

SOLAR CITY CRITERIA FOR CANADIAN MUNICIPALITIES

By

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We accept this thesis as conforming  
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## **ABSTRACT**

This action research project identifies a ten-point set of criteria that may guide Canadian municipalities to become solar cities and improve the environmental sustainability and energy security within their jurisdictions. This project was a three-stage research initiative that involved developing an initial set of criteria based on a review of international models, and then refining the set of criteria during two stages of enquiry. The two enquiry stages were conducted with Canadian solar leaders, municipalities and members of the public and included one-on-one interviews, surveys and two focus group sessions. This project concludes that there is significant support, from both municipalities and citizens, for the establishment of solar cities in Canada by following the set of criteria identified in this study. During this study care was taken to ensure that all ethical considerations were applied and that the results were achieved based on respect for all participants.

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## CHAPTER ONE: FOCUS AND FRAMING

The City of Dawson Creek has made excellent progress in developing a culture of sustainability over the past several years. Recently the Province of BC awarded the community with one of the 2007 Green Community Awards (Sustainable Dawson Creek, 2007). The award recognizes the community as a leader in the province with respect to energy conservation and renewable energy as seen in the use of solar energy for heating water and powering traffic lights. The community also has a green purchasing policy and an educational website for residents to learn about sustainability issues. Even with all of the sustainability measures the community has initiated residents and businesses primarily heat, domestic water with natural gas and the vast majority of homes are heated with conventional natural gas furnaces making the community one of the highest per-capita greenhouse gas emitters in the country. In order for the community to reduce overall greenhouse gas emissions, other measures must be considered (Sustainable Dawson Creek, 2007)

The British Columbia Government recently announced their Green Plan with a commitment to reduce greenhouse gas emissions by 33% by 2020 and coupled with funding opportunities for municipalities, it presents opportunities for the City of Dawson Creek to take action and become a solar city (Province of BC Speech From The Throne, 2007) There are currently no designated solar cities in Canada although the concept has been gaining popularity in Europe, Australia and the United States.

This project identifies what it means to be a solar city and how citizens and businesses can participate. This is the first stage of the project and will result in a set of criteria for communities to follow to become designated as Solar Cities.

The City of Dawson Creek is interested in learning more about the solar city initiative and further how the city could achieve this designation. To assist the City of Dawson Creek my central question is: What set of criteria could define a Canadian solar city, and how can establishing these criteria move the City of Dawson Creek, as well as other Canadian municipalities towards the designation?

My personal interest in the sustainability plan for the City of Dawson Creek comes from being an active participant in the plan.

Currently I'm leading a renewable energy project here at Northern Lights College called Energy House with a number of community partners including the City of Dawson Creek. It involves building an energy efficient building complete with renewable energy systems such as solar thermal, photovoltaic, geo exchange, biomass and recycled water systems. The building is designed to be a classroom for renewable energy training and to demonstrate the technologies in action and fulfils the role of providing community education.

Public education is included in the sustainability plan and as a partner in the project the City of Dawson Creek will play an active role in presenting community workshops (Sustainable Dawson Creek, 2007).

### **The Opportunity**

With our growing understanding of the dangers of global climate change and the role greenhouse gas emissions play, people are looking for ways they can help. In many other countries the solar city concept has empowered citizens to take positive action to reduce their impact on the climate change crisis. By developing a set of criteria for Canadian communities to follow to become designated as solar cities, municipalities have

a guide to help them become more sustainable.

The criteria identified in this study will help the City of Dawson Creek become a solar city, providing the citizens of Dawson Creek concrete ways of participating in reducing their greenhouse gas emissions and the opportunity to become part of the ‘cure’ for global warming. The process has started with The City of Dawson Creek celebrating the first official Solar Days Event in June 2010 with participation from local businesses and educational institutions.

By developing a culture of environmental awareness and action there is a further opportunity of developing a renewable energy economy in Dawson Creek. Once the community becomes a solar city there will be an increasing local demand for solar water heaters and photovoltaic systems and local companies will have the opportunity to fill the demand.

There is also an opportunity for the City of Dawson Creek to act as a positive model for other small communities interested in developing a more sustainable future using solar technologies and perhaps the potential of developing a network of small sustainable communities promoting best practices and sharing resources. Currently in Canada there are no other solar cities so information is somewhat limited and there are no models to work from. In Europe, Australia and the United States, with the exception of Alice Springs in Australia, the only solar cities are large communities with populations in excess of 150,000 (Martinot, 2010). This creates an opportunity for the City of Dawson Creek to develop a model for other communities to follow and to create local opportunities for the Dawson Creek business community to diversify into renewable energy products and services.

The City of Dawson Creek is uniquely situated to undertake an initiative such as the solar city project. With a population of just over 11,000, a declining agricultural base, a growing oil and gas sector and a declining tourism industry based on American tourists traveling the Alaska Highway there is a need for economic diversification. The community was incorporated in 1957 and was the first city in North Eastern British Columbia to be incorporated however the community has not really grown in the 50 years since incorporation (Calverley Collection, 2007). Due to demographic changes the number of American tourists travelling the Alaska Highway is declining. In other communities that have become solar cities tourism has increased as people come to see the technologies in operation. Other solar cities have also increased their local renewable energy sectors in service, retail and manufacturing (Aitkin, 2003).

This action research project followed the steps in the model presented by Glanz (1998), “Select a focus – Collect Data – Analyze and Interpret Data – Take Action”.

The focus of the research was to discover what criteria could be identified to define a solar city in Canada, and how to apply the set of criteria to The City of Dawson Creek as well as other cities in Canada.

### **Significance of the Opportunity**

Since this study identifies the first set of criteria for solar cities in Canada the City of Dawson Creek will gain the opportunity to raise the profile of the city and enhance Dawson Creek’s ability to achieve sustainability goals. Also, if as a result of taking the steps outlined in the action plan of this project, the City of Dawson Creek becomes a solar city then it could be the first designated solar city in Canada and will be on the leading edge of emerging solar technologies. The community could also be the most

northerly solar city in the world with this designation and as such will attract the attention of researchers studying the efficacy of solar technologies in the north. This creates the potential of adding renewable energy education to the offerings of Northern Lights College as well as attracting funding to set up a research chair in renewable energy technology for the Clean Energy Department of the college.

In Europe and Australia the concept of solar cities has been initiated by a number of communities with excellent environmental, social and economic results. Since 1992, in the city of Freiburg in southern Germany, city bylaws are in place, which require all new residential and commercial construction projects to adhere to strict passive and active solar and low energy use requirements. In 1996 Freiburg set a greenhouse gas emission target of 25% below 1992 levels by 2010 and further to have 10% of its electricity generated by renewable sources by 2010 (Television for the Environment, 2010). The city also incorporated a number of initiatives to encourage participation in the renewable energy industries in the community such as financing solar projects, leasing community owned rooftops to solar power generators and providing subsidies and zoning flexibility (Solar Cities Europe, 2007). Communities designated as solar cities in Australia follow similar strategies. For instance Adelaide has adopted the policy of zero net greenhouse gas emissions from buildings by 2012 and in transportation by 2020. Townsville, Queensland and Blacktown, New South Wales have adopted similar strategies (Solar Cities Australia, 2007).

In a recent Report to Dawson Creek Community Council, the Deputy Director of Development Services recommended that the City of Dawson Creek adopt greenhouse gas emissions reduction targets of 14% below 2006 levels by 2012, 33% below 2006

levels by 2020 and 85% below 2006 levels by 2050 (Sustainable Dawson Creek). In order to meet these aggressive targets initiatives such as this solar city project will become critical. The solar city project will provide an opportunity for the community to meet the targets and will provide the focus to make the changes that are required. The City of Dawson Creek has the opportunity to become a leader in renewable energy and community sustainability and create opportunities for education through the community college and schools. A further opportunity is to act as a catalyst for environmental change by presenting the concept and model of solar city to other small communities in BC, Canada and communities around the world. This will bring national and international attention to the community providing further connections to other like-minded communities bringing further opportunities for economic and social development. While helping The City of Dawson Creek become a solar city is the ultimate goal of this project the first step is to establish criteria for Canadian communities to follow to become designated as solar cities.

### **Systems Analysis of the Opportunity**

Throughout the world there is a growing acceptance of the concept of catastrophic climate change and the part greenhouse gas emissions play. In 2003 an unprecedented heat wave devastated Europe causing 19,000 deaths and for countries such as Bangladesh increasingly powerful storms are causing greater and greater devastation (Aitkin, 2003). Citizens all over Canada and in the developed world share in the responsibility of creating the greenhouse gas that has resulted in increasing and devastating climate change. During one of the focus group sessions the theme of collective guilt and responsibility for climate change emerged, suggested by a Victoria BC resident, and

confirmed by the other participants. By initiating this research, and developing a set of criteria to have the community designated as a solar city we will be showing the citizens of Dawson Creek ways of taking positive action to reduce their greenhouse gas emissions and to be part of the solution to the problem.

In Canada the federal government is adopting aggressive targets to combat greenhouse gas emissions. “As we pursue a global consensus, Canada is acting even more aggressively at home. Our Government will implement our national strategy to reduce Canada’s total greenhouse gas emissions 60 to 70 percent by 2050. There will be a 20 percent reduction by 2020” (Government of Canada Speech from the Throne, 2007). With this in mind it would seem that there would be opportunities to petition the federal government for support for the project.

The British Columbia provincial government is also making greenhouse gas reduction a high priority.

This government will firmly establish British Columbia standards for action on climate change. It will aim to reduce B.C.'s greenhouse gas emissions by at least 33 per cent below current levels by 2020. This will place British Columbia's greenhouse gas emissions at 10 per cent under 1990 levels by 2020. It is an aggressive target and will set a new standard. To achieve that goal we will need to be focused and relentless in its pursuit. (Province of BC Speech from The Throne, 2007)

In light of these federal and provincial government initiatives and the worldwide acceptance that greenhouse gas plays a significant role in global climate change it is important for citizens to take part in developing a solution to the problem. According to a study sponsored by the United Nations, worldwide losses from natural disasters brought about by global climate change are doubling every ten years potentially risking the financial viability of insurance companies and banks (Aitkin, 2003).

The City of Dawson Creek has been pursuing a sustainability plan for a number of years and has achieved a degree of success, recently winning a Green Communities Award from the Province of BC. Participating in this study and becoming a solar city the City of Dawson Creek will join an international network of solar cities and take an important and significant step forward in combating climate change (Sustainable Dawson Creek, 2007). With Canadian criteria established for Canadian solar cities the concept could become an innovative way for Canada to move toward a more sustainable future as more and more communities across Canada pursue the concept and implement their own action plans.

### **Organizational Context**

The City of Dawson Creek is led by an elected mayor and council and administered by an administration staff led by a community manager. The community operates under a Vision, Mission, and a set of guiding principles, which include, a vision, "...to be a visionary community that works together for innovative social, cultural, economic and environmental vitality", and a mission "...to provide excellence in service and leadership that promotes a dynamic community within a healthy environment for all generations". Guiding Principles include, fostering a climate of trust and integrity, being an inclusive community by ensuring all individuals have equal access to services and opportunities for success and by seeking ways to reflect and celebrate the diversity of our community and ensuring physical accessibility. The environmental policy is: "We will demonstrate respect for the future of the earth by: Fostering recycling, reuse and reduced consumption; promoting, demonstrating and using renewable energy and advocating for

the preservation of clean air, clean water and healthy land” (City of Dawson Creek, 2007).

Economic development will focus on creating a modern economy and “...strengthening the community’s economic vitality by establishing a climate that encourages responsible economic development, by focusing on and promoting the opportunities for economic development that are inherent in our community and region and encouraging projects that serve the local community and enhance regional self-sufficiency in areas such as power, general supply, and food” (City of Dawson Creek 2007). My research concentrated on developing a set of criteria to help the City of Dawson Creek become a solar city with a goal to develop a renewable energy industry in the community creating economic diversity and economic development opportunities.

The City of Dawson Creek maintains a website, Sustainable Dawson Creek, which outlines the community’s sustainability plan as well as other documents related to their environmental strategy including the Community’s Community Energy Plan. The Community Energy Plan, (CEP), resulted in the City of Dawson Creek winning a federal award from the Federation of Canadian Municipalities in June 2007. The CEP includes policy for the purchase of hybrid vehicles for community operations, the installation of solar water heaters on municipal buildings and an analysis of the municipality’s energy use and greenhouse gas emissions (Sustainable Dawson Creek, 2007). Becoming a solar city is an excellent next step in the expansion of the City of Dawson Creek sustainability plan and fits well with the overall plan the community is putting forward.

