Community Energy Preferences and Residential Occupant Behaviour of the MoCreebec
Eeyoud

By

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Abstract

Located in Moose Factory and Moosonee in Northern Ontario, the MoCreebec are connected to the provincial electricity grid however their history, remote and northern location, and lack of access to the natural gas network make the energy issues they face much different than other more populated parts of the province. In light of these challenges the MoCreebec are investigating opportunities where energy efficiency and conservation, as well as electricity generation can be used to increase the community's energy security and financial self-sustainability. This thesis explores the community's unique energy situation by focusing on community preferences for different electricity generation technologies and preferences related to the development of a community energy system. It also seeks to better understand the cost of electricity in the residential sector as well as the behaviour of residential occupants. Based on the data collected, this thesis seeks to provide information to MoCreebec to help inform future energy planning decisions.

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Foreword

Before beginning, it is important to state the author's background and bias. It is crucial to acknowledge that I am not indigenous nor have I ever lived in a northern community. Growing up in the Greater Toronto Area and working in Ottawa have undoubtedly shaped how I perceive the history, culture and issues of the MoCreebec Eeyoud. Precautions have been taken to counteract these biases. Information from community documents and primary sources were prioritized, while secondary sources supplemented the material. Furthermore, an ongoing dialogue with MoCreebec staff, in line with MoCreebec strategic objectives, has informed this research. Most importantly, the history chapter has been reviewed for accuracy by a panel of MoCreebec elders.

A note on terminology

Indigenous Peoples in Canada employ a diversity of terms within First Nations, Métis and Inuit groups that are influenced by legal terms, social, cultural and linguistic contexts (Hedican, 2017). Although legal and legislative documents utilize the term “Indian” and “Aboriginal” as outlined in the *Indian Act* and Section 35 of the Canadian *Constitution Act*, 1982, this thesis is about the MoCreebec Eeyoud. The term Indigenous is employed in broader contexts to be consistent with international documents such as the United Nations Declaration on the Rights of Indigenous Peoples. Exceptions in the terminology are made when using legal terminology of the *Indian Act* or the *Constitution Act*.

Maps

Figure 1. Map of Moose Factory

Figure 2. Map of Moose Factory and Moosonee

Chapter 1: Introduction

1.1 Overview

MoCreebec Eeyoud are Eeyou of Eeyou Istchee, a Y-dialect Cree community whose members live in the sub-Arctic communities of Moose Factory and Moosonee. Both communities are situated within the Moose River delta, Ontario. MoCreebec members in Moosonee live throughout the town, while members in Moose Factory inhabit the southern portion of the island on provincial land. Moose Factory is home to another First Nation, the Moose Cree, a federally recognized band¹ that live on the northern portion of the island on reserve land. MoCreebec Eeyoud, henceforth known as MoCreebec, is politically recognized as a First Nation community by other Indigenous communities, and was officially recognized by the Grand Council of the Crees/Cree Nation Government (Grand Council)² as the eleventh Cree nation community in 2017 (Cree Nation Government, 2017; Isaac, 2017). They are affiliated with the *James Bay and Northern Québec Agreement* (JBNQA), a modern treaty that governs a large portion of territory in Northern Québec, however they are without any tangible benefits from the treaty as they are located outside of the treaty's territory (Cree Nation Government, 2017;

¹An "Indian band" is a governing unit instituted under the *Indian Act* (Revised Statutes of Canada, 1985). In this context, the words "Band" and "Indian" are both legal terms under the *Indian Act*, however, they are colonizer terms and will only be used when referring to legal terminology in the *Indian Act*. The term "Indian" has fallen out of use due to its incorrect origin and connection to colonizer policies (Indigenous Corporate Training Inc, 2016).

² The Grand Council of the Crees (Eeyou Istchee)/Cree Nation Government is the political body that was established to represent and advance the interest of the Cree People affected by the proposed hydroelectric development in Québec. The Council still exists today and is composed of 11 communities. MoCreebec officially joined as of November 2017 (Isaac, 2017). Recognition by the Grand Council is a significant step for the community. It acknowledges that they have rights and benefits under the JBNQA, however to have rights as a community and access to water, sewage, and infrastructure funding, they need to be recognized by not only the Grand Council but Canada, Québec, and Ontario.

Isaac, 2017; MacLeod Farley & Associates, 2015; MoCreebec Eeyoud, 2005, 2016). Access to these benefits is further complicated because MoCreebec is not recognized as a federally registered band by the federal government. MoCreebec and the Moose Cree First Nation share similar cultures, however both groups recognize themselves as having distinct cultural and historical differences, and political objectives.

Without tangible treaty benefits, the MoCreebec community does not have access to treaty funding for housing and other essential infrastructure that other First Nation communities receive. This lack of funding was most obvious in disparities in housing conditions in the 1980s between MoCreebec members and the neighbouring Moose Cree First Nation. Up until the 1980s many MoCreebec members were living in un-serviced, tent-frame structures, while Moose Cree had been receiving funding for housing since the 1940s (Kimura, 2016). The living situation has since improved due to MoCreebec's continued efforts to become self-sufficient.

In recent decades the community has made many advancements in improving the quality of life for their community despite these lack of treaty benefits and services. The community owns, operates and manages residential units to provide residents with affordable housing options while some members now own their own property. The community also owns a number of local businesses, and has developed a constitution to guide community governance. Access to other infrastructure services, such as electricity, has also become available over the same time period.

