T’Sou-ke Solar Project

Charity Gladstone

Geography 346: Urban Change Management

April 8, 2017

**Introduction**

First Nations people living in remote communities lack access to essential services that every Canadian should be equally entitled to such as affordable and reliable electricity (Government of Canada, 2011). Many communities must find alternative resources. One of these alternatives is the use of diesel fuel generators (Government of Canada, 2011). However, the cost of diesel is rapidly increasing and the environmental impacts that are associated with diesel combustion are significant (Rakshit, 2016). Diesel electricity generation in a remote off-grid community is at least three times more costly than electricity in an on-grid community, and in locations where there is no year round access, the cost of diesel delivery can be 10 times higher (Government of Canada, 2011; Rakshit, 2016). This high cost of electricity generation, combined with the environmental impacts of burning diesel has created an interest amongst remote communities in renewable energy projects (Rakshit, 2016).

While much is said about the promises of community energy projects and policy mechanisms for addressing the needs of the community, very little attention has been paid to what the communities actually want (McAdams, 2016; “Renewable Energy Toolkit T'Sou-ke Solar Project,” 2010). Thus, off-grid communities are integrating the use of renewable energy sources with conventional fuel sources to increase energy security by minimizing dependence on sources of external energy (Government of Canada, 2011). This also reduces the negative environmental impact of generating energy and the related health implications (Government of Canada, 2011). Several renewable energy alternatives can be identified in typical applications with various benefits and constraints (Government of Canada, 2011). As a result, First Nations communities in Canada are increasingly interested in the development of community energy projects (Government of Canada, 2011).

A First Nations community that chose to focus on developing an on-site renewable energy source is the T'Sou-ke Nation, located on Vancouver Island, B.C. While the T’Sou-ke Nation is an on-grid community, the issue for them was autonomy (“Renewable Energy Toolkit T'Sou-ke Solar Project,” 2010). The T’Sou-ke Nation made excellent progress in developing a culture of sustainability over the past several years. They produced a vision of autonomy for their community built around self-reliance and economic development (“Renewable Energy Toolkit T'Sou-ke Solar Project,” 2010). The project was to install solar energy panels consisting of solar hot water and electricity systems (“Renewable Energy Toolkit T'Sou-ke Solar Project,” 2010). Moreover, due to the high cost of the project the T’Sou-ke Nation appealed to 15 separate government and non-profit organizations in order to secure the required $1.5 million dollars to complete this project (“Sun keeps shining on T'Sou'ke: T'Sou-ke Nation”, 2017). Consequently, this paper will examine the potential of solar energy for remote off-grid communities through the understanding of the T’Sou-ke Solar Project case study.

**Off-Grid Communities**

The standard electricity production method in remote communities using diesel fueled generators has proven to be stable and reliable when properly maintained (Government of Canada, 2011). However, the high cost of electricity in off-grid communities is a barrier to economic development for any industry consuming even a moderate amount of electricity and also adds to the cost of living for populations often living at a subsistence level (Rezaei, & Dowlatabadi, 2015).

In current societies, access to energy is a major factor for sustainability in both developed and developing countries (Government of Canada, 2011). Remote First Nations communities are extremely vulnerable when their geographic location strongly limits the likelihood of grid connection to a larger electricity network (Government of Canada, 2011). Since most remote First Nations communities lack direct pipelines to fossil-fuel sources, fuel such as gasoline and diesel have to be externally delivered by truck or boat which translates to increases in fuel prices (Government of Canada, 2011).

The increasing cost of diesel is a major hindrance to diesel generated electricity (Government of Canada, 2011). According to Jaramillo-Nieves and del Río, (2010) senior researchers in Environmental Economics they expect that the cost of diesel fuel will continue to increase making it more expensive to generate electricity from this source. This means that remote First Nations communities will be required to find extra finances to compensate for the increased cost of diesel (Petrescu, 2014).