The City of Dawson Creek has developed a solar strategy that recognizes the potential of utilizing solar energy in the Dawson Creek region. This area of Canada has

long days in the summer and while the days are short in the winter they are usually very sunny with very little cloud cover. Because of these natural climatic advantages solar energy may be the most cost-effective method for reducing greenhouse gas emissions and energy costs in the Dawson Creek region.

Currently the city has installed solar water heating systems on several city-owned buildings and their goal is to have solar systems installed in every city-owned building with a water heating system. In addition to solar water heating the city is replacing outdated street lighting with photovoltaic streetlights reducing the use of electricity. Besides the obvious long-term savings these measures also enhance energy security, as these systems are not dependent on the provincial utility grid and so in the event of a failure of the grid these systems still operate (Sustainable Dawson Creek, 2007).

Because of the City of Dawson Creek pioneering solar energy, the former Mayor of Dawson Creek, Calvin Kruk, was asked to co-chair the “The 100,000 Solar Roofs Policy Task Force”. This task force is developing a deployment strategy to incorporate solar energy into British Columbia’s energy portfolio. “The program will remove barriers by stimulating the demand for solar technologies, promoting the popularization of residential solar systems, reducing the cost of the systems, training solar installers and developing better manufacturing and system technologies and infrastructure” (Sustainable Dawson Creek, 2007).

Becoming the first solar city in Canada will enhance the profile of the City of Dawson Creek and further aid in the promotion of solar energy deployment and greenhouse gas reduction throughout the region, province and country.

In summary, the federal, provincial, and municipal governments along with

business, industry and Canadian citizens all have their part to play in reducing greenhouse gas emissions and combating global climate change.

The solar city initiative is very well suited for The City of Dawson Creek and the criteria developed from this study could help Dawson Creek become the first solar city in Canada. This initiative could also empower the community to take positive action and serve as a model for other communities in Canada. Developing Canadian Criteria for solar cities is a critical first step in this process.

## **CHAPTER 2: LITERATURE REVIEW**

This literature review is presented in three sections; the first section explores the criteria used in other jurisdictions, the second section looks at environmental issues and the final section examines the leadership required for cities to move towards sustainability and become solar cities.

### **International Solar City Criteria**

This literature review explores the criteria other jurisdictions use to designate cities as solar cities. The literature review also explores current environmental conditions as well as possible impacts the solar city initiative could have on communities in Canada and beyond. The jurisdictions this review examines are Europe and Australia.

The central research question is: What set of criteria could define a Canadian solar city, and how can establishing these criteria move the City of Dawson Creek, as well as other Canadian municipalities towards the designation?

This topic is central to the project as the definition of what it means to be a solar city must be established before the other questions and topics can be explored in relation to Dawson Creek, that is the definition will make clear what goals the project is focusing on achieving and these goals will then determine the process of becoming a solar city.

Because there are no solar cities in Canada, my literature research was conducted using sources from Europe and Australia and engaging Canadian stakeholders in the development of Canadian criteria.

On the website, Renewable Energy Information on Markets, Policy, Investment, and Future Pathways by Eric Martinot (2010), the following matrix is provided and explores how various Solar Cities around the world meet a set of criteria developed by

the author.

Dr. Eric Martinot is a senior research fellow with the Worldwatch Institute, lead author for the Intergovernmental Panel on Climate Change (IPCC), and adjunct professor at the University of Maryland.

The set of criteria Martinot sets out includes seven policy items and one funding item and includes policies for greenhouse gas reduction targets as well as renewable energy targets for communities to meet. He suggests that municipalities set policies for the utilization of both solar water heating, and solar electricity production, with financial incentives for both. Other policy suggestions include urban planning initiatives with future energy needs in mind and sustainable approaches for transportation, both for municipality and citizen owned assets. Martinot also suggests municipalities set building code requirements for energy efficiency and renewable energy utilization for residential and commercial applications (Martinot, 2010).

The following chart was adapted from Dr. Martinot’s website, and represents how a number of Solar Cities around the world measure up using his set of criteria (Martinot, 2010).

City	RE goals	CO2 goals	SHW	Solar PV	Transport	Buildings	Planning	Demos
<b>Adelaide, Australia</b>	X	X					X	X
<b>Barcelona, Spain</b>			X				X	X
<b>Cape Town, South Africa</b>	X	X					X	
<b>Daegu, Korea</b>	X	X			X		X	X
<b>Freiburg, Germany</b>	X	X		X			X	X
<b>Gelsenkirchen, Germany</b>							X	X
<b>Goteborg, Sweden</b>							X	X
<b>Gwangju, Korea</b>	X	X					X	
<b>The Hague, Netherlands</b>		X						
<b>Linz, Austria</b>								X
<b>Minneapolis, USA</b>	X							X
<b>Oxford, UK</b>	X	X	X	X		X	X	
<b>Portland, USA</b>	X	X	X	X	X	X	X	X
<b>Qingdao, China</b>							X	X
<b>Santa Monica, USA</b>					X	X	X	X

Sapporo, Japan		X					X	X
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<b>RE goals</b>	Targets or goals set for the future share of energy from renewable energy.
<b>CO2 goals</b>	Future CO2 emissions targets set, usually on a city-wide or per-capita basis, and often referenced to the emissions of a base year (like 1990 or 2000).
<b>SHW</b>	Policies and/or incentives for solar hot water enacted.
<b>Solar PV</b>	Policies and/or incentives for solar power enacted.
<b>Transport</b>	Policies and/or urban planning approaches for sustainable transport enacted/being used.
<b>Buildings</b>	Energy-efficient building codes, standards, and/or incentives enacted.
<b>Planning</b>	Overall urban planning approaches with consideration for future energy consumption and sources.
<b>Demos</b>	Specific projects, subsidized by public funds or otherwise financed as one-time demonstrations or limited-scale investments in any of the above categories.

*Figure 1. Solar city criteria applied around the world*

While Martinot provides no guidelines for cities actually achieving solar city designation the criteria he provides are helpful in informing the development of solar city criteria for Canada.

In his book, *The Renewable City*, Peter Droege (2006) discusses the evolution of the environmental movement as it relates to cities and establishes a guide for communities to follow in their efforts to reduce their dependence on fossil fuel and to embrace a renewable future. Peter Droege directed and developed solar city; a research development effort conducted under the auspices of the International Energy Agency and currently holds professorial positions at the Universities of Newcastle, Australia and Beijing, China. The book sets out a 10-point “Renewable City Rating Framework” which could provide a theoretical framework for Solar City criteria. The following is a summary of the 10-point rating (Droege, 2006, pp. 247 - 250).

1. *Renewable Culture:* There are policies in place to ensure the right to utilize renewable energy in place of fossil fuels. Public events, press articles and media features regarding renewable energy are prominent. Energy and environmental

groups are engaged and there are educational programs in the community and the schools.

2. *Greenhouse gas emissions reduction targeting, planning and tracking:* A long-range, well-resourced, emission reduction plan in place with targets and effective monitoring in place. A citywide greenhouse gas accounting method in place to monitor per-capita emissions and individual residents, and industry and business sectors are involved in reductions.
3. *Renewable City Finance:* Renewable power purchase plans in place for the municipality. A municipal budget to support development and investments in renewable energy strategies and technologies is in place. A commercial grant, loan and incentives program in place to assist the business sector in meeting targets.
4. *Renewable energy technology development and proliferation policies:* Green power purchasing offers, incentives and requirements in place. City operated or contracted, district-heating systems, wind power, biofuel, and solar projects are encouraged, initiated and supported. Partnerships with colleges and universities are established to provide renewable energy education in an effort to build technical expertise and local capacity.
5. *Renewable Institutions:* Municipal or municipal-controlled energy planning and policy agencies are established to provide direction and guidance to the community. Municipal renewable power generation capacity increasing annually through district heating and other renewable energy programs.
6. *Renewable city design:* Renewable or sustainable building rating systems, such as

- Leadership in Energy and Environmental Design (LEED®), are established as part of planning administration. Green roof and cool roof programs or equivalent urban thermal management programs are encouraged and land use planning that promotes renewable energy and greenhouse gas emission reduction are enacted. Policies are enacted to encourage and expand urban agriculture, community gardens and parks. Land use planning policies are integrated with regional, energy sensitive transport planning to reduce pollution and greenhouse gas emissions.
7. *Longevity and success factor: Renewable City learning:* The city has an overall monitoring and evaluation program in place to measure the success of the program with institutional feedback and learning mechanisms in place.
  8. *Climate change adaptation through mitigation:* An institutional reform agenda is embraced to prioritize climate change mitigation response and greenhouse gas reduction measures are integrated as central to adaptation. Dynamic local climate change prediction and mitigation models are in place to educate the public and provide motivation to embrace the change to a more sustainable society.
  9. *Business development and employment generation:* Public-private partnerships are embraced and encouraged and local government policy includes programs that support renewable energy projects.
  10. *Think locally, act globally:* Regional, national and international city networks and programs are engaged and participation in global action and research programs is initiated and encouraged.

Droege suggests that there is a need for municipalities to "... restructure outmoded planning and management arrangements to cope with massive environmental

change, but also to deal with the enormous security threats that stem from fossil and nuclear dependency” (Droege, 2006, p. 217).

In all of the countries where the solar city initiative has been implemented, strong central or regional government support, in the provision of funding and development of policy, has been in place. In Australia the Solar City initiative is a central government initiative with the central government providing the funding as well as the criteria for involvement. The Australian Solar City program was announced in 2004 by the Department of the Environment and Heritage, Australian Greenhouse Office, with \$75 Million in start-up funding to select cities throughout Australia to become Solar Cities (Australian Greenhouse Office, 2005). The funding provides Solar Cities with funding for distributed solar technologies including photovoltaic and solar thermal and other renewable energy systems for institutional, commercial and residential applications.

The objectives of the program are to “...demonstrate the economic and environmental impacts of integrating cost-reflective pricing with the concentrated uptake of solar, energy efficiency and smart metering technologies and to identify and implement options for addressing barriers to distributed solar generation, energy efficiency, and demand side management for grid connected urban areas” (Australian Greenhouse Office, 2005).

The Australian Criteria for Solar Cities is written in two parts. The first set of criteria is to establish eligibility for the community or consortium making the application and includes such things as, the demonstration of the economic and environmental impacts of the uptake of solar energy as well as a demonstration of the options for addressing the barriers to the project (Australian Greenhouse Office, 2005).

Once the Eligibility Criteria has been met applicants are assessed against the Selection Core Criteria and the proposals rated the highest are selected for the Solar Cities Program. The core criteria includes items ranging from demonstrating the uptake of photovoltaic technologies and the potential to impact future electricity supplies and demands to providing proof of community support and a business plan within the budget presented. Other items are focused on energy use monitoring, by supporting the use of smart meters to show customers the actual cost of electricity at various times of the day, and providing for real-time measurement and monitoring of energy data. Proposals are also expected to show the possibility of a reduction of future electricity infrastructure spending through the use of solar electric systems in both commercial and residential applications as well as the reduction of energy use and greenhouse gas emissions. Financial considerations include a risk management plan, at least 50% of the funding coming from sources other than the central government and a commitment to bring the project in on budget and on time (Australian Greenhouse Office, 2005).

Solar city initiatives are in the very early stages in Canada. Currently the city of Toronto is exploring becoming a Solar City and in British Columbia, Solar BC, a project administered by the British Columbia Sustainable Energy Association, has a solar communities project underway (Harris, 2008).

Solar BC, in association with the British Columbia Sustainable Energy Association was formed in 2008 to promote the establishment of five Solar Communities in British Columbia and to drive the 100,000 Solar Roofs Program (Harris, 2008). In May 2008 an invitation was extended to local governments and First Nations communities to submit proposals to be considered for one of the five communities to be selected. The

five Solar Communities were granted funding to promote solar technologies and installations. The goals of the Solar BC program are:

- “Act as flagship communities and provide leadership to community members;
- Help to develop means to remove barriers to solar hot water installations;
- Help to promote and raise awareness of SolarBC to community members; and
- Provide visible demonstration projects.” (Harris, 2008)

The selection criteria for the program include the following:

- Solar targets, actions and initiatives proposed,
- “Innovation in the targets, actions and policy/planning/leadership measures proposed,
- Intention to apply for other grants to help implement the solar hot water initiatives;
- Commitment of resources to achieve the solar hot water initiatives;
- Participation in Community Action on Energy and Emissions (CAEE);
- Demonstrated commitment and past implementation of solar initiatives in the community; and
- Replicability of initiatives in other communities” (Harris, 2008).

Solar City criteria as found in the literature can be categorized into five broad categories.