Moose Factory and Moosonee were connected to the provincial electricity grid in 1976, however even after being connected to the grid, the community faced issues related to the reliability and affordability of electricity ("Moosonee formally linked with Hydro

grid,” 1976). The Community Energy Plan (CEP), commissioned by the community and prepared by MacLeod Farley & Associates in 2015, documents the community’s struggle with energy security.³ The CEP documents that the community faces a number of issues with reliability and affordability of electricity and concludes that MoCreebec residents were not energy secure (MacLeod Farley & Associates, 2015). The CEP provides the first analysis of the community’s energy situation and demonstrates that the community has a strong desire for change. The CEP outlines this desire for change in an energy vision for the community:

“For Mocreebec Eyoud community members to have secure access to energy, while we make wise use of mother earth’s resources and strive towards self-sufficiency through energy conservation, energy efficiency and the development of renewable energy as much as possible.” (MacLeod Farley & Associates, 2015)

The vision clearly identifies themes such as “secure access to energy” and “self-sufficiency” as important qualities in their future energy situation. The plan also sets specific community energy goals related to affordability of electricity costs for community members, as well as energy security and financial self-sustainability to guide future energy planning. The energy goals have come into greater focus in the past few years as the community is looking to relocate and build a new community. With the prospect of a new community, MoCreebec is exploring approaches to ensure the new community does not inherit their current energy issues. This thesis seeks to build off of previous studies to provide a more detailed analysis of the energy situation of MoCreebec in order to help inform future energy planning. To do so, it utilizes primary data from the community as well publicly available information to better understand energy use in the

³ MacLeod Farley & Associates defined “energy security” as an uninterrupted source of energy and the ability to afford heating in the depths of a Moose Factory winter (MacLeod Farley & Associates, 2015).

residential sector, community preferences for electricity generation and preferences for a new energy system.

1.2 Research Questions

This thesis seeks to build on the CEP by further exploring residential energy use and cost, and further defining the community's energy vision by exploring preferences for electricity generation and preferences for a new energy system. Through its vision and goals, the CEP demonstrates that there is a clear desire for change from the status quo. Although the CEP provides good baseline data and starts to analyze the community's energy issues, further analysis is needed to better understand how the community can begin to achieve the vision and goals set out in the CEP. Specifically, this thesis seeks to address the following questions:

1. *What are the community's preferences for different electricity generation technologies?*
2. *What are the community's preferences for different desired qualities in an energy system?*
3. *How does the cost of energy differ across different MoCreebec units?*
4. *How does occupant behaviour differ across different MoCreebec housing units and can demand be shifted and brought in line with local supply?*

These questions are inspired by the vision and goals outlined in the CEP and consultations with the community. Specifically, they have been designed to assist the community in achieving the community energy planning goals stated in the CEP below.

- Goal #2: Assist MoCreebec members reduce energy costs for their existing homes
- Goal #4: Make future homes and community buildings energy efficient
- Goal #5: Pursue renewable energy development where possible in order to increase MoCreebec's energy security and financial self-sustainability

As such, findings from this research will be presented back to the community to assist with their future energy planning.

1.3 Methodology

I draw from Participatory Action Research (PAR) methods to conduct my research. The purpose of PAR is to enable action and to produce knowledge based on experience (Baum, MacDougall, & Smith, 2006; Smith, 1997). This is a reflective cycle that is directly influenced by an understanding of history, culture, local context and power relationships (Baum et al., 2006). According to Baum et al., PAR differentiates from conventional research in three ways: firstly, its purpose is to enable action, secondly, it pays careful attention to power relationships and advocates for power to be deliberately shared between the researcher and the researched, and thirdly, it attempts to connect the researched with their data, however this is dependent on the consent of those individuals involved in the research (Baum et al., 2006). To this end, the community were active participants in designing the research objectives and were consulted on a regular basis throughout the development of the project to ensure it was in line with their goals.

Two methods of data collection were used to answer the research questions: focus groups, and a questionnaire. Focus groups were used to answer Question 1 and Question 2, while questionnaires were administered to answer Question 3 and Question 4. Data was gathered over eighteen days spent in Moose Factory and Moosonee. An additional aspect of this methodology is the interdisciplinary approach that was used to gather, analyze information, and produce recommendations.

This research is not explored in isolation but is part of an interdisciplinary approach that combines policy and engineering expertise to explore energy issues in the

community of MoCreebec. I have worked closely with Keelia LaFreniere who is completing a thesis to fulfil requirements of a Master of Applied Science at Carleton University. LaFreniere's research also extends from the CEP but examines the issues from a technical perspective. Her research focuses on local renewable electricity generation potential (solar, wind, and hydrokinetic) as well as the potential to implement a district heating system. This interdisciplinary research approach provides a unique opportunity to combine the strengths of both disciplines and adds depth to the research that would not be possible if research was conducted in isolation. Data will be shared between both researchers in order to inform recommendations that will be provided to the community. Methodology is further elaborated on in Chapter 5.