There are many ways in which the use of diesel energy affects small communities. Economically, the increasing cost of fuel combined with the added transportation cost may put stress on low income households (Kekinusuqs, 2015). Geographically, the remoteness of some First Nations communities affects the length of time of an electricity black out (Kekinusuqs, 2015). When a generator breaks down, resources and manpower may not be readily available to repair it (Ozog, 2008). This can be very dangerous in the winter months when the temperature is low (Ozog, 2008). Socially, diesel generators are noisy, which can be disruptive to the quiet way of life in remote communities (Kekinusuqs, 2015). Environmentally, diesel emissions have a negative impact on human health as well as the health of living species and the environment (Kekinusuqs, 2015). It is argued that emissions from the combustions of diesel contributes to cancer and other health effects in humans and living species, and also contribute to soil, water and atmospheric degradations (Ozog, 2008).

All of these factors have led community leaders to seek other energy sources (Ozog, 2008). Many of the remote communities of Canada have access to adequate renewable energy resources which, if properly managed, could help contribute to the communities’ sustainable development (Ozog, 2008). In fact, cost effective placement opportunities of renewable technologies exist in many remote communities for both power generation and space heating applications (Ozog, 2008). The comparative savings in the communities could lead to several economic benefits such as job creation, local skill development and increased community self-reliance (Ozog, 2008).

**T’Sou-ke Solar Project**

T’Sou-ke Solar Project is a 75 kilowatt (kW) Photovoltaic (PV) system, which is small scale but it is the largest of its kind in British Columbia, Canada (REF). The project consists of two solar options for producing hot water and electricity (McAdams, 2016). The solar hot water component uses the suns energy collected by thermal panels that are mounted on individual homes, which are used to transfer heat to an existing hot water tank (McAdams, 2016). Whereas, the solar PV panels also convert sunlight energy into electricity which drives the generator (McAdams, 2016). Fundamental to the plan was the creation of a sustainable energy project that would provide power for the community and cause zero emissions.

This plan, known as “Sum-SHA-Thut” (the Sencoten word for “sunshine”), started in 2009 (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). By 2012, T’Sou-ke Nation established policies that guide and coordinate a common future and vision that became a reality with the creation of a 440-panel, 75 kW solar installation. This installation not only relieved the community's dependence on external suppliers, but assists its members toward sustainable living consistent with the community's most sacred beliefs (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). Consequently, the T’Sou-ke solar initiative is an example of innovative leadership in the long-term energy cost reduction through the application of renewable energy technologies, stimulating local economic development and encouraging local community development (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010).

With three components, the solar project has given the community self-sufficiency; they have significantly reduced their demand for external energy (McAdams, 2016). The first component is located on the bands’ fisheries office which consists of a 6 kW PV system that is ideal for off-grid communities (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). Ordinarily, such a system would require some form of backup such as a diesel or propane generator (McAdams, 2016). Instead, it is supplemented by energy provided by the second component (McAdams, 2016). The second component is a 7 kW PV system, located on the band hall (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). It provides emergency battery back-up in case of a hydro outage. The third and final component is a 62 kW PV atop the band's canoe shed (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). This model is so successful that these three components produce enough energy surplus to sell to BC Hydro (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010).

Not only does the T'Sou-ke Solar Project produce energy, it also produces hot water through a method with zero emissions, consisting of 41 roof-mounted thermal panels (McAdams, 2016). These thermal panels pre-heat water. In the summertime, these reportedly provide for community’s hot water needs while reducing electrical consumption (McAdams, 2016). The combined effects of all these measures has greatly reduced the amount of electricity they had to buy from BC Hydro (McAdams, 2016).

As Andrew Moore, the solar program manager, explained, it has also led to a situation where all administrative buildings in the community have “net zero” hydro consumption (Williams, 2015). In the summertime, when electricity is sold to BC Hydro, the meters run backwards, and in the winter, when electricity is being bought, the T’Sou-ke Nation hydro meters move forward (Williams, 2015). Contributing to the goal of economic independence, the project prioritizes training and employment within the community (Williams, 2015). T'Sou-ke community members were able to obtain special industry training through Canadian Solar Installers (CanSIA) (Williams, 2015). Consequently, energy self-sufficiency is an expression of broader interests of autonomy among the T’Sou-ke Nation. In the sense, that it provides a revenue stream that helps T’Sou-ke Nation in the pursuit of economic independence. Also, energy self-sufficiency provides decision making power over the direction and development of the community’s energy needs that allows the reclaiming the ability to define the community’s relationship with the land.