1. Policy: In many Solar Cities there are bylaws in place to compel homeowners to install solar thermal or photovoltaic systems. Many jurisdictions have building codes requiring builders to ensure that all new buildings are “solar ready” that is to have the plumbing and wiring in place for easy installation of solar systems. One of the major expenses of solar installations in existing buildings is the cost of retrofitting new technologies into old buildings, often with no blueprints to work from. The most cost-effective installations are on new builds or on homes designed originally for solar technologies. Other policies include the requirement to build to the standards of programs such as Energy Star and LEED to ensure that buildings meet minimum energy

efficiency standards based on measurable and widely accepted standards (Droege, 2006, pp. 195 - 197).

2. Technology: Most Solar Cities focus on solar thermal and solar electric generating technology with installation incentives for institutional, commercial and residential systems. The technologies may also be provided by specific solar manufacturers who meet certain criteria such as achieving CSA designation as required by SolarBC. (Harris, 2008)
3. Greenhouse Gas Reduction Goals: On his website, Martinot features thirteen Solar Cities and of the thirteen, eight have greenhouse gas reduction targets as part of their Solar City plan (Martinot, 2010). In the book, *Renewable City*, the author places greenhouse gas reduction goals as second only to creating and nurturing a renewable culture in the community. (Droege, 2006, p. 248)
4. Planning: Municipal planning departments have an important role to play in developing renewable energy opportunities in communities. Planning includes policies for transportation as well as for land and subdivision development policies.
5. Financing: Financing for renewable energy projects can be greatly influenced by municipal governments through leadership demonstrated by municipal management, staff and council. Droege suggests that "...secure base funding is a crucial element in the design of a solar city and entrepreneurial financial skills are required to launch the programs" (Droege, 2006, p. 224). In Dawson Creek the city installed solar thermal systems on all of the municipal buildings to demonstrate the environmental benefits, the efficiency gains, and the

esthetics of the systems in an effort to encourage citizens to consider adopting these technologies in their homes and businesses. The city has established a sustainability department to assist citizens in securing funding to help with the cost of installing renewable energy systems (Sustainable Dawson Creek, 2007).

### **The Possible Environmental Impact**

In Europe and Australia the purpose of the solar city initiative is to reduce greenhouse gas emissions and the dependence on non-renewable energy sources. This section attempts to explore the evidence supporting the need for initiatives to reduce greenhouse gas emissions as well as attempt to understand the possible impact on the environment the Solar City initiative would have. What is the environmental significance of the project in terms of energy savings and greenhouse gas reduction?

This is an important piece to add to the body of research as there are no solar cities in Canada and none in the world that are as far north as Dawson Creek.

As well, with this research in hand other northern communities may be able to implement the solar city initiative with confidence that their efforts will have an impact on global climate change and their dependence on non-renewable fossil fuel.

In order to assess the possible environmental impact of this action research project one must first gain an understanding of the current global situation as it relates to climate change as well as where we are in Canada and our environmental impact status in Dawson Creek. A review of the literature on global climate change reveals the following key themes.

1. Human activity, specifically the burning of fossil fuel, is the major cause of

- global climate change (IPCC, 2007).
2. Global warming is changing weather patterns all over the earth causing widespread extreme weather events, destruction of crops and many casualties (Dasgupta, 2009).
  3. North Americans and Australians are major greenhouse gas emitters (Henson, 2007).
  4. According to a vast majority of scientists around the world the planet is getting warmer at a rate much faster than previously expected (IPCC, 2007).
  5. Canada faces threats to water supplies and to agricultural production (IPCC, 2007).

The literature makes it clear that global warming is a definite threat supporting the need for this proposed research in the following ways (IPCC, 2007).

### **Current global climate change situation**

The first theme emerging from the literature on climate change is that human activity plays a significant role and that people must take action to combat this reality.

Global human activity adds 26 billion tonnes of Carbon Dioxide (CO<sub>2</sub>) to the Earth's atmosphere every year. This amounts to over 4 tonnes per person on the planet with Canadians contributing 6.3 tonnes per capita. Only the United States of America and Australia contribute higher amounts at 6.8 tonnes per person (Henson, 2007, p. 40).

According to the World Health Organization, in 2000, more than 150,000 people died as a direct result of climate change (Henson, 2007, p. 13). In the seven years since 2000 the planet has become warmer and weather events have become stronger and more destructive so the death toll attributed to climate change could well be much higher

today. Recently there were in excess of 3,000 casualties in Bangladesh and more than 80,000 in Myanmar as a result of powerful typhoons and subsequent storm surges that many scientists attribute to global climate change (Dasgupta, 2009). Increasing ocean levels and more and more violent storms are negatively impacting many coastal communities and as the earth continues to heat up these places may become uninhabitable (IPCC, 2007).

We may, as a species, be precipitating a global catastrophe because of what is known as the “tipping point.” The tipping point is described as the point that the warming of the earth has progressed to the point where the Greenland ice sheet will start to melt uncontrollably causing all of the coastal communities on the planet to be threatened by rising ocean levels. A worldwide temperature increase of 2 degrees C is considered by many to be the “tipping point.” If this temperature is reached and the Greenland ice sheet melts the corresponding increase in ocean levels could be as high as 7 meters causing catastrophic flooding of all coastal populations including the oldest communities on the planet (Henson, 2007, p. 83).

The Intergovernmental Panel on Climate Change, (IPCC), is a team of researchers representing the United Nations, who draw upon the work of more than 1,000 scientists from around the world to create reports for governments to use to prepare climate change policy and strategies. The 2007 report was reviewed by more than 500 scientists who subsequently sent in more than 17,000 comments that were taken into consideration for the final report (IPCC, 2007).

According to the November 16, 2007 IPCC report the 100-year linear trend in global temperature increase, 1906 – 2005 is .74 degrees C and represents a more rapid

increase than the panel predicted in their last report in 2001. This shows that the Earth is warming more rapidly than predicted and we are getting to the “tipping point” faster than expected (IPCC, 2007). The report also found that greenhouse gasses are at, by far, the highest concentrations in the atmosphere in the past 650,000 years and are increasing far faster than the 2001 report predicted. It is clearly the time to take the problem of climate change and global warming seriously (IPCC, 2007).

This research project is critical because as more and more people become convinced of the importance of combating climate change, methods for doing so must be developed and offered to them. If the City of Dawson Creek becomes a solar city the citizens will have clearly defined, effective means of “doing their part” in the battle against climate change.

**Current Canadian and local situation:**

In Canada we face significant threats caused by climate change such as rising sea levels in the Maritime Provinces, droughts in Central Canada and melting glaciers and droughts in Western Canada. Coastal communities in the Maritimes are threatened by rising ocean levels that magnify storm surges and damage infrastructure. Ocean levels have increased by 10 – 20 centimeters in the last century. On the prairies rivers are freezing up to 24 days later in the winter and thawing 14 days earlier in the spring and droughts are longer and more damaging (Simpson, Jaccard and Rivers, 2007, p. 28).

Recently in Vancouver, Johannes Koch of The College of Wooster reported that logs and stumps found at the base of a melting glacier were carbon dated at 7,000 years old (2007). These ancient trees had been frozen in ice formed when humans were still in the Neolithic Stone Age and agriculture was just emerging. The melting of the glaciers

threatens the water supply of our communities as the water from the melting glaciers provides drinking water and once the glaciers have melted, Vancouver along with other communities that depend on glacier water will experience serious water shortages (Simpson et al. 2007, p. 29).

This conclusion is based on a simple mathematical equation. Currently the community of Vancouver is using all of the water generated by the watershed including rain, snow and glacier melt. The melting glaciers contribute up to 20% of the water provided by the watershed and once the glaciers are completely melted the community will be in a water crisis. The City of Dawson Creek also depends on a watershed with glacier melt contributing to the volume of water. As with all watersheds in Western Canada, currently the water levels in the Dawson Creek watershed are increasing even though precipitation is declining (IPCC, 2007, p. 52).

Climate change has become one of the most important topics for Canadians and as more and more evidence of our contribution to the problem emerges Canadians will be looking to their leaders to take action. Creating an actionable set of Canadian Criteria will help communities all across Canada become solar cities and raise awareness to the simple actions people can take to offset their personal contribution to climate change. In Dawson Creek, the Mayor and Council have joined the British Columbia 100,000 solar roofs program and are taking steps to achieve the goal by installing solar systems on all community-owned buildings. In fact Dawson Creek's mayor was the founding co-chair of the BC 100,000 Solar Roofs initiative (Sinoski, 2008).

Dawson Creek is a small community with only a few thousand homes and less than 12,000 people, however moving the world to a solar economy from a fossil fuel

economy is a "...transnational social project that has to be realized by innumerable agents and in countless steps, small and large. Every step has a value, in that it brings the shift to a new economic base closer. These are the courses we must take" (Scheer, 2004, p. 250). Scheer suggests that everyone and every community can make an impact individually and collectively by taking positive action in combating climate change. Participating in this action research project to establish clear Canadian solar city criteria will help Dawson Creek eventually become a solar city and will enable local citizens in Dawson Creek to feel empowered to take action and be part of the solution to global climate change.

In addition to reducing greenhouse gas emissions and reducing Dawson Creek's contribution to global climate change the solar city project is expected to help reduce the use of traditional energy sources and help improve air quality in the community. The literature reveals a number of methods for renewable and greenhouse gas emission free energy generation. In many countries around the world homeowners are encouraged to install photovoltaic and wind generators on their homes to generate electricity to offset their electricity use (Henson, 2007, pp. 317 - 318). In a technique known as "net metering" homeowners generate electricity and during peak generating times they effectively sell surplus electricity to the utility and during low generating periods buy the electricity back from the utility. The goal is to have a net zero electricity bill at the end of the year. BC Hydro has this policy in place, and if Dawson Creek eventually becomes designated as a solar city Dawson Creek homeowners will be encouraged to install solar photovoltaic systems on their rooftops. Along with photovoltaic systems solar thermal systems are very effective in reducing energy consumption and costs. A typical solar

thermal system can provide up to 70% of a typical family's hot water needs and save several tonnes of CO<sub>2</sub> emissions (Henson, 2007, pp. 317 - 318). The reduction in CO<sub>2</sub> emissions achieved by installing photovoltaic and solar thermal systems will also help reduce ground level air pollution thereby improving the quality of life of Dawson Creek residents.

This literature review confirmed much of what I already knew about the topic with a few exceptions. First of all, much of my early research was based on the previous IPCC report that came out in 2002. That report predicted a much slower global warming trend than the 2007 report shows and it is the accelerated rate of global warming that is so problematic. It means that we have even less time than the scientific community predicted to stop our increasing greenhouse gas emissions and action must be taken now in order to have any chance of stopping the global warming trend.

Another aspect of the research I didn't anticipate was the possibility of a fresh water shortage for western Canada. None of my previous reading pointed to water shortages as a problem and the research indicates that it is an issue potentially facing the City of Dawson Creek as well as many other western Canadian cities dependent on mountain watersheds fed by glacier melt.

### **Cities, Change and Leadership**

“Most definitions of leadership reflect the assumption that it involves a process whereby intentional influence is exerted by one person over other people to guide, structure and facilitate activities and relationships in a group or organization” (Yukl, 2006, p. 3). The following examples demonstrate how civic leaders are instrumental in

changing the way cities and their citizens approach the climate change issue as well as how energy is generated and used within municipalities.

In 1902 only 37.5% of Canadians lived in urban centres. By 2006 the number had climbed to over 80% and with current demographic trends the spread is growing (Stats Canada, 2010). With the vast majority of Canadians living in municipalities, local politicians and civic leaders have an opportunity to affect real change by leading green initiatives in their communities. More than 80% of Canadians are directly affected by policies established by Mayors, Councils and municipal staff members (Stats Canada, 2010).

In the absence of central government support it falls to municipalities to lead renewable energy initiatives. Initiatives such as the Live Green Toronto initiative in Toronto and the Green Development Program the Town of Caledon has developed are examples.

The Live Green Toronto initiative 2009 provides residents with a wide range of environmental options, rebates and green community events to inspire citizens and families to green their lives. The program includes grants for home renovations and energy audits of homes and businesses, as well as free workshops on renewable energy and water saving. As part of the Live Green Toronto initiative the city of Toronto was the first city in North America to adopt a green roof bylaw to ensure that all new buildings include green roofs in their plan. A green roof is a roof that has grass or other vegetation growing on it. The benefit of green roofs is to provide cooling for the building in the summer, insulation in the winter and to help control rain water run-off during rainstorms.