1.4 Value of Research

This research will provide the community with more detailed information on preferences for different electricity generation sources as well as preferences for various qualities in an energy system. The research is qualitative and thus cannot claim a confidence level that results are representative of the whole community, however it will provide the community with some new, detailed insights on energy related issues. These insights can then be combined with further research to contribute to the social legitimacy of community energy planning decisions. The information presented in this thesis also provides greater insight into the energy situation of the residential sector. Specifically, it gathers new information on the cost of energy across different residences in the MoCreebec community, occupant behaviour and willingness to shift and change energy consumption activities at certain times of the day. An understanding of occupant behaviour and willingness to change consumption activities will be important if the

community decides to further explore local electricity generation to meet their own energy needs, especially if they are interested in using an intermittent source. Furthermore, the research adds value to the broader literature due to the current energy context in Ontario's North.

There are thirty remote communities in Northern Ontario that are not connected to the provincial electricity grid; twenty-five of these communities are indigenous (Lovekin, 2018; Natural Resources Canada, 2018b). The Wataynikaneyap Project transmission line project is moving forward to connect up to 17 of these communities in North Western Ontario ("Wataynikaneyap Project," 2018). In addition, the Ontario government indicated that there could be an economic case to increase the number of connected communities to 21, although a time line was not provided (Government of Ontario, 2017a). The experience of energy issues from MoCreebec and more recently connected communities such as Attawapiskat, Fort Albany, and Kashechewan will be invaluable for informing policy for future connected communities.

1.5 Chapter Outline

This thesis consists of seven parts. Chapter 2 delivers a broad overview of MoCreebec's history to better understand the political and economic context that the thesis navigates. Chapter 3 explores the community's energy profile in order to contextualize the work that has been done in the community and to outline the community vision and goals that chart a path towards future energy planning. Chapter 4 provides a review of the literature. Chapter 5 describes the ethics and methodology behind the research that has been conducted. Chapter 6 explores community preferences in pursuit of answering research questions #1 and #2. Chapter 7 presents the data from

the questionnaires in order to better understand energy use in the residential sector in pursuit of answering research questions #3 and #4. Finally, Chapter 8 outlines some recommendations based on the current research to potentially inform future community planning decisions.

Chapter 2: MoCreebec Eeyoud

2.1 Who are MoCreebec?

Colonial policies and boundaries that govern Cree traditional territory in the James Bay region have contributed to the current situation of MoCreebec. To better understand this situation, a quote from an anonymous MoCreebec member helps remind the reader that the history discussed deals with concepts and assumptions that are colonial in nature and that these ideas diverge from traditional Cree governance of the territory:

“The Crees of James Bay had no distinctions among themselves as they do today, other than family clans and their recognized territorial areas where they [harvested]⁴. There weren’t any status or non-status Indians, metis or west and east coast Crees, but rather the Crees were one and together they respected each other as having rights to use the land.” (MoCreebec Eeyoud, 2017a)

A thorough analysis of MoCreebec’s history is beyond the scope of this thesis, however some context is necessary to understand the community, their current energy issues and future community goals. The only scholarly work that has been done on the community of MoCreebec are two Masters theses; one by Alexandra Carol Macqueen, submitted to Queen’s University in 1992, and the other by Kota Kimura, submitted to the University of Saskatchewan in 2016 (Kimura, 2016; Macqueen, 1992). Both draw

⁴ The original quote contained the word “trapped”, however the description has been modified on the recommendation of the MoCreebec elders’ panel. The panel claimed that “harvesting” is a more accurate description of what was formerly referred to as “trapping”.

attention to the incompatibility of Indigenous self-identity and the identity determined by the state, however Kimura delves deeper to explore the specific way the *James Bay and Northern Québec Agreement* (JBNQA) has redefined the Cree's collective identity in the region (Kimura, 2016; Macqueen, 1992). Kimura argues that the agreement has allowed the Cree in Québec to gain considerable autonomy, however it has territorialized this autonomy within Québec (Kimura, 2016). The territorial limits of autonomy granted through the JBNQA have led to MoCreebec's current situation. Keeping this in mind, there are two treaties that are relevant to a discussion of MoCreebec.

The 1905-1906 Treaty 9, and its adhesion treaty in 1929, as well as the 1975 JBNQA modern treaty are the two treaties that govern the James Bay region. Members of MoCreebec have moved from or can trace their ancestry to Cree communities on the East coast of James Bay that are signatories to the 1975 JBNQA. Most MoCreebec members can trace their ancestry to three of these communities: Waskaganish, Eastmain, and Wemindji; in 1987 72% of MoCreebec members had band affiliation with one of these three communities and many members continue to be affiliated with these communities today (MoCreebec Eeyoud, 2016). Although the community of MoCreebec was not incorporated under the JBNQA, its members are entitled to benefits under Section 3 of the JBNQA⁵. MoCreebec's recent recognition by the Grand Council is further confirmation of these rights (Cree Nation Government, 2017; Isaac, 2017). While their rights are recognized through the JBNQA, the MoCreebec community are unable to

⁵ Section 3 of the *James Bay and Northern Québec Agreement* states: "In the event a person mentioned in paragraphs 3.2.1 to 3.2.6 inclusive of this Sub-Section is absent from the Territory during ten continuous years and is domiciled outside the Territory, such person shall not be entitled to exercise his rights or receive benefits under the Agreement. Upon such person re-establishing his domicile in the Territory, the right of such person to exercise his rights or to receive benefits under the Agreement shall revive". Some MoCreebec members temporarily return to their communities to access these benefits, for example, students go back to the territory to access education funding (Kimura, 2016).

access benefits or rights under the agreement because these rights are tied to territory they do not reside in. Their community is within Treaty 9 territory and although MoCreebec members have lived here for generations and call this area home, they are not signatories of Treaty 9 like many of their Ontario neighbours and do not receive any benefits stemming from this treaty either (MoCreebec Eeyoud, 2016; Scott & Morrison, 1993). MoCreebec's exclusion from both treaties leaves their status and future uncertain. In government terms, the MoCreebec community is an unrecognized "band" who is neither beneficiary of the JBNQA nor of Treaty 9.