As a result, the T’Sou-ke Solar Project is an example for opportunities in using renewable energy in remote First Nations communities (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). By extension, the information gathered by the program can be applied to other remote First Nations communities with the added benefit that having more communities in an area or region adopting a given solution may actually make these more cost effective through economies of similar scale (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010).

**The Role of Renewable Energy in Sustainable Development**

The conversion of energy is directly related to pollution in terms of greenhouse gas emissions (GHG) (Government of Canada, 2011). The major contributors of GHGs are causing global warming to the environment so there needs to be alternatives to produce energy in an environmentally sustainable way (Government of Canada, 2011). Sustainable development has traditionally been defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs (Jaramillo-Nieves, & del Río, 2010). Accordingly, T’Sou-ke Nation initiated the solar energy project with a comprehensive community planning process that involved everyone, including children. The guiding principle for the planning was based on the Seventh Generation, planning 100 years ahead model (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). Likewise achieving solutions to contemporary environmental problems requires long term potential actions for sustainable development (Jaramillo-Nieves, & del Río, 2010). In this regard, renewable energy appears to be one of the most efficient and effective solutions (Jaramillo-Nieves, & del Río, 2010).

Renewable energy has significant potential to contribute to the economic, social and environmental energy sustainability for remote First Nations communities (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). Renewable energy sources improve access to energy for most of the population; they also reduce emissions of local and global pollutants, and they may create local socioeconomic development opportunities (Rezaei, & Dowlatabadi, 2015). This specific project contributes to the improvement of the economic, social and environmental conditions of a specific territory, and thus to the welfare of its population (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). Consequently, sustainable development and renewable energy are connected to attain conservation and environmental protection (Rezaei, & Dowlatabadi, 2015). T’Sou-ke community planning tools were utilized to encourage solar technologies and financial policy both in terms of direct subsidies for locally available green energy as well as profitable enterprises (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010).

**Challenges and Results of Solar Energy**

Information that is available today illustrates that there are many remote communities in Canada facing serious energy issues related to their remoteness and reliance on technologies that were developed and installed in the past (Rezaei, & Dowlatabadi, 2015). Very few remote communities use other technologies to produce electricity apart from diesel powered generators (Government of Canada, 2011). Remote communities of Canada are diverse, ranging from the arctic dry climate to the coastal humidity and the plains region (Government of Canada, 2011). It is difficult to make comparisons between communities considering the diversity of physical and climate conditions, as well as the diversity of energy supply methods in use and diversity of agencies administering these communities (Government of Canada, 2011).

While First Nations communities’ debate the advantages and disadvantages of partnering with energy corporations on pipelines and LNG projects, T’Sou-ke Nation aimed at setting standards towards sustainability, independence, and alternative energy (Renewable Energy Toolkit T'Sou-ke Solar Project, 2010). The fact is that remote communities must find ways to become more self-reliant and environmentally sustainable (Jaramillo-Nieves, & del Río, 2010). The economies of remote communities have traditionally been based on local resources such as fishing, hunting and trapping, but, with the advancement of technology and transportation adopted in these communities also came fuel usage (Rezaei, & Dowlatabadi, 2015). Thus, it seems evident that in the near future, off-grid communities will continue to rely on fossil fuels However, it is possible to reduce their dependence and increase their reliance on local energy resources resulting in decreased pollution and contributing to their economic development security of energy supply (Jaramillo-Nieves, & del Río, 2010).