This document, *The Power to Live Green*, describes where we are today, where we need to be in the future, and how to get there. It focuses predominantly on

stationary energy in buildings because they are responsible for almost two-thirds of the greenhouse gas emissions in Toronto. (Miller, 2009)

This initiative demonstrates how the city of Toronto is applying the principals of leadership, as presented by Kouzes and Posner (2007) in their book, *“The Leadership Challenge”*. They describe the principal of inspiring a shared vision by envisioning the future, and looking for opportunities to make needed changes. In the city of Toronto example the city created a plan that looked at where they were at the present, and then looked into the future to create a new plan to reduce greenhouse gas emissions. The plan also includes workshops to teach citizens the benefits and environmental reasons for making the project a priority worthy of support. The theory of inspiring a shared vision includes teaching the people affected by the proposed changes about the benefits and enlisting their support. “Leaders breathe life into the hopes and dreams of others and enable them to see the exciting possibilities that the future holds” (p.18).

The Town of Caledon Ontario, Green Development Program provides developers with significant development fee discounts if the developer incorporates either green technologies or builds their project to LEED® standards. Discounts can be as high as 27% for LEED® Platinum standard. Other initiatives include providing environmental education to citizens and business owners to promote sustainable, green activities and building community capacity by supporting community environmental organizations through funding and in-kind contributions (Town of Caledon Communications Department, 2010).

Providing incentives for developers may not seem like exemplary leadership. However, when this action is combined with the community capacity building through training, and the funding of environmental change initiatives, you find the elements of a

successful change initiative. The Kotter model, presented by Bolman & Deal, 2003 suggests that there are eight stages of successful change initiatives including:

Creating a sense of urgency, pulling together a guiding team with the needed skills, credibility, connections, and authority to move things along, creating an uplifting vision and strategy, communicating the vision and strategy through a combination of words, deeds and symbols, removing obstacles, or empowering people to move ahead, producing visible signs of progress through short-term victories, sticking with the process and refusing to quit when things get tough and nurturing and shaping a new culture to support the emerging innovative ways (pp. 383 - 384).

The Town of Caledon, Green Development Program incorporates a number of the stages of change by removing obstacles by offering development fee reductions and by communicating the vision by providing training for citizens and financial support for environmental organizations.

In Europe there are many examples of city governments and citizens taking on the challenge of sustainability and there are many examples of European cities taking action. The European Union Commission (EUC) recently named Stockholm Sweden as the European Green Capital 2010 in the inaugural year of the award. The EUC will designate one city per year as the European Green Capital with the intent... “To improve the living environment in cities and the environment as a whole by designating one city every year to be an example to others and to take a lead in this work by presenting good examples and sharing experiences, thoughts and ideas with other cities” (EUC Green Capital, 2010).

In the European examples, green initiatives have been established for many years, partly because of the much higher energy costs that Europeans experience and also the population density of European cities and concerns about air quality. The result is that European cities are much more advanced in their climate change mitigation strategies and

actions than Canadian cities. The Solar City initiative was launched in Europe in 2003 under the direction of International Energy Agency (Droege, 2006, p. 121).

Both of these European examples are models of large organizations implementing and leading major change initiatives in the realm of energy utilization, the reduction of greenhouse gas emissions and mitigating the effects of climate change. Yukl describes "...the essential role of top management in implementing change is to formulate an integrative vision and general strategy, build a coalition of supporters that support the strategy, then guide and coordinate the process by which the strategy will be implemented" (Yukl, 2006, p.174).

Stockholm mayor Sten Nordin said, "More than half of the world's population live in cities, and in Europe the figure is no less than 80 per cent. Cities therefore play an important role in improving the living environment for citizens. This award represents an excellent opportunity to inform and inspire others about the good environmental work being undertaken by the City, the residents of Stockholm and companies," Nordin went on to say, "Stockholm is a city of opportunities! I want that to continue. For me, an important part of the vision for the future is that we will continue to be a model city. We are the European Green Capital 2010. In 2030, we will be the green capital of the world" (City of Stockholm).

The mayor of Stockholm has demonstrated "Modeling the Way", the first of the Five Practices of Exemplary Leadership as presented by (Kouzes & Posner, 2007, p.47).

People expect their leaders to speak out on matters of values and conscience. To stand up for your beliefs, you have to know what you stand for. To walk the talk, you have to have a talk to walk. To do what you say, you have to know what you want to say. To earn and sustain personal credibility, you must first be able to clearly articulate deeply held beliefs (Kouzes & Posner, 2007, p.47).

The reasons given for Stockholm being designated European Green Capital 2010 include administrative policies guaranteeing that environmental considerations are included in all aspects of governance, the fact that Stockholm has cut its greenhouse gas emissions by 25% over 1990 levels and the resolution the city of Stockholm has made to be fossil fuel free by 2050 (City of Stockholm).

Alice Springs in Australia is also an example of cities taking leadership roles in becoming environmentally sustainable. Alice Springs is located in the centre of Australia with a population of just over 25,000. It is the smallest of the seven Solar Cities included in the initial Australian Government 100 million-dollar Solar City initiative, and has been a Solar City since 2008. As of March 2010 there were over 300 solar systems installed. In 2008, when Alice Springs was declared a Solar City, there were only two solar systems in the city. “In December 2010, it will be 1000 days since Alice Springs became a Solar City, so we are issuing the community with a challenge to have 1000 solar systems installed by then – equivalent to about 10% of roofs” (Ashard, 2010, p. 4).

According to the press release, an average home in Alice Springs requires a 3.5kw solar system, which could generate more than \$1,000 worth of electricity per year with a capital investment of \$4,000. “If homes or businesses became mini power stations by going solar, they would get paid for all the electricity they produce, get a credit on every electricity bill and they would be protected against any future price rises in electricity...The reasons to convert homes and businesses to solar far outweigh the financial investment,” said Mayor of Alice Springs, Damien Ryan (Ashard, 2010, p. 4).

The Alice Springs example demonstrates how civic leaders can apply the leadership principal of fostering collaboration (Kouzes & Posner, 2007). The Australian

solar city project is a collaboration of the central federal government, the municipal government and the homeowners of the municipalities. Without the participation of each of the partners the initiative fails. In addition to looking to the future and creating a long-term shared vision, leaders must also develop a culture of sustainability within the municipalities and in the case of Australia, the country since all taxpayers of Australia contribute to the initiative.

In British Columbia there are also good examples of municipalities taking action to become more sustainable. According to the Globe Foundation report, British Columbia's Green Economy (2010), by January 2010, 176 out of 184 BC local governments had signed on to the Climate Action Charter, a provincial government initiative that requires municipalities to be carbon neutral in their municipal operations by 2012 (Shorthouse, 2010). The Climate Action Charter, at first glance, is an example of transactional leadership in that the initiative provides municipalities with financial incentives for meeting the objectives of the initiative (Yukl, 2006, p. 136). The financial incentives are carbon tax offsets designed to reduce the tax burden on municipal taxpayers. Transactional leadership is the practice of the leader providing rewards for following the dictates of the leader and punishments meted out for non-compliance. Yukl describes two types of transactional behaviour as; contingent reward, which is described as the use of incentives and rewards to influence behaviour, as well as passive management by exception, which is the practice of assessing punishments and other corrective actions in response to "... obvious deviations from acceptable performance standards". (Yukl, 2006, p. 136).

The goals of the Climate Action Charter are to foster cooperative inter-

governmental relations, to reduce municipal greenhouse gas emissions, and to remove barriers to action including legislative, regulatory and policy. When the goals of the initiative are analyzed several additional leadership themes emerge. The first theme is one of initiating change by the provincial government building a coalition with municipalities to support the change. In the example the coalition is formed when the municipalities sign on to the initiative. Yukl (2006) suggests that successful change initiatives require leaders to apply a number of leadership behaviors, which he groups into two broad categories. The categories and actions for leading change he suggests are *political/organizational and people-orientated* (Yukl, 2006, p. 175). In the development of the Climate Action Charter the provincial government is working in the political/organizational actions category.

The coalition is organized around a set of goals as well as a set of principals, agreements or shared values regarding the need for the change. These include the following statements. Scientific consensus has developed that increasing emissions of human caused greenhouse gases that are released into the atmosphere are affecting the Earth's climate. The evidence of global warming is unequivocal and the effects of climate change are evident across British Columbia. Reducing greenhouse gas emissions will generate environmental and health benefits for individuals, families, and communities. Climate change and reducing greenhouse gas emissions are issues of importance to British Columbians. Governments urgently need to implement effective measures to reduce greenhouse gas emissions and anticipate and prepare for climate change impacts. Protecting the environment can be done in ways that promote economic prosperity, and it is important to take action and to work together to share best practices, to reduce greenhouse gas emissions and address the impacts of climate change (Shorthouse, 2010).

One example of the implementation of the Climate Action Plan is the City of Vancouver's initiative, *Vancouver 2020: A Bright Green Future* (City of Vancouver, 2009), a plan that sets the goal to make Vancouver the greenest city in the world by 2020. The plan includes creating 20,000 green jobs in the city, starting a citywide composting program, and improving walking, biking, and public transit options (Shorthouse, 2010). By setting the lofty goal of becoming the greenest city in the world by 2020, the city leaders are developing a vision to inspire the citizens of the city. Bolman and Deal (2003) state that, "Vision turns an organization's core ideology, or sense of purpose, into an image of what the future might become". And that, "Vision is vital in contemporary organizations" (Bolman & Deal, 2003, pp. 252 - 253).

The city of Revelstoke has deployed a biomass district heating system to heat public buildings. The system is fueled by waste forest product byproducts from local forest product manufacturers. The district-heating project has been in operation since 2005 and offsets over 3,700 tonnes of greenhouse gas per year and since the old beehive burner from the sawmill has since been decommissioned the community has experienced improved air quality as an added bonus. The cost of the project was \$5.6 million and with the energy savings the estimated payback period is 10 years (Shorthouse, 2010). When beehive wood waste burners were banned, because of the air pollution they were causing, forestry companies and communities all over BC were facing challenges on a number of fronts. The wood waste needed to be disposed of and municipal landfills were filling up and the additional cost of disposing of the waste had the potential of negatively impacting the viability of forestry companies. Converting the waste wood into heat for homes and

businesses is a natural solution. Since projects such as the one in Revelstoke require partnerships between municipalities and private industry, leadership skills are required.

Municipal leaders, both administrative and elected, have a critical role to play in leading and initiating change in their communities to build a more environmentally and socially sustainable future. According to Peter Droege, cities emerge as the most viable and tangible staging ground for global renewable energy deployment and change (Droege, 2006).

The examples provided in this section demonstrate the application of many leadership models, particularly in the area of developing shared vision, mission and values and the building of coalitions to promote and facilitate change initiatives.

“Leaders gaze across the horizon of time, imagining the attractive opportunities that are in store when they and their constituents arrive at a distant destination. They envision exciting and ennobling possibilities. Leaders have a desire to make something happen, to change the way things are, to create something that no one else has ever created before” (Kouzes & Posner, 2007, p.17).

## CHAPTER THREE – CONDUCT OF ACTION RESEARCH PROJECT

### Research Approach

This action research project studied the potential for criteria to be developed for Canadian municipalities to become solar cities and experience the benefits of enhanced environmental sustainability and energy security in their jurisdictions. The central research question is: What set of criteria could define a Canadian solar city, and how can establishing these criteria move the City of Dawson Creek, as well as other Canadian municipalities towards the designation?

The establishment of solar city criteria for Canadian municipalities is the first stage of a process that may lead to many Canadian communities eventually becoming solar cities and developing additional tools to combat climate change.

Once my literature review was completed, and I had identified a set of criteria based on the international models, I conducted a series of interviews and surveys to further refine the list. My research approach was a two stage research process with the first stage to interview stakeholder representatives from organizations such as The Canadian Solar Industries Association, Federal Ministry of the Environment, Province of BC Ministry of Energy and Province of BC Ministry of Environment, Natural Resources Canada and 18 Canadian municipalities with my initial set of criteria. The second stage was to refine the initial list of possible criteria, based on the results of the first stage, and then conduct focus group sessions to test the criteria.

The action research methodology and the methods employed to gather the data needed to move this project along were suited to the people providing the data and information. The first stage was to gather the data for setting the criteria for solar cities in

Canada. The subjects of this phase of research are Government leaders, municipal leaders and industry stakeholders drawn from across Canada. This phase of the research provided an opportunity for me to engage the very people from across Canada who can move the project to a national level by, as Stringer suggests, "...build[ing] a supportive network of collaborative relationships that provides an ongoing resource" (Stringer, 2007, p. 21). Stringer goes on to talk about how the solutions that come from this "cultural style of action research" are more sustainable over the long term and add to individual capacity and personal power to affect change (Stringer, 2007, p. 21). The goal was to create relationships through thoughtful inquiry with leaders that can offer practical, actionable solutions to the questions and provide me with a deeper understanding of the issues.