The story of MoCreebec begins long before either treaty was signed. Theirs is part of a larger story of the Cree Peoples of James Bay. This perspective is in stark contrast to the current distinctions that are used to define the communities today; it is only from this understanding that one can begin to interpret the history. In order to fully understand the history, the discussion must first begin with the land.

2.2 The Land

Moose Factory is a sub-arctic community located on an island within the Moose River delta. It is situated nineteen kilometers from the southern shores of James Bay within the largest temperate wetland complex in the world, the Hudson Bay lowlands (Gamble, 2017). The landscape is characterized by peat bogs, fens, and shallow lakes that provides habitat for diverse animal life, such as moose, caribou, beaver, wolverine, bear, skunk, fisher, marten, mink, muskrat, weasel and rabbit (Long, Preston, Srigley, & Sutherland, 2017). Towards the coast one can find several species of fox near the shores where migratory geese and ducks stop on their path south for the winter (Long et al., 2017). This land is the traditional territory of the Cree Peoples.

In recent history the land itself has become increasingly connected to the south and the wider North American power grid. Throughout the twentieth century the tributaries of the Moose River have been used for hydroelectric development that continues to affect neighbouring and down-river communities. Five generating stations are located along the Moose River tributaries with a total of 1,106 megawatts (MW) of installed capacity. Four dams make up the Lower Mattagami system⁶ on the Mattagami River with a total generating capacity of 924 megawatts (MW): Smoky Falls (1928), Little Long (1963), Harmon (1965) and Kipling (1966) (Cragg & Schwartz, 1996; Government of Ontario, 2011). Another 182 MW is supplied from the Otter Rapids Generating Station on the Abitibi River (1961) (“Otter Rapids Generating Station,” 2018). These developments continue to have lasting impacts on the inhabitants of the Moose River delta.

2.3 Eeyou Istchee – “The Peoples Land”

Before provincial boundaries, the *Indian Act*, and the subsequent Treaty 9, and the JBQNA were in place, the Cree Peoples made their own distinctions between each other. The above colonial policies created distinctions between the people of the region that did not exist in the same way before (MoCreebec Eeyoud, 2017b). Prior to these policies, the Cree inhabited an ecological range and organized themselves into mobile and flexible social organizations with territorial boundaries that were fluid and sometimes overlapping, which drastically contrasts the rigid institutionalized boundaries created by the Canadian state (Kimura, 2016; Long et al., 2017; Scott & Morrison, 1993, p. iv).

⁶ The Moose Cree First Nation secured an agreement with Ontario Power Generation as a twenty-five per cent equity shareholder in six new generating units that were created during the expansion of this system as well as \$300 million worth of contracting opportunities (Canadian Hydropower Association, n.d.; Garrick, 2015; OPG, n.d.). MoCreebec was not included in the agreement.

The Cree Peoples have their own distinctions amongst themselves that can be categorized by family ties and language; these existed and continue to exist regardless of new boundaries, legislation and treaties (Long et al., 2017; MoCreebec Eeyoud, 2017b). The Clan or family level is the primary level of social organization and distinction between Cree Peoples; however other broader distinctions can be made based on geography and linguistic differences (Long et al., 2017; MoCreebec Eeyoud, 2017b). Distinctions in the James Bay and Hudson Bay lowlands can be made between Lowland Cree who lived on the coast close to the water, while upland Cree lived inland, away from the coast (Long et al., 2017; Preston, 1981, p. 195). It is important to note that these territorial divisions were not rigid and relationships to these territories could shift fluidly (Long et al., 2017).

Linguistic differences also drew distinctions between peoples. The Cree in the James Bay region speak three main dialects. There is the Y-dialect, which is spoken on the East coast of James Bay and by MoCreebec members, and there are two sub-dialects that are spoken on the West coast of James Bay (MoCreebec Eeyoud, 2016; Preston, 1981, p. 195). The MoCreebec speak a dialect distinct from their neighbours who speak Moose Cree (L-Dialect) in Moose Factory, and Swampy Cree (N-dialect) that is spoken in Cree communities along the West coast of the bay and Western Ontario (Preston, 1981). The MoCreebec refer to themselves as *Eeyou* “the people” in their language, and they call their home *Eeyou Istchee*, which roughly translates to “The Peoples Land” (Carlson, 2008; Cree Nation Government, 2017). The Cree on the west coast of James Bay call themselves *Illiliwuk* or *Inniniwuk*, which means “the people” or sometimes *Omushkegowuk* which translates to “the people of the muskeg” (Mushkegowuk Council,

2018). Language remains important to the community of MoCreebec and community members are conscious of the lack of opportunities to learn and speak their dialect in the Moose Factory area. In a consultation with the community in 1987, it was found that only 17% of members spoke Cree in their homes, even though a larger portion, 40%, considered it their primary language (MoCreebec Eeyoud, 2016). The percentage may have changed since the consultation took place, however the community is working hard to maintain their dialect and have recently launched a language course in the community (Machenkova, 2018).