**Conclusion**

The main findings for remote off-grid communities reveal each community’s diversity of natural resources and opportunities to create alternate energy sources. Remote First Nations communities usually have adequate renewable energy resources, such as wind, solar and ocean, which could be utilized for energy generation. In addition, their lack of fossil fuel makes remote commuities highly dependent on external energy sources, thus economically vulnerable. However, the T’Sou-ke Solar Project revealed that renewable energy for off-grid communities is feasible and promotes self-autonomy. T’Sou-ke Nation is a successful example helpful to understand how First Nations communities that are off-grid and reliant on diesel could have financial, health, and security benefits from renewable energy sources. Renewable energy and their utilization are closely connected to sustainable development. For First Nations communities to attain or try to attain sustainable development, much effort should be devoted to discovering sustainable energy resources in order to produce electricity. As a result, T’Sou-ke Nation has demonstrated a successful renewable energy project supplementing power for their community by proving to other First Nations that solar energy is feasible for off-grid communities.

**References**

*B.C. First Nation unveils solar power project*. (2009). *CBC News*. Retrieved from http://www.cbc.ca/news/canada/british-columbia/b-c-first-nation-unveils-solar-power-project-1.780255

Dodge, D., & Kinney, D. (2013). *38. T'sou-ke First Nation goes all in on energy conservation and solar - Green Energy Futures*. *Green Energy Futures*. Retrieved from http://www.greenenergyfutures.ca/episode/38-tsou-ke-first-nation-goes-all-energy-conservation-and-solar

Government of Canada, (2011). *Status of Remote/Off-Grid Communities in Canada*. Government of Canada.

Haugen, B. (2011). *Solar City Criteria for Canadian Municipalities* (Master of Arts). Royal Roads Univeristy.

Jaramillo-Nieves, L., & del Río, P. (2010). Contribution of Renewable Energy Sources to the Sustainable Development of Islands: An Overview of the Literature and a Research Agenda. *Sustainability*, *2*(3), 783-811. http://dx.doi.org/10.3390/su2030783

Kekinusuqs, J. (2015). *B.C. First Nations Clean Energy Tool Kit*. *Clean Energy BC*. Retrieved from https://www.cleanenergybc.org/wp-content/uploads/2016/04/BC-FN-Toolkit.pdf

McAdams, S. (2016). *Towards Energy Sovereignty: case studies from north american first nations* (1st ed., pp. 3-7). Community Power Agency. Retrieved from http://cpagency.org.au/wp-content/uploads/2016/07/Towards-Energy-Sovereignty-First-Nations-case-studies-from-North-America.pdf

Ozog, S. (2008). *Towards First Nations Energy Self Sufficiency: Analyzing the Renewable Energy Partnership Between T’Sou-ke Nation and Skidegate Band* (Master of Arts). University of Northern British Columbia.

Petrescu, S. (2014). *Island First Nation grasps potential of alternative power*. *Times Colonist*. Retrieved from http://www.timescolonist.com/news/local/island-first-nation-grasps-potential-of-alternative-power-1.779062

Rakshit, R. (2016). *Remote First Nations leading the way with renewable energy*. *Chronicle Journal*. Retrieved from http://www.chroniclejournal.com/opinion/columns/remote-first-nations-leading-the-way-with-renewable-energy/article\_0c9ab21c-889c-11e6-9e63-d7d7c126f722.html

*Renewable Energy Toolkit T'Sou-ke Solar Project*. (2010) (1st ed.). Vancouver.

Rezaei, M., & Dowlatabadi, H. (2015). Off-grid: community energy and the pursuit of self-sufficiency in British Columbia's remote and First Nations communities. *Local Environment*, *21*(7), 789-807. http://dx.doi.org/10.1080/13549839.2015.1031730

*Sun keeps shining on T'Sou'ke: T'Sou-ke Nation*. (2017). *Tsoukenation.com*. Retrieved from http://www.tsoukenation.com/sun-keeps-shining-on-tsou-ke/

Williams, M. (2015). *The T'Sou-ke First Nation Solar Power Initiative*. *Herox.com*. Retrieved from https://herox.com/news/264-the-tsou-ke-first-nation-solar-power-initiative