are considered in cost calculations	Possibly the most important economic benefit of renewable energy is that it does not expose our economies to externalities such as fossil fuel price volatility, hazardous waste disposal, or greenhouse gas emissions, risk reductions that are not accounted in the standard methods of calculating energy prices (Krohn, S. Ed. 2009). Generally, the costs of conventional electricity production are determined by the following 4 components: fuel cost, cost of CO2 emissions, operation and maintenance costs, and capital costs. In the case of most renewable energy systems, 2 of the 4 components do not exist: operation and maintenance costs, and capital costs. Over 75% of the total cost of energy generated from a wind turbine are up front costs related to operations and maintenance, and capital costs for planning and turbine equipment (Krohn, S. Ed. 2009). This means that ongoing fuel and emissions related costs are not present and making this type of energy generation more affordable in the long run. As more renewable based energy systems are added, energy production costs decline. This is because of the replacement of conventional generation with renewable generation, which leads to the reduction in variable costs, such as fuel, GHG emissions and hazardous waste (Mazza, P. 2008).
Once the above mentioned considerations are monetized, the likelihood of producing the forecasted mix of sustainable energy to meet demand	Monetizing external costs of all energy supply systems would improve the cost competitiveness of renewable energy. Further, the levelized cost of an energy technology is not the only determinant of competitiveness, economic, environmental and social aspects need to be considered as well as the technology's contribution to meeting energy needs (Edenhofer, O. et al. 2011). As Valentine (2010) points out, wind power is not necessarily

	more expensive than fossil fuel generating sources if external costs are internalized. In fact, wind power would be economically superior, even compared to new coal. Bolinger et al. (2004) notes that as more CP projects are built, the quicker development costs decrease with the emergence and development of local capacity and experience.

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