2.4 New Opportunities at Moose Factory

The Cree traditionally hunted and harvested, throughout the James Bay region and had their own established trade networks prior to contact with Europeans. This economic activity shifted with the arrival of the European traders, in particular the permanent establishment of the Hudson's Bay Company (HBC) in the area.

The HBC established a trading fort in the area of Moose Factory in 1673; this would become an important economic hub for the HBC and the Cree in the region. In the late 1600s the HBC established forts and trading posts along the East and West coasts of James Bay. Moose Fort, constructed around current day Moose Factory, was the first to be established in 1673 (Long et al., 2017). Other HBC post were later constructed around the bay. To the east of Moose Factory, posts at Hannah Bay (Ontario) and at Rupert House (near present day Waskaganish, Québec) were established. Bitter rivalries between European trading companies characterized these early years, and as a result, trade was unstable until the HBC permanently established themselves in the area in 1730 (Long et al., 2017).

The trading posts were often located on large rivers or at the mouth of a delta, in order to benefit from existing transportation routes. From small hunting groups through widely distributed hunting territories, the Cree would congregate downstream on larger watercourses or on the shores of James Bay to hunt, trade, and fish with larger, regional groups (Scott & Morrison, 1993). The HBC posts were well situated on these routes, and the posts of Hannah Bay, Rupert House, and especially, Moose Factory, became importance places to do business for the Cree in the area of what would become the Québec-Ontario border (MoCreebec Eeyoud, 2017a).

In 1810, Moose Factory became headquarters of the HBC's southern department which solidified its role as an important economic hub into the nineteenth and early twentieth century (Long, 2010). Its position as the southern department meant that Moose Factory was a busy post; it received supplies from England to be distributed to the more southern post locations and assembled furs from all over the region to be prepared for transport to Europe (Long, 2010). Unlike other trading posts, it required a large, permanent, year-round staff which provided even more opportunities for locals in the area (Long, 2010). The stabilization of the post and its importance to the HBC secured the position of Moose Factory as an important economic hub that continued to provide opportunities in the area for year-round settlement.

2.5 Provincial Boundaries, Treaties and New Distinctions

2.5.1 Provincial Boundaries

Sixty years after it was established as the headquarters of the southern department, HBC sold its vast territory of Rupert's Land to the newly formed Canadian

state. The sale of Rupert's Land⁷ in 1870 and the process that established the modern Quebec-Ontario border in the following decades divided the shores of James Bay in two. Although this border would have been of little importance to the Cree and traders in the area at the time, it would have lasting political and economic consequences for the Cree.

The new border drew an arbitrary boundary through the traditional territory of Cree groups; this became problematic when HBC and government officials began to define the Cree by applying these new constructs which would be a precursor to treaty making. Applying the new boundary to Cree groups was complex due to the mobility of Cree populations and due to a lack of understanding of the flexibility of their territories by settlers; this was made more difficult due to the fact that choosing which post to trade at was often a question of convenience for the trader (Scott & Morrison, 1993). Cree traders could do business at a number of different posts, which could make it difficult for Europeans to associate smaller groups with their broader kin. For example, some Y-Dialect Cree who associated themselves with populations East of the present Québec-Ontario boundary traditionally harvested around the Hannah Bay Basin in Ontario and principally gathered at the Hannah Bay post (Scott & Morrison, 1993). However, when the post closed in 1832, these people had to either make their way to Moose Factory or Rupert House to trade. Some of those who went to Moose Factory became associated with that post (Scott & Morrison, 1993, p. 30). This led to potentially inaccurate associations during treaty making.

⁷ Indigenous Peoples living in the territory of Rupert's Land were neither informed or consulted about the sale (Morantz, 2002).

2.5.2 Treaties and Colonial Distinctions

At the turn of the twentieth century, the new state of Canada was occupied making treaties with Indigenous communities to gain access to vast swathes of land for the purpose of government control and resource extraction. John Long, in his book *Treaty 9*, describes this process and its motives in Northern Ontario: “the new nation of Canada...sought to dominate First Nations in Ontario south of the Hudson Bay watershed through land-surrender treaties, where possible, and through the federal Indian Act, its programs of assimilation and control, and its contradictory goals of advancement and protection” (Long, 2010, 24). Long goes on to argue that the Cree and Ojibwe were never asked to surrender their land and that important details of Treaty 9 were never orally explained during the negotiations (e.g., reference to the *Indian Act*, the concept of blanket extinguishment, limits on harvesting rights, and the purpose of the reserve system) (Long, 2010, pp. 344–359). This is problematic as Canada and Ontario view the agreement as having effectively extinguished Aboriginal title⁸ in Northern Ontario. The nature of treaty making and the real controversy and deception over how they were explained and agreed to is beyond the scope of this thesis but it is important to keep in mind that treaty creation was a deeply flawed process. A brief history of the relevant treaties, Treaty 9 and the JBQNA is described below.

In the early 1900’s the fur trade was in decline and the economy of the area was suffering as a consequence; it was in these troubling economic conditions that the

⁸ Indigenous Foundations, developed by the First Nations Studies Program at the University of British Columbia offers the following definition of “Aboriginal title”: the concept of Aboriginal title refers to the inherent right to land or a territory; the right is not granted from an external source but is a result of Aboriginal People’s own occupation of, and relationship with their territories. In Canada, the concept is derived from the Royal Proclamation (1763) which states that ownership over North America is issued through King George III, but that Aboriginal title exists and can only be extinguished by treaty with the Crown (Hanson, 2018).