Action research can be defined as "...a systematic approach to investigation that enables people to find effective solutions to problems they confront in their daily lives" (Stringer, 2007, p. 1). Stringer proposes that the practice of Action Research is demonstrated in the cycle or spiral of Look, Think and Act. The researcher starts the cycle by looking at the issue by gathering relevant information or data to get a picture to better describe the situation. The second step in the spiral is to think, which is to explore and analyze what is happening then interpret and explain how and why things are as they are. The final step is to act, which is to report, plan implement and evaluate (Stringer, 2007, p. 8).

To ensure the authenticity and validity of the study, and further to ensure that the conclusions and recommendations are trustworthy, my research was based on finding the most qualified subjects for both the literature review and the subsequent interviews, surveys and focus group sessions. Triangulation is a method utilized by researchers to

augment the trustworthiness of a study and involves the researcher drawing data from a variety of sources utilizing a variety of methods (Glesne, 2006, p. 37). For the engagement stages of this project, one-on-one interviews, surveys, focus group sessions and follow-up interviews were conducted with a wide variety of subjects from all across the country. The subjects ranged from solar and renewable energy experts to municipal employees with limited knowledge of the topic and provided a wide range of thoughts and opinions.

For the literature review of international solar city models I studied the work of Peter Droege, the author of the book *Renewable City*, which describes the basis for solar cities in Europe and the author of *Solar City*, a research project he developed for the International Energy Agency (Droege, 2006). I also studied the work of Dr. Eric Martinot, a senior research fellow with the Worldwatch Institute, lead author for the Intergovernmental Panel on Climate Change (IPCC), and adjunct professor at the University of Maryland, who developed an eight-point set of criteria for European and Asian solar cities (College of Energy, Environment and Sustainability, 2011).

Palys, T. and Atchison, C. (2008) talk about qualitative study methodology as an iterative process where the researcher spends a great deal of time with the subjects of the research project and conducts more than one interview, focus group session or any other method of research. This is to allow the analysis to evolve as understanding of the question increases both in the mind of the researcher and in the mind of the subjects. I conducted several meetings, focus group interactions and interviews with my primary subjects before circulating the set of criteria to the wider group of stakeholders (Palys, 2008).

## **Project Participants**

This project required a number of diverse groups of participants from a wide variety of regions and demographics. For the first engagement phase of the project I focused on gathering input from participants with knowledge regarding the question, or who were stakeholders with an active interest in the solar city project. This group was comprised of representatives from The Canadian Solar Industries Association, Natural Resources Canada, Solar BC, The BC Sustainable Energy Association, the City of Dawson Creek and representatives from 18 Canadian municipalities. I engaged this group of participants during the second stage of the project, once I had developed the first draft of the criteria based on my review of the international literature which I consider stage 1 of the project. This cohort provided the technical, political and social input into refining the draft criteria into what became the final criteria.

The municipalities chosen for the second stage of the study were a sampling of small and large communities with developed sustainability plans and a commitment to reducing their environmental footprint. The survey was sent to the directors of sustainability or equivalent staff members as these people either wrote or directed the development of the sustainability plans for their communities.

Once the second stage of the project was complete I conducted two focus group sessions, one with solar industry practitioners and the other with members of the general public to further refine the criteria. The first focus group session was with three residential taxpayers of the city of Dawson Creek and the second focus group session was with a group of solar industry employees and business owners in Victoria BC. I wanted to test the set of criteria with as diverse a sampling of people as possible to ensure that the

criteria were credible.

### **Research Methods and Tools**

Once my literature review was completed, and I had identified an initial set of criteria based on the international models, I conducted a series of interviews and surveys to further refine the list. My research approach was a three stage process with the first stage to identify the initial set of criteria based on a review of available literature, the second stage to interview and survey representatives from stakeholder groups and Canadian municipalities with my initial set of criteria. The third stage was to refine the initial list of possible criteria, based on the results of the second stage, and then conduct focus group sessions to test the criteria.

The methods employed for the second and third stages of the research were one-on-one interviews, focus group sessions and a survey sent to all participants. The survey included, in addition to the ten points of criteria, a section for comments, which were very helpful. I developed the first list of possible criteria based on the literature from the European and Australian experience, which I circulated to the first research subjects (see Appendix A). I gave this group time to read the report and then I conducted a series of one-on-one interviews with this first group to further inform my possible list of criteria. Once I completed the one-on-one interviews I wrote the second draft of criteria options. For the third stage of the study I conducted two focus group sessions to test the refined criteria.

Stringer (2007) describes the action research cycle as an interacting spiral where the researcher looks, thinks and acts and then starts the cycle again in a process of observation, reflection and action. In this project I worked from the international solar

city models to create the first set of criteria then through a process of interviews, focus group sessions and a survey. As Stringer says, "...action research can be a complex process" (Stringer, 2007, p. 9).

The input from the second stage of the study was used to rewrite the criteria and was analyzed by comparing the suggestions from the research subjects to the international criteria. This project was initiated by the City of Dawson Creek rather than the federal government, as was the case in Australia and Europe so as a result the criteria for Canada are somewhat different.

Before I sent the surveys out to the participants I tested the surveys with selected staff members of the City of Dawson Creek by having them answer the survey and then offer suggestions for improvement. The test did not result in any changes to the survey or to the test questions.

### **Study Conduct**

As stated in the previous chapters this study was a three-stage process conducted in two distinct stages of participant engagement and one stage of literature review research to develop a draft set of criteria for solar cities for Canada, based on an examination of the European and Australian models.

I developed the first list of possible criteria based on the literature from the European and Australian experience, which I circulated to the first research subjects as well as the municipal participants (see Appendix A). I gave this group time to consider the draft criteria and then I conducted a series of one-on-one interviews with this group to further inform my possible list of criteria. Once I completed the one-on-one interviews I wrote the second draft of criteria options. For the third stage of the study I conducted two

focus group sessions to test the refined criteria (see Appendix B).

The first focus group session was with three individuals and was conducted over a lunch hour, which ended up being 30 minutes of conversation and 15 minutes to complete the survey. I taped the session and transcribed the session later that evening. The session was conducted in a classroom at Northern Lights College. The second focus group session was with a group of 20 individuals and it was also conducted over a short lunch period. I also had the participants complete the survey, with particular emphasis on providing comments, as the time was very limited. Once the participants completed the surveys we had a group conversation, which basically reiterated the comments they provided on the survey forms. I tried to record the session but the room was too large and the recorder was not able to pick up much of the conversation, however I took notes of most of the conversation.

### **Data Analysis**

The data collected during this study were primarily qualitative due to the makeup of the survey. My strategy for analyzing the data was to identify trends in the data and compare and contrast the data as suggested by Palys (2008). I also attempted to identify themes and key concepts (Stringer, 2007) to better understand the relationships within the data and between the various respondents' experiences with the topic. The challenge was to compare the responses from the stakeholders, many of whom have divergent interests and motivations. The environmental groups want stringent requirements for solar city criteria to ensure the criteria result in positive environmental change, while municipalities want the criteria to be achievable within their political structures and priorities. Stringer (2007) suggests that in order to find the deeper meaning the data can be categorized and

from these categories key themes may emerge. In my analysis of the qualitative data I categorized the data in the themes of:

- Government policy, both senior and municipal
- Environmental issues
- Energy utilization issues
- Implementation and financial issues

I identified all of the above themes from my review of the literature and then verified and expanded on the themes during the data collection. These themes are an amalgam of the qualitative data and literature review. They were identified during the literature review and then refined and modified as a result of the direct research phase of the project.

These themes informed the final set of criteria for Solar City and provided more advanced and effective criteria than was available from the review of literature. I started with the literature and then added to the knowledge with new insights derived from the stakeholder engagement (Palys, 2008). The literature review regarding solar cities was drawn primarily from European and Australian models while the qualitative data from the two engagements was drawn from the cities and stakeholders that responded to the survey and from the two focus group sessions. The comments from these respondents were organized into the above themes and formed the basis for the final set of Canadian solar city criteria.

### **Ethical Issues**

This action research project was to study the potential for Canadian cities to become solar cities, which, in the case of Dawson Creek, will probably require the

deployment of a considerable number of solar systems on the homes, businesses and institutions of the city. While I do not work for the City of Dawson Creek I am a taxpayer and homeowner in the community so this research project could be considered to be in my own organization and the ethical principals described in the book, *Doing Action Research in your own Organization* (Coghlan & Brannick, 2005, p. 79) may apply. The authors describe politics as a potential issue and there are many divergent political motivations at play in The City of Dawson Creek. The Mayor and Council are looking for recognition and popular policies that will be appreciated by the voters; administration is concerned with fiscal balance and following the policies set out by Mayor and Council; the citizens and business community are looking for appropriate services and reasonable taxation.

My research project was conducted using the Royal Roads University Research Ethics Policy (2007) specifically the eight guiding principals as a guide.

#### Respect for Human Dignity

In his book, *Action Research*, Stringer describes dignity as "... feelings of autonomy, independence and competence (Stringer, 2007, p. 132). During my interactions with everyone involved in this research project I used this as my guide. It is difficult to be detached from a concept one is committed to however in order to have participants fully engage in the process they must feel independent, autonomous and competent. In order to achieve this, I acted as an unbiased observer during focus group sessions whenever possible, and respected the opinions of everyone involved in the project.

### **Respect for Free and Informed Consent**

“Through informed consent, potential study participants were made aware (1) that participation is voluntary, (2) of any aspects of the research that might affect their well-being, and (3) that they may freely choose to stop participation at any point in the study” (Glesne, 2006, p. 132).

Participation in all focus group sessions and responding to written and on-line surveys was completely voluntary. In this project there was very little potential that participation in the research could affect the well being of any participant.

### **Respect for Vulnerable Persons**

This research project is focused on homeowners, business owners and institutions and while vulnerable people are potentially members of these groups the research was not directed to this group. I ensured that the focus group sessions were open to all interested people in the community.

### **Respect for Privacy and Confidentiality**

All information was protected by removing all references to the identification of the owners of all personal information collected. All involvement in the project by the public has been protected and kept private including focus group session participation and survey completions.

### **Respect for Justice and Inclusiveness**

My research project provided the opportunity for anyone from the community who wanted to participate in the study. The goal of the research was to gather input and suggestions as to how to create a set of criteria for possible solar city designation in Canada so I wanted to get the widest possible input from interested participants. I did not

prevent anyone from answering the survey or joining a focus group even if I knew his or her opinion differed from mine.

### **Balancing Harms and Benefits**

While there was very little potential for harm during the research phase of the project I did ensure that focus group sessions were scheduled when there were no severe weather events that could have made travel dangerous.

### **Minimizing Harm**

As stated previously this research project had very little potential to cause harm to anyone except possibly the participation in focus group sessions. The City of Dawson Creek has an emergency plan for all community buildings and since the focus group sessions and team meetings were held at city hall and Northern Lights College in Dawson Creek and at Camosun College in Victoria, we followed their established emergency response plans.

In addition to the possible harms from physical dangers there is also the consideration for psychological harm during the project. During all focus group sessions, participants were treated with respect and they were able to express their individual opinions without censure or criticism. I also ensured that all survey results were completely confidential to protect the identity of the participants. Many of the participants were and may still be employees of municipalities and solar installation companies so their opinions could potentially have a negative effect on their employment.

### **Maximizing Benefit**

The benefit of the research was to discover methods for municipalities across Canada to reduce their dependence on non-renewable energy, to improve air quality by reducing fossil fuel use and give people the opportunity to participate in the task of reducing greenhouse gas emissions.

## **CHAPTER FOUR - ACTION RESEARCH PROJECT RESULTS AND CONCLUSIONS**

### **Study Findings**

The central question of this research project is: What set of criteria could define a Canadian solar city, and how can establishing these criteria move the City of Dawson Creek, as well as other Canadian municipalities towards the designation? In this chapter I will list the final set of criteria that resulted from the three stages of research including the literature review and the two further stages of surveys, focus group sessions and interviews. I will provide a narrative describing how the results were arrived at and interpreted, as well as a review of the qualitative responses from the focus group sessions and the survey. I have broken the findings down into the three stages of the project.

The literature review and the two enquiry stages of the project findings revealed four distinct broad themes that were repeated throughout the project. The themes are:

- Government policy, both senior and municipal
- Environmental issues
- Energy utilization issues
- Implementation and financial issues

The project findings can be categorized as what governments, specifically municipal governments, can do to reduce greenhouse gas emissions, reduce the dependence on carbon-based fuels and provide financial support for the initiative. From the standpoint of leadership, municipalities, and municipal leaders are uniquely positioned to create initiatives and promote policies that can impact the use of energy and reduce greenhouse gas emissions. A majority of Canadians live in urban centres rather

than rural communities and are directly affected by the policies and actions of municipal governments. Adopting the set of criteria developed in this study could provide the impetus to start communities on the path to greater sustainability.

My review of the literature identified many cities around the world taking action on climate change, establishing policies to encourage the deployment of renewable energy technologies and initiating greenhouse gas reduction strategies and policies within their jurisdictions.

### **Stage 1 – Literature Review**

From my review of international literature I developed an initial set of 10 criteria items, which were sent in survey form to the group of solar and environmental leaders as well as the municipalities for comment and further refinement. The list was based primarily on the eight–point set of criteria Dr. Eric Martinot established (Martinot, 2010), the Australian Solar City initiative, as well as the book, *Renewable City* by Peter Droege (Droege, 2006), and with the addition of a number of other sources referenced in my literature review section. I felt that the initial list I developed was a good starting point for the study.

1. The City has greenhouse gas reduction plans with short-term and long-term targets and timeframes in place
2. The City has adopted targets for a proportion of total community energy demand and corporate energy demand to be met by solar energy either photovoltaic and/or solar thermal
3. The City has established policies and incentives for solar electricity and solar thermal utilization for residential homeowners

4. The City has established policies and incentives for solar electricity and solar thermal utilization for commercial ratepayers
5. The City has established policies for energy efficient building codes and standards
6. The City has established policies for land use planning to promote and encourage energy efficiency
7. Community renewable energy, energy efficiency technologies and green living demonstration projects are supported and encouraged by the city to demonstrate these concepts to the public
8. The City encourages and supports district energy projects within its jurisdiction
9. Solar City initiatives and renewable energy and solar projects have significant Federal and Provincial Government support
10. Local government support for solar initiatives is in place

The international criteria fall into several general categories, including energy conservation, environmental protection, demonstration projects, urban planning to encourage solar technologies and financial policy both in terms of direct subsidies for citizens as well as commercial enterprises. In the European and Australian models central governments and municipalities provide the leadership for solar city initiatives with funding directed at addressing issues such as greenhouse gas emission reductions and enhancing energy security.

### **Stage 2 – Initial Engagement**

Once the first set of draft criteria was established I interviewed my initial subjects, identified as stakeholder representatives from organizations such as The Canadian Solar Industries Association, Federal Ministry of the Environment, Province of BC Ministry of

Energy and Province of BC Ministry of Environment, Natural Resources Canada and 18 Canadian municipalities. The second, and what became the final set of criteria, was the result of my engagement with the initial subjects as well as a survey conducted with civic leaders from cities across Canada. I sent the first set of criteria to the following cities: Toronto ON, Montreal QE, Saskatoon SK, Campbell River BC, Nanaimo BC, Kelowna BC, Prince George BC, Medicine Hat AB, Regina SK, Brandon MB, Winnipeg MB, Caledon ON, Ottawa ON, Saint John NB, Halifax NS, Saint Johns NF, Charlottetown PE, and Dawson Creek BC. I followed up the survey with one-on-one interviews with three of the cities that responded to the survey.

As a result of the interviews, surveys and written comments I changed and refined every item of the initial list. For instance most respondents thought that while federal and provincial government support of the initiative would be helpful they did not understand how a municipality could be judged on something they have no control over. One respondent felt that the solar city initiative was better suited to new housing developments rather than built-up neighbourhoods where the historic integrity of the buildings could be compromised by the addition of solar panels. Another municipal respondent felt that since "... their electricity costs are so low in their province, solar technology would be a hard sell, and that more energy could be put into wind projects that could be more economical."

A suggestion to change the first item to include climate change plan in the place of greenhouse gas reduction plan and a number of respondents felt that number two could be simplified by changing it to read: The municipality has a community energy plan in place and to add a new number three item to include the municipality owned facilities.

One respondent thought that there should be targets for greenhouse gas reduction as well as timeframes in place and a monitoring system to ensure that the solar city designation is deserved and earned. “Without targets and time-frames there is no credible way to monitor the municipality.” A municipal respondent felt that there was an opportunity for local governments to start the process of changing the community by taking action on buildings owned and controlled by the municipality. “Municipal governments have complete control over their own facilities and at the same time being limited to incentives to influence the behaviour of residents.” One respondent thought that the municipalities should have to state what types of solar energy technologies they have installed on their own buildings and that points could be awarded for each individual installation. Numbers three and four are essentially the same with minor changes however number five was felt to be irrelevant as municipalities have very little control over building codes as building codes are set by the provincial government. “I’m not sure how this item can be relevant since city governments do not set provincial building codes. This should be deleted.”

Another respondent stated, “This is a provincially regulated area – perhaps deal with policies for city-owned buildings.” On the new list, number seven, which is the communications plan item, was added because of the importance of keeping the public informed and the need to promote the program. One of the municipal respondents felt that since many new initiatives fail because of a lack of support from the community and the lack of support can be traced back to a “...deficiency of understanding by the general public rather than a flawed project.” Droege considers public awareness campaigns to be an important aspect of the solar city initiative. “Sustained, innovative and engaging branding, public awareness programs and communications campaigns are key to success”

(Droege, 2006, p. 224). The final item on the original list was dropped as it was considered too great a burden on municipal taxpayers to provide financial incentives for the utilization of solar technologies and that this type of financial support should come from more senior government agencies and programs. Municipalities are under pressure to balance their budgets, and the idea of the financial incentives coming out of local taxation was a sore spot in the discussion with municipal leaders, and generated a few pointed comments. One municipal representative, during the interview stated: “If a smaller country like Australia can do this why can’t we? If this is going to fly we need the feds and the province to step up. This is not to say that municipalities cannot access money from other agencies I just think the taxpayers shouldn’t have to cover all of the cost from property taxes.”

The original number nine item has to do with provincial and federal government support and was dropped because, as one respondent stated, “...since we have no control over how they, (the federal and provincial governments,) spend their money we need to drop this item.”

There was a striking difference between the municipal respondents as compared to the others in the second stage. While all of the non-municipal subjects accepted and supported the concept of solar city the concept was not supported by 22% of the municipal respondents. Their objections were primarily financial with a serious concern that, “...raising municipal taxes to support renewable energy programs was being irresponsible with ratepayers hard-earned money, during a time where basic infrastructure like city streets and bridges, sewer systems and recreation facilities were in dire need of repair and upgrading.” This view was shared by all of the respondents who

opposed the concept and was stated as a concern by three of the municipalities who were in support of the initiative. Three of the four opposing municipalities also felt that their citizens were not ready to support the solar city concept as they are located in oil and gas producing regions and the economies of their communities are dependent on the petroleum industry. Two municipal respondents felt that since the election cycle is much shorter than the estimated payback time for solar technology, politicians could be punished at election time if the solar city initiative is established and promoted in an aggressive manner.

During this stage of the project, in addition to the municipal representatives, I surveyed a group of government bureaucrats, solar industry leaders and environmental organization representatives and their responses were somewhat different than the municipal responses. First of all the concerns about raising municipal taxes were not in evidence in their responses as well the election cycle concerns were not raised. This group was more focused on the environmental, government policy and energy utilization themes.

The following criteria list resulted from the interviews and the survey results from the second stage of the study.

1. The municipality has a climate change plan with short-term and long-term targets and time-frames in place
2. The municipality has a community energy plan in place.
3. The municipality has an energy plan in place for its own facilities.
4. The municipality has adopted targets for a proportion of total community energy demand to be met by renewable energy.
5. The municipality has established policies and incentives for solar electricity and solar thermal utilization for residential homeowners

6. The municipality has established policies and incentives for solar electricity and solar thermal utilization for commercial ratepayers
7. The municipality has a communication plan in place to build awareness of its renewable energy projects and policies
8. The municipality has established policies for land use planning to promote and encourage energy efficiency
9. Community renewable energy, energy efficiency technologies and green living demonstration projects are developed, supported and encouraged by the city to demonstrate these concepts to the public
10. The municipality has policies in place to encourage district energy projects within its jurisdiction

### **Stage 3- Second Engagement**

Once the revised criteria list was established I conducted two focus group sessions to further test the criteria. The first session was very small with only three participants. The participants were citizens of Dawson Creek with varying degrees of familiarity with solar energy, but as taxpayers they have a stake in what eventually happens in Dawson Creek as a result of this study. The focus group questions were:

1. After reviewing the 10 criteria points are there items you feel do not need to be on the list or is the list missing an important item?
2. What actions do you feel you would take if your city were to be designated as a Solar City?

The focus group session was conducted over a lunch break and lasted about 40 minutes. The participants were given a few minutes to read through the list of criteria and I briefly explained the purpose of the project. The participants were then asked to discuss the opening question. The discussion lasted about 25 minutes and resulted in some new

insights however the majority of the discussion was focused on transportation and senior government funding rather than a discussion of the actual criteria points.

Under the theme of environmental issues, one respondent felt that food security is an issue and contributes to our climate change impact. “Most of our food is trucked in from Edmonton, Vancouver and California, at a great cost to the environment, and this needs to be addressed.” The consensus of the group was that the criteria as set out were good but could be expanded to include transportation as transportation contributes to greenhouse gas emissions, air pollution as well as local food production. Under the theme of implementation and financial issues, they felt that before they, as homeowners, would participate there would have to be significant subsidies from the federal or provincial government. “It seems like to be environmentally conscious in Canada, homeowners have to pay a lot more for things like solar systems and other environmentally friendly big-ticket items.” They also felt that, “...the onus should not be on homeowners and taxpayers to solve the climate change problem alone but that the government needs to be involved.” This participant went on to say, “In other countries there seems to be a lot more support for this stuff.” Another participant felt that since we have such low energy costs already the payback on solar systems is too long to be feasible. “Since my bill for heating water is only \$35.00 per month it will take more than 10 years to get my investment back and by that time I will have moved anyway.” This was a concern for all of the participants as Dawson Creek is a resource-based community and quite transient, with homes changing hands every 5 or 6 years. According to Statistics Canada 50% of the homes in Dawson Creek change ownership every five years (Stats Canada census, 2006).

One of the participants, an employee of the city of Dawson Creek, suggested that the idea of solar city would work in a place like Dawson Creek as the city has a mayor and council who are very supportive of environmental initiatives. “Calvin, (Calvin Kruk, former mayor of Dawson Creek), won an award last year for his solar plan for the city. He put solar panels on all of the city buildings, and without someone like Calvin this solar city plan won’t work.” Another participant mentioned that the plan is expensive and putting solar systems on city buildings is maybe not the best use of tax dollars.

Because of the focus on transportation issues during the first focus group session I researched the energy plans of the municipalities I chose for the project and found that all, except for Medicine Hat Alberta, include a transportation plan within their energy plans. I decided that to incorporate a separate item for transportation would therefore be duplication, and not add value to the criteria list.

The second focus group session was conducted in Victoria with about 20 participants, the majority of whom were solar industry workers and owners of solar companies, however two were municipal building inspectors, and there were also two plumbing instructors.

This focus group session was 45 minutes in length and included each participant filling out a survey based on the second set of criteria. The survey listed the revised criteria list and had two spaces for comments with headings “Other criterion that could be considered,” and a space for “Additional Comments.” There was a short period of time at the end of the survey for participants to comment on the project. I have included these comments in the following narrative.

Of the 19 surveys that were returned 12 surveys were 100 percent positive about the list of criteria. The seven surveys that indicated a difference of opinion were based on the solar readiness of the community that the participant came from, rather than an analysis of the criteria, and indicated a misunderstanding of the question, however we were under a time restraint and I was not able to address the issue fully. I was able to spend a few minutes at the end of the survey to question the participants and confirmed that some of them misunderstood the directions but since the session was done they had no time to make any additions or corrections to their surveys. They all did confirm their support of the idea of solar city and the set of criteria as it is set out, with the concern that their community is probably not ready to be declared a solar city.

The themes from this focus group were similar to the themes that emerged from the first two stages and the previous focus group, however the environment, energy utilization and government policy were the dominant themes with less emphasis on implementation and financial issues. Another theme that emerged from the second focus group session was the need for a local political or community champion for the cause of environmental protection and reduction of the community carbon footprint. Examples that were discussed were the Ontario Feed in Tariff program, initiated by the Ontario government, whereby citizens and commercial enterprises have the opportunity to produce and sell electricity, generated by solar, back into the grid for four times the rate charged to customers. This program was well known to this focus group as it has resulted in a very significant expansion to the solar industry in Ontario. One of the participants said, “The Ontario FIT was brought in by the Liberals and the Mayor of Toronto, and is a great idea for the whole country, if we really are serious about GHG pollution.” A

respondent from Alberta said, “If we could have that program in the west we would see lots of opportunities to sell solar systems in my area.” A respondent from Victoria felt that a feed in tariff would “...help the BC government meet their municipal carbon neutral goals.”