Government of Ontario and the Government of Canada negotiated Treaty 9 in what became Northern Ontario. At the turn of the twentieth century, two fur trading companies, the HBC and the Revillon Frères, were trading in the area of Moose Factory. The brief competition between the two companies may have offered some economic relief to the region, but the fur trade was no longer supporting the economy as it once did (Long, 2010). Around the same time of this economic decline, the Government of Ontario and the Government of Canada from 1905-1929 made Treaty 9 with 41 Cree and Ojibwe communities throughout the vast territory of Northern Ontario (Long, 2010).

Treaty 9 had hidden consequences for its signatories that created new distinctions between the First Nations communities inside and outside the province's borders. The treaty established 41 registered bands under the *Indian Act* and under this Act new concepts such as "status" and "non-status", registered bands, and the reserve system were introduced as well as new rules that governed taxation, wills and estates, education, and land and resource management were established (Long, 2010; Parliament of Canada, 2001). These colonial policies harmed First Nations populations who are still dealing with the consequences of these policies today. As harmful as these policies are, they did also establish certain services to communities. In the Moose Factory area this was demonstrated with the creation of the Moose Cree band and a reserve for them in 1905 and later, a reserve on Moose Factory island (Long, 2010). During treaty making at Moose Factory, all Cree trading at the post were considered to be from Ontario, even though the territory of the band trading at Moose Factory stretched into Québec and it is quite likely that many would have traded at Québec posts as well (Long, 2010, p. 229; Scott & Morrison, 1993). Likewise, some of the Y-Dialect Cree who traded at Rupert's

House and Moose Factory, and harvested in the Hannah Bay Basin, were excluded from Treaty 9 as they were considered to be from Québec (Scott & Morrison, 1993). The treaty created distinctions that did not previously exist between communities; it created government benefits and restrictions for certain Cree but not others. With the conclusion of Treaty 9, Cree in Ontario had a treaty with the Canadian Government that created benefits and restrictions for these communities.

On the eastern shore of James Bay in Québec, the Cree had no such agreements. In the early 1900s, economic hardships grew in the James Bay region, however Moose Factory and Moosonee remained an area where economic opportunities could still be found (MoCreebec Eeyoud, 2016). While HBC activities wound down on the East Coast due to the destruction of HBC's monopoly in the region with the arrival of the Revillon Frères trading company, the Moose Factory and Moosonee area remained an area where economic opportunities were still available.

Throughout the following years, movement continued across the border as Cree pursued opportunities in Moose Factory. There were a variety of historical factors that may have contributed to this migration. In the 1920s the HBC reduced activities on the East coast of James Bay and in the 1930s the railway was extended from Cochrane to Moosonee (MoCreebec Eeyoud, 2017a). The construction of the railway provided construction jobs for local residents and when completed, connected the area with the South (MoCreebec Eeyoud, 2017a). Further economic opportunities, and services such as healthcare and education, arose in the following decades as well. In the 1940s the federal government focused certain health and educational services in Moose Factory. A hospital was constructed in 1948 to treat tuberculosis and in the 1950s and in the 1960s a joint

federal and provincial government program recruited Y-Dialect Cree to come to the Moose River Basin area to trap beaver that were threatening the railway and the forestry industry (MoCreebec Eeyoud, 2017a). Federal services were administered from Moosonee and Moose Factory for both sides of James Bay during this period, including the Department of Indian Affairs that administered the East and West coast as one unit until 1962 (MoCreebec Eeyoud, 2016; *Presentation to the House of Commons ' Standing Committee on Indigenous and Northern Affairs- Study on Suicide Among Indigenous Peoples and Communities. Weeneebayko Area Health Authority (WAHA)*, 2016). The Y-Dialect Cree who had already been in the Moose Factory area and the Cree who moved across the provincial border to access these opportunities and services found themselves in a situation different from their Moose Cree and Treaty 9 neighbours. Many who had already been living in the area were not signatories of Treaty 9 and received no benefits from the treaty, while others who recently moved from Québec did not have a treaty to begin with. This led to disparities between the Moose Cree who had a reserve on Moose Factory and the Y-Dialect Cree who organized to become MoCreebec Eeyoud. From the signing of Treaty 9 in the early 1900s, Y-Dialect Cree in Ontario along with communities in Québec remained without a treaty. This changed in 1975.

In the 1970s, the Cree in Québec were opposing the flooding of their traditional territory in response to Hydro Québec's plans to create massive hydroelectric generating stations. The struggle concluded in 1975 with the signing of the JBNQA, a modern land claim treaty, between the Grand Council of the Crees, the Inuit, the province of Québec and the Government of Canada. The JBNQA is an extensive agreement and the first modern land claim treaty in Canada. It outlined different levels of jurisdiction, including

three categories of land with varying level of Cree control, established funding for healthcare, social services and education, defined powers and funding for the administration of justice, policing, environmental protection, harvesting, taxation, economic and social development, and income security for Cree hunters and trappers (Long, 2010). The JBNQA extinguished all aboriginal rights within a specified area in exchange for benefits. The *Living Treaties: Lasting Agreements Report of the Task Force to Review Comprehensive Claims Policy* recognized that the rights of the MoCreebec were extinguished without their consent as a result of the JBNQA (Department of Indian and Northern Development Canada, 1985). All of these benefits applied to those who reside in the territory however, Section 3.2.7 of the JBNQA, ensured that members of these communities who lived outside of the JBNQA territory were not completely forgotten. The Y-Dialect community in Ontario who still had strong ties with communities represented by the Grand Council were not completely left out of the discussion. In 1975, representatives from the Grand Council came to Moose Factory to discuss the agreement with Y-Dialect Cree in the area (MoCreebec Eeyoud, 2016). Unfortunately the Y-Dialect community was still in the process of formally organizing and was not able to disseminate the information effectively to community members (MoCreebec Eeyoud, 2016). Although MoCreebec members are affiliated and have rights under the JBNQA, they do not have access to these benefits in their current location.

2.6 The Birth of MoCreebec Eeyoud

Without access to benefits under Treaty 9 or under the JBNQA, the Y-Dialect community in Ontario looked for ways to provide for themselves. In the 1970s, community members lacked services and lived in sub-standard living conditions; many

members lived in canvass and plywood shelters on an area of Moose Factory owned by the Anglican Church (MoCreebec Eeyoud, 2016). In the absence of federal or provincial recognition, or their own land to develop, the community was in a state of crisis. Access to federal government services through treaties was not possible and provincial services in the area were minimal (MoCreebec Eeyoud, 2016). In 1980 the community, with some assistance from the Grand Council, came together to create an association in response to the immediate housing, health and social concerns; they called this organization the MoCreebec Association.

The new organization wasted no time and immediately began addressing the issues that plagued their community. In 1980 they established and incorporated the MoCreebec Housing Corporation to address immediate housing needs (Kimura, 2016). The MoCreebec Housing Corporation negotiated directly with the Canada Mortgage and Housing Corporation (CMHC) and the Ontario Ministry of Housing to construct housing units for the community (Kimura, 2016). Some of the units were developed as rent-to-own, while others were developed as rental units. The community ensured some of these units were available to provide affordable housing for its members. MoCreebec also established a number of businesses to help support the community. In 1985 the MoCreebec Development Corporation was incorporated to support economic growth and bring in financial revenue for the new organization just as the support from the Grand Council ended in 1986 (Kimura, 2016; MoCreebec Eeyoud, 2005, 2016). Even without support from the Grand Council, the community persisted. In 1993 the community ratified their constitutional framework outlining values, goals and a governance structure for the community, in 1997 they opened the Moose River Broadcasting Association, and

in 1999 finished the construction of the award winning Cree Village EcoLodge (Kimura, 2016; MoCreebec Eeyoud, 2005). MoCreebec has made many advances through their own endeavours, however the community still remembers their rights under the JBNQA.

MoCreebec became frustrated with the Grand Council over governance issues and sought legal action to clarify the issue of beneficiaries in the JBNQA (Kimura, 2016). In 2002 MoCreebec took legal action against all JBNQA parties (Canada, Québec, and the Grand Council) to seek a declaratory judgement from the Supreme Court of Québec that Section 3.2.7 is discriminatory (Kimura, 2016). The action was later discontinued in 2013 after a membership vote that perhaps signalled desire for a new approach to resolve the issue (CBC News, 2014; Kimura, 2016). MoCreebec's legal action illustrates the importance of the JBNQA to the community, however, the MoCreebec have become much more than an organization to represent the community's political interests in relation to the JBNQA.

In 2005 the community celebrated its 25th anniversary and reflected on their past progress and future direction in a commemorative report. The report provided an opportunity to reflect on their progress and ask where they want to be in the future. Former Chief Randy Kapashesit reflected that not twenty years before “we lived in tents, shacks and modest homes. Now many of us have cable television, computers and the internet” (MoCreebec Eeyoud, 2005, p. 3). Indeed, much progress has been made in the community since their formal organization in 1980. The community now consists of seven active clans,⁹ multiple commercial enterprises and departments that deliver services to their community. In Kimura's documentation of the community's

⁹ MoCreebec governance has sought to draw from traditional social organization by calling upon family groups (clans) to organize and participate in the council meetings that help govern the community (MoCreebec Eeyoud, 2017b)

development throughout the twentieth century, he points to the importance of self-determination as a common theme in community members he interviewed (Kimura, 2016). This theme is echoed in a quote from the current Chief, Allan Jolly, in the commemorative report:

“Early on in the 1980s, I clearly remember at general community meetings when some of our elderly people spoke up and said, “It is better if people learn to help themselves, rather than expecting to be helped.” At first, I didn’t fully grasp what they meant by those words. But in time, I slowly began to understand the wisdom of their words to mean that whatever it is we are going to do, we should continue to strive for self-reliance and economic independence.

Today, I am convinced more than ever, they were right and their words of advice is good. I firmly believe we must encourage people at all times, both as individuals and as a collective group, to follow this principle in everything we aspire to do. We must adhere to this in all of our endeavours if we are to regain our sense of true identity and full autonomy as Cree people.” (MoCreebec Eeyoud, 2005, p. 11)

In November 2017, the Grand Council of the Crees accepted MoCreebec as the eleventh Cree community in a unanimous resolution; the resolution is significant as it begins paving the way for future recognition under the JBNQA (Cree Nation Government, 2017; Herodier & Bell, 2017; Isaac, 2017). When speaking about the new resolution, Grand Council of the Crees Executive Director, Bill Namagoose, stated, “MoCreebec members have always possessed rights and benefits under the JBNQA. Those can never be taken away” (Isaac, 2017). The resolution acknowledges MoCreebec’s rights under the JBNQA by the Grand Council, however they will still need to be recognized by the Government of Canada, and the provincial governments of Québec and Ontario in order to access funding under the agreement (Ibid.). This recognition was a historic and positive step for the community, however in the interim of legal recognition MoCreebec must continue to seek ways to improve the livelihood of their community members.

2.7 Conclusion

MoCreebec has undergone significant development in the pursuit of economic self-sufficiency. From providing affordable housing options for community members, and operating numerous businesses, MoCreebec is constantly seeking ways to improve their community. Their political situation, like other Indigenous groups that are separated by provincial borders can be summed up in the words of the *Living Treaties: Lasting Agreements Report of the Task Force to Review Comprehensive Claims Policy*, “some aboriginal groups live, and use the land, on both sides of a border. These groups want to negotiate as a group and not to be divided by the borders of others” (Department of Indian and Northern Development Canada, 1985). Moving forward, the community recognizes the importance of affordable and reliable energy for the functioning of a healthy community. In recent years, in response to historical energy issues, the community has turned its focus to examining potential options that could increase energy security, reduce electricity costs for residents and generate revenue through renewable energy options. The energy goals of the community are the subject of the next chapter.

Chapter 3: Community Energy Profile

3.1 Introduction

MoCreebec continues to strive to improve their community throughout the ongoing process of political and legal recognition. The community is currently examining energy issues in their community, especially how reliability of supply and affordability are affecting their community members. MoCreebec has seen significant improvements in access to electricity since their conception, however like many remote and northern

communities, they face unique issues that are not commonly experienced in southern, more populated, and interconnected urban centres (Conservation on the Coast, 2018c; Environmental Commissioner of Ontario, 2018). Moose Factory is not connected to the province's natural gas distribution infrastructure and therefore has to rely on electricity to meet the majority of their space heating needs, which results in higher electricity bills. (Natural Resources Canada, Survey of Household Energy Use 2011 cited in Environmental Commissioner of Ontario, 2018). Approximately 16% of Ontarians rely on electricity to fulfill their space heating needs; some of these homes, like those in MoCreebec, are in colder parts of the province where the demand for heat is higher (Conservation on the Coast, 2018c; Environmental Commissioner of Ontario, 2018). Unaffordable electricity bills and historical reliability issues have pushed the community to seek alternatives to their current situation. These historic and current energy issues, the history of community energy planning, and potential opportunities for future community development are the subject of this chapter.

3.2 Community Energy Plan

The MoCreebec community continues to struggle with energy-related issues. Connected to the electricity grid in 1976 with a 115 kilovolt line, but not part of the natural gas network, MoCreebec residents rely almost entirely on electricity for space heating needs (MacLeod Farley & Associates, 2015; "Moosonee formally linked with Hydro grid," 1976). Before being connected to the grid, residents stated that they used a variety of fuel sources for space heating, including wood and coal (Russell, 2018a). Although electricity is now the main source for space heating, other fuels like propane are used for commercial and public buildings like the Ecolodge and the MoCreebec

office, while wood is sometimes used to help heat homes¹⁰ (MacLeod Farley & Associates, 2015). In 2015, MoCreebec commissioned the consulting firm MacLeod Farley & Associates to study the energy situation of the community and to create a document to guide future energy planning. The resulting Community Energy Plan (CEP) concluded that MoCreebec lacked energy security due to barriers related to the reliability and the affordability of electricity (MacLeod Farley & Associates, 2015). To achieve greater self-reliance and a more sustainable situation for its residents, MoCreebec developed the following energy vision for their community:

“For Mocreebec Eyoud community members to have secure access to energy, while we make wise use of mother earth’s resources and strive towards self-sufficiency through energy conservation, energy efficiency and the development of renewable energy as much as possible.”

The CEP established the first comprehensive review of MoCreebec’s energy situation. It outlined community energy goals, an energy profile of the community, documented financial and social costs of electricity and energy for residential and commercial buildings, and created an action plan to guide future energy planning (MacLeod Farley & Associates, 2015). The CEP identifies measures to achieve these goals through conservation and efficiency measures, as well as the pursuit of renewable electricity generation. The plan was the first attempt at establishing baseline data for the community and it provides some key findings on cost, energy-use in the residential sector, and billing practices of Hydro One. MoCreebec also established energy goals through the CEP. These goals are outlined below.

¹⁰ According to one Moose Factory resident who heats their house exclusively with wood from October 1 – May 31, they use approximately 16 cords of wood at \$120-\$140 per cord (J. Russell, personal communication with MoCreebec resident, April. 28, 2019). The CEP states that propane costs from 2012-2014 were approximately \$1.30 per litre (MacLeod Farley & Associates, 2015).

MoCreebec's Energy Goals

- Goal #1: Take a proactive and highly organized approach to achieving community energy improvements for MoCreebec
- Goal #2: Assist MoCreebec members to reduce energy costs for their existing homes
- Goal #3: Minimize energy costs for existing community buildings
- Goal #4: Make future homes and community buildings energy efficient
- Goal #5: Pursue renewable energy development where possible in order to increase MoCreebec's energy security and financial self-sustainability

3.3 Community Energy Profile

The community energy profile was developed through the CEP by using a small sample of buildings with