The literature review was comprised of international models with significant central government support and protection of the environment was the major theme followed by government policy, energy utilization and finally financial issues. Since the first focus group was comprised of taxpayers, the financial aspects were considered the most important issues, followed by the transportation and food security concerns that were beyond the scope of this project.

The second focus group, made up of solar contractors and workers brought a different focus to the topic. Their focus was to promote the benefits of the technologies and to support the solar city initiative to improve the viability of their industry. During the focus group sessions many of the participants agreed that identifying actions they could take to mitigate their personal impact on the environment, and their contribution to climate change were very welcome. “We feel a collective guilt, not only for the wealthy, comfortable lifestyle we enjoy, but also for the fact that we, as Canadians, are among the largest greenhouse gas contributors on the planet.” “Even those of us that live in the warmest part of the province, are major greenhouse gas contributors because of our cars and large homes” (Victoria respondent). A participant from the interior felt that, “...municipalities should demonstrate renewable projects by retrofitting or building with renewable energy technologies to lead the way in the community.” He went on to add, “Provincial or federal guidelines should be developed in order for easy adoptions to

municipalities, especially small municipalities without the resources to develop their own energy planning.” Another Victoria participant would like to see renewable energy programs offered in Engineering schools and universities as well as in the school system. “Start kids at an early age to conserve energy and protect the environment.” On the theme of education and communication a Victoria respondent felt that subsidized renewable energy educational programs should be offered in schools and colleges. Other comments included the need for solar demonstration projects and support for further research in solar technology.

During the focus group discussion the subject of building and plumbing inspections and building codes was discussed with the inspectors expressing the need for strong regulations to protect the public from unsafe installations of solar systems and the technicians suggesting that the codes “...go beyond what is needed to protect the public.” Another respondent stated, “Building regulations and codes that ease the development process for solar installations rather than putting up unnecessary barriers would be more effective.” These seemed to be somewhat contentious issues and fall under the theme of government policy. In Europe the regulations governing the installation of solar thermal systems are less stringent than in Canada and by contrast all European Union countries have “solar obligations” in place. “Solar obligations are regulations requiring a minimum share of the heating demand be covered by solar energy. They usually apply to new buildings, those undergoing major renovation and sometimes in the case of replacement of the heating system” (EREC, 2011).

The second focus group participants were 100% supportive of the concept of solar city and all agreed with the second set of criteria. There were a significant number of

participants who felt that more emphasis on educational opportunities for renewable energy curriculum in all levels of the education system would be helpful but agreed that including this item in the set of criteria is beyond the scope of this project.

### **Study Conclusions**

The literature review section of this study explored the impact of climate change on the environment in Canada, and around the world, it identified some of the international criterion for solar city initiatives, and examined the impact of leadership at the municipality level in communities in Canada and in other parts of the world. The second and third stages of the study involved one-on-one interviews, surveys and focus group sessions to further explore the possible criteria that could apply to Canadian municipalities. These three stages of the project resulted in a final set of criteria that can be applied to Canadian municipalities and could result in significant reductions in greenhouse gas emissions.

The first conclusion is that there is a good basis in international solar city models and the literature for a set of effective and achievable solar city criteria for Canadian municipalities to follow to become Canadian solar cities. Droege (2006) sets out a model for renewable municipalities that includes fostering a renewable culture within the community, planning, tracking and targeting greenhouse gas emissions, encouraging financial arrangements with the private sector and other levels of government, designing cities around current models of energy efficient building design, and encouraging municipalities to enact policies to promote the proliferation of renewable energy technologies. In the model for solar city that Martinot (2020) provides, the focus is on renewable energy goals, greenhouse gas reduction goals, solar technologies, building

codes to encourage energy conservation, urban planning approaches to encourage future efficiencies, improving the energy efficiency of transportation systems and demonstration projects to ensure that the citizens understand the benefits of the initiative. These two examples provide the basis for the initial list of criteria along with examples from Australia and Canada. The set of criteria developed in this study was based on the international models and modified as a result of the first engagement with the solar leaders and municipalities. The final set of criteria was approved and accepted by the participants in the two focus group sessions, and by their written responses to the survey.

The third conclusion is that in order for a community to make significant changes there must be a leader to champion the project and inspire others to join the cause. In the literature there are many examples of civic leaders leading actions to combat climate change by initiating projects within their communities. Stockholm Sweden mayor, Sten Norden, led the city to it's first European Green Capital award designation as the greenest city in Europe and the mayor of Alice Springs, Damien Ryan, leading the city to be the smallest Australian solar city and inspiring his city to perhaps have 20% of the homes with solar systems by the end of this year. These examples and others found in the literature review demonstrate "Modeling the Way", the first of the Five Practices of Exemplary Leadership as presented by Kouzes and Posner. "People expect their leaders to speak out on matters of values and conscience. To stand up for your beliefs, you have to know what you stand for. To walk the talk, you have to have a talk to walk. To do what you say, you have to know what you want to say. To earn and sustain personal credibility, you must first be able to clearly articulate deeply held beliefs" (Kouzes & Posner, 2007, p. 47). During the focus group sessions there were a number of references

to the mayors of both Dawson Creek and Toronto being examples of local leaders championing the cause of environmental sustainability and energy security.

The fourth conclusion is that there is a great deal of support from Canadian industry leaders, municipalities and citizens for the general concept of solar city and an appetite for municipalities to take direct action to reduce greenhouse gas emissions and the dependency on fossil fuels within their jurisdictions. 78% of the municipality's surveyed support the solar city concept and 100% of the industry respondents and the focus group participants were supportive of the idea and of the final set of criteria. In his book *Renewable City* (2006) Droege attributes the acceptance, by municipal leaders and citizens, of the concept of solar city or renewable city, to what he describes as three axioms of urban change.

The three energy axioms are; (a) the fact of rapid climate changes as triggered by humans through carbon emissions, and the corollary that a dramatic reduction in manmade greenhouse gas emissions will help to positively address its fundamental, long-term dynamics; (b) the impending peaking of oil and gas supplies and equally finite availability of uranium; and (c) that petroleum and nuclear power chains are a root cause of worldwide environmental damage and constitute a threat to urban health. (Droege, 2006, p. 50).

Based on the study findings, the set of criteria that resulted from the three stages of research seems to meet the needs of the majority of municipalities surveyed and had the support of all of the focus group participants. The set of criteria is a reflection of the international criteria in that the major points, as well as the intent, are consistent with the international criteria and available literature. The only major difference is the issue of central government funding and for the initiative, which in the literature is an important aspect of solar city initiatives in other countries and will have to be overcome in order for cities in Canada to be solar cities.

The following criteria list is the list I will present to the City of Dawson Creek for their approval and to the Federation of Canadian Municipalities for adoption as a guide for Canadian municipalities to become solar cities.

1. The municipality has a climate change plan with short-term and long-term targets and time-frames in place
2. The municipality has a community energy plan in place.
3. The municipality has an energy plan in place for its own facilities.
4. The municipality has adopted targets for a proportion of total community energy demand to be met by renewable energy.
5. The municipality has established policies and incentives for solar electricity and solar thermal utilization for residential homeowners
6. The municipality has established policies and incentives for solar electricity and solar thermal utilization for commercial ratepayers
7. The municipality has a communication plan in place to build awareness of its renewable energy projects and policies
8. The municipality has established policies for land use planning to promote and encourage energy efficiency
9. Community renewable energy, energy efficiency technologies and green living demonstration projects are developed, supported and encouraged by the city to demonstrate these concepts to the public
10. The municipality has policies in place to encourage district energy projects within its jurisdiction

### **Scope and limitations of the research**

When I started out on this project I had imagined that everyone would want to have input into the final criteria and that I would have no shortage of research subjects. I found however, that I had fewer willing subjects than expected, both among the federal and provincial government agencies and the municipalities. As a result I feel that the scope of the research that I undertook was smaller than I had originally imagined. With

this in mind however, even though the sampling of subjects was smaller than I had originally desired, the quality of input I received was excellent, and therefore my research conclusions are credible.

The other limitation of the research is that in order for the recommendations to be implemented, the Federation of Canadian Municipalities (FCM) must first approve it. The FCM is the only association representing all Canadian cities and has a great deal of influence in setting policy and in disseminating information to members.

Solar city, as a concept, is adopted in many countries as a method for the promotion of central government energy and climate change policy, and while this project identified a level of interest by municipalities, without the support of senior federal and provincial governments the initiative may fail to achieve success and implementation.

The final focus group session was with a group of mainly solar industry workers and so their responses may be biased in favour of the solar city concept. As one participant stated, “In presenting this idea to us you are preaching to the choir.” However, they all are citizens of towns and cities and therefore taxpayers and so their participation in the study was warranted.

## CHAPTER FIVE - RESEARCH IMPLICATIONS

### Study Recommendations

This project was to establish a set of criteria for solar cities in Canada, with the intention of providing options and steps for communities to take action to combat climate change. While I was able to achieve this, it seems a small step in what needs to be done to avert a global crisis. The philosophy of thinking globally and acting locally comes to mind. If every municipality in Canada adopted the solar city criteria and became a solar city the environmental impact could be great. Every solar hot water heater installed on a home in Canada reduces two tonnes of greenhouse gas emissions from the home. If one was to extrapolate this across Canada, based on the objectives of the Australian Solar City initiative, which has the goal of having 10% of homes with solar thermal systems installed, and the number of houses in Canada being approximately 7 million, Canada could reduce greenhouse gas emissions by 1.4 million tonnes per year, (Stats Canada). This is a lofty goal perhaps, but one that could be a reality, if the initiative is adopted by Canadian municipalities, and supported by senior governments.

During the focus group sessions many of the participants agreed that identifying actions they could take to mitigate their personal impact on the environment would inspire them to take action.

Based on the study findings, the set of criteria that resulted from the three stages of research will be my recommendation, as the criteria for Solar Cities Canada. The criteria list is a good reflection of the international criteria in that the major points, as well as the intent, are consistent with the international criteria and literature. The only major difference is the issue of central government funding and support for the initiative,

which in the literature is an important aspect of the concept of solar city initiatives. The Australian solar city initiative is fully funded by the central government and the solar cities in Europe can access funding from the European Green Capital Fund.

**Recommendation # 1: That the criteria be accepted by the City of Dawson Creek**

The first recommendation is that the following list of criteria be accepted by the City of Dawson Creek and that it be presented to the Federation of Canadian Municipalities for adoption as a guide for Canadian municipalities to become solar cities.

1. The municipality has a climate change plan with short-term and long-term targets and time-frames in place
2. The municipality has a community energy plan in place.
3. The municipality has an energy plan in place for its own facilities.
4. The municipality has adopted targets for a proportion of total community energy demand to be met by renewable energy.
5. The municipality has established policies and incentives for solar electricity and solar thermal utilization for residential homeowners
6. The municipality has established policies and incentives for solar electricity and solar thermal utilization for commercial ratepayers
7. The municipality has a communication plan in place to build awareness of its renewable energy projects and policies
8. The municipality has established policies for land use planning to promote and encourage energy efficiency
9. Community renewable energy, energy efficiency technologies and green living demonstration projects are developed, supported and encouraged by the city to demonstrate these concepts to the public
10. The municipality has policies in place to encourage district energy projects within its jurisdiction

During the three stages of this project the list of criteria was developed to reflect the spirit of the international solar city models while adapting to the realities of Canadian industry, municipalities and to the citizens involved in the study. The set of criteria that resulted from this project embodies the creation of a shared vision for developing action plans to make Canadian cities more energy efficient, emit less damaging greenhouse gasses and inspire citizens to get involved and make their communities better places to live. As Kouzes and Posner (2007) suggest, the theory of inspiring a shared vision includes teaching the people affected by the proposed changes about the benefits and enlisting their support. “Leaders breathe life into the hopes and dreams of others and enable them to see the exciting possibilities that the future holds (Kouzes and Posner, 2007, p. 18).”

**Recommendation #2: Create a nonprofit to advance the solar city concept in Canada.**

Since Canada has no formal solar city or renewable city initiative in place, a nonprofit organization could be formed to lead the initiative and promote solar city to cities across Canada. The organization’s goals could include assisting municipalities to meet the criteria to reach the designation of solar city, assist with fundraising and energy planning, provide workshops in communities to teach municipal staff as well as the public about renewable energy technologies and find leaders and champions in municipalities to provide the local leadership to move the initiative along.

In the international literature solar city initiatives are sponsored with funding provided by central governments, as in the case of Australia, or with funding from partnerships with business and utilities such as the city of Hanover, where a partnership

between the city and the public utility provides a fund of five million Euros to assist homeowners in improving the efficiency of their homes and for installing solar thermal and solar electric systems to offset fossil fuel energy use. The city of Delft, in the Netherlands is another example. The city initiated a district heating system providing home heating and domestic hot water to 20,000 homes with the energy utility and the municipality sharing in the ownership of the project with the utility owning 97% and the city owning 3% (Covenant of Mayors, 2011). A Canadian solar city nonprofit organization could lead the development of fundraising proposals and search out national funding partners for the initiative.

**Recommendation #3: Present the project to the Federation of Canadian Municipalities.**

The Federation of Canadian Municipalities (FCM) represents 1,900 Canadian cities and towns all across Canada and “...has been the national voice of municipal government since 1901” (FCM, 2011). The City of Dawson Creek has offered to request that this project and the set of criteria be presented at the annual conference in 2012. Through the Green Municipal Fund, FCM provides funding to three types of environmental initiatives developed by Canadian municipalities including the development of environmental action plans, the conduct of environmental studies and establishing environmental projects. Grants are available for sustainable community plans, feasibility studies and field tests, while a combination of grants and loans are available for capital projects.

Funding is allocated in five sectors of municipal activity: brownfields, energy, transportation, waste and water (FCM, 2011).

In order to effectively promote the solar city initiative in Canada the FCM must be involved and as a partner in the initiative funding can be accessed for individual communities to create renewable energy projects to meet the set of criteria set out in this study.

**Recommendation #4: Create a national municipal solar city committee.**

This recommendation also requires the support and involvement of the Federation of Canadian Municipalities, as the committee will be drawn from the FCM membership. The committee would be a volunteer committee and the members would be the leaders from municipalities across Canada. The work of the committee would be to liaise with the nonprofit solar city organization as well as national organizations like the Canadian Solar Industries Association and other national renewable energy organizations. In order to achieve the potential of this project a national initiative is required.

**Organizational Implications**

This study was sponsored by the City of Dawson Creek, and the challenge now is to develop an action plan to incorporate the findings and recommendations into the sustainability plan of the city.

In the review of the literature regarding solar city initiatives around the world I found many similar criteria points to the ones selected in this study. The solar city concept has been widely accepted in many cities in Europe, Asia, Australia and the United States and the implementation of the concept varies widely.

In Alice Springs in Australia the goal of the city council is to have 10% of the homes in the city with solar systems installed by the end of 2010 (Halford, 2010). According to the solar city study Martinot (2010) conducted, and as shown in the table

included in the Literature review section of this thesis, other cities such as Barcelona, Spain have quite limited solar city initiatives with only solar thermal goals, solar initiatives included in the overall energy plan for the city and a number of demonstration projects. Portland Oregon on the other hand has implemented all of the goals Martinot (2010) set out for solar city designation in Europe, including renewable energy implementation, greenhouse gas emission reduction, solar hot water heating, solar electricity, transportation, buildings, city planning and demonstrations of renewable energy systems (Martinot, 2010).

The action plan developed for Dawson Creek, and eventually for other Canadian municipalities, to become solar cities, will have to meet the criteria we have developed in this study, once the study recommendations have been adopted by the Canadian Federation of Municipalities. The primary difficulty in this is the issue of communicating the solar city concept to municipalities across the country and again the only effective way to communicate the concept is to secure the support of the FCM and establish a committee to give the project the required credibility of the initiative. The establishment of a solar city committee from among the FCM membership is one way to perhaps overcome this difficulty. A national committee will have the ability to communicate with the 1,900 members of the FCM in a credible and effective way. Establishing this committee will be the task of the City of Dawson Creek when the findings of this study are presented in 2012 at the FCM national conference.

### **Implications for further research**

This study was confined to the concept of solar cities and the identification of possible criteria that could be applied to Canadian municipalities to be declared solar cities, and as such, was somewhat limited in scope.

There is a place for additional studies to explore the broader concept of renewable cities, perhaps incorporating other types of renewable energy systems and strategies.

I would also like to see a study examining the impact of district energy systems. I have identified a number of systems such as the system in Charlottetown PEI that uses wood waste to heat large buildings in the downtown core, the one in Revelstoke BC which is a partnership with the local forest industry and perhaps the district heating system in Stockholm Sweden that helps make the citizens of Stockholm the lowest per-capita greenhouse emitters in the developed world.

Another aspect of additional study could be a study of the socioeconomic impact of providing renewable energy options in the current cities, designated as solar cities, to better understand the impacts of initiatives such as this.

During this study I was constantly reminded that solar energy is too expensive in Canada because of the extremely low cost of electricity, fuel and other conventional energy options. A study of energy costs, and how energy cost relates to the acceptance of renewable energy options could be valuable.

## CHAPTER SIX - LESSONS LEARNED

The first lesson I learned from this experience was how difficult it is to write a thesis at the same time as working full-time, in a very stressful and demanding organization. It is a lonely job, to lock one's self away in an office, away from family and friends and write. In retrospect I would have been better served to take an extended leave from my job and really focus on this project. The task of gathering the information, analyzing the information, confirming the findings and then writing the report is a long and difficult process, when done in fits and starts over a long period of time.

Another lesson I learned was, it would have been valuable to have an assistant to help gather the comments from the various discussions, interviews and focus group sessions I hosted. With only a digital tape recorder and my messy notes I am sure I missed some important dialogue, especially in the large group session in Victoria, where I had 20 people involved in the session.

From the perspective of this project, and the readiness of the municipalities in Canada to participate in the study, I learned that most cities in Canada do not have the capacity, interest or planning and development readiness to fully participate. While most municipalities have an energy plan in place, and many mention sustainability and renewable energy in their plans, most municipalities do not have any staff dedicated to green initiatives. These duties are most often assigned to a full-time staff member in the engineering or planning department. This partly explains the relatively low response rate I received from my survey of Canadian municipalities.

I also learned that because of Canada's low energy costs and the absence of any sort of carbon taxation, except in British Columbia, there is little incentive for the solar

city initiative. In Europe, Asia and Australia energy costs are high, there are carbon tax schemes in place, and there is a more sophisticated understanding of global climate change among the political leaders than is the case in Canada.

The final lesson is that in order for the concept of solar city to gain traction in Canada, local leaders will have to step up and take action. The solar city initiative around the world has been successful because the mayors, councils and city staff of the various solar cities have provided the leadership and vision, lobbied for the funding and engaged the citizens to make the projects happen.

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**APPENDIX A: RESEARCH CONSENT FORM**

My name is Robert Haugen, and this research project is part of the requirement for a Master’s Degree in the School of Leadership Studies at Royal Roads University. My credentials with Royal Roads University can be established by telephoning Dr. Gerry Nixon, Director of the School of Leadership Studies.

This document constitutes an agreement to participate in my research project, the objective of which to identify and set the criteria for city in Canada.

My research project will consist of one-on-one interviews, focus group sessions as well as an electronic survey. The research question is *“what defines a Canadian solar city and what criteria must be followed to become one?”*

The objective of my research project is to identify the criteria for city in Canada. In addition to submitting my final report to Royal Roads University in partial fulfillment for a Master of Arts in Leadership degree, I will also be sharing my research findings with the City of Dawson Creek as well as all participating agencies and municipalities. The data will form the basis for the development of solar cities/communities in Canada.

Information will be recorded in hand-written and audio-recorded format and, where appropriate summarized, in anonymous format, in the body of the final report. At no time will any specific comments be attributed to any individual unless your specific agreement has been obtained beforehand. All documentation will be kept strictly confidential.

A copy of the final report will be published. A copy will be housed at Royal Roads University, available online through UMI/Proquest and the Theses Canada portal and will be publicly accessible. The findings of this study will form the basis of additional professional journal articles which will also be published.

You are not compelled to participate in this research project. If you do choose to participate, you are free to withdraw at any time without prejudice. Similarly, if you choose not to participate in this research project, this information will also be maintained in confidence.

By signing this letter, you give free and informed consent to participate in this project.

Name: (Please Print): \_\_\_\_\_

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

## APPENDIX B: LETTER OF INVITATION

April 30, 2008

Dear [Participant],

I would like to invite you to be part of a research project that I am conducting. This project is part of the requirement for a Master's Degree in the School of Leadership Studies at Royal Roads University. My name is Robert Haugen and my credentials with Royal Roads University can be established by calling Dr. Gerry Nixon, Director of the School of Leadership Studies, [telephone number].

The objective of my research project is to identify the criteria for city in Canada. In addition to submitting my final report to Royal Roads University in partial fulfillment for a Master of Arts in Leadership degree, I will also be sharing my research findings with the City of Dawson Creek as well as all participating agencies and municipalities. The data will form the basis for the development of solar cities/communities in Canada.

My research project will consist of one-on-one interviews, focus group sessions as well as an electronic survey. The research question is *"what defines a Canadian solar city and what criteria must be followed to become one?"*

Your name was chosen as a prospective participant because of your interest in renewable energy and the protection of the environment.

Information will be recorded in hand-written and audio-recorded format and, where appropriate summarized, in anonymous format, in the body of the final report. At no time will any specific comments be attributed to any individual unless your specific agreement has been obtained beforehand. All documentation will be kept strictly confidential.

A copy of the final report will be published. A copy will be housed at Royal Roads University, available online through UMI/Proquest and the Theses Canada portal and will be publicly accessible. The findings of this study will form the basis of additional professional journal articles which will also be published.

Please feel free to contact me at any time should you have additional questions regarding the project and its outcomes.

You are not compelled to participate in this research project. If you do choose to participate, you are free to withdraw at any time without prejudice. Similarly, if you choose not to participate in this research project, this information will also be maintained in confidence.

If you would like to participate in my research project, please contact me at:

Email: [email address]

Telephone: [telephone number]

Sincerely,  
Robert Haugen

**APPENDIX C: INITIAL SURVEY QUESTIONS**

**Canadian Solar City Research Criteria Selection Form**

\*Name:

Address:

Phone #:

Permission to contact you regarding this survey: Yes: No:

*\*Providing your name and personal information is entirely voluntary.*

**Preferred Criteria:**

Once you have read the Solar City criteria items please select the items you feel are important to include in the Canadian Criteria. Select the items either yes or no in the shaded text box.

1. City has greenhouse gas reduction plans with short-term and long-term targets and time-frames in place Yes: No:
2. City has adopted targets for a proportion of total community energy demand and corporate energy demand to be met by solar energy either photovoltaic and/or solar thermal Yes: No:
3. The City has established policies and incentives for solar electricity and solar thermal utilization for residential homeowners Yes: No:
4. The City has established policies and incentives for solar electricity and solar thermal utilization for commercial ratepayers Yes: No:
5. The City has established policies for energy efficient building codes and standards Yes: No:
6. The City has established policies for land use planning to promote and encourage energy efficiency Yes: No:
7. Community renewable energy, energy efficiency technologies and green living demonstration projects are supported and encouraged by the city to demonstrate these concepts to the public Yes: No:
8. The City encourages and supports district energy projects within its jurisdiction Yes: No:

9. Solar City initiatives and renewable energy and solar projects have significant  
Federal and Provincial Government support      Yes:      No:

10. Local government support for solar initiatives is in place  
Yes:      No:

Other criteria that could be considered:

Additional comments:

Thank You!

**APPENDIX D: FINAL SURVEY QUESTIONS**

**Canadian Solar City Research Criteria Selection Form**

\*Name:

Address:

Phone #:

Permission to contact you regarding this survey: Yes: No:

*\*Providing your name and personal information is entirely voluntary.*

**Preferred Criteria:**

Once you have read the Solar City criteria items please select the items you feel are important to include in the Canadian Criteria. Select the items either yes or no in the shaded text box.

1. The municipality has a climate change plan with short-term and long-term targets and time-frames in place Yes: No:
2. The municipality has a community energy plan in place. Yes: No:
3. The municipality has an energy plan in place for its own facilities. Yes: No:
4. The municipality has adopted targets for a proportion of total community energy demand to be met by renewable energy Yes: No:
5. The municipality has established policies and incentives for solar electricity and solar thermal utilization for residential homeowners Yes: No:
6. The municipality has established policies and incentives for solar electricity and solar thermal utilization for commercial ratepayers Yes: No:
7. The municipality has a communication plan in place to build awareness of its renewable energy projects and policies Yes: No:
8. The municipality has established policies for land use planning to promote and encourage energy efficiency Yes: No:

9. Community renewable energy, energy efficiency technologies and green living demonstration projects are developed, supported and encouraged by the city to demonstrate these concepts to the public                      Yes:                      No:

10. The municipality has policies in place to encourage district energy projects within its jurisdiction                      Yes:                      No:

Other criteria that could be considered:

Additional comments:

Thank You!

**APPENDIX D: FOCUS GROUP AND INTERVIEW QUESTIONS**

1. After reviewing the 10 criteria points are there items you feel do not need to be on the list or is the list missing an important item?
2. What actions do you feel you would take if your city were to be designated as a Solar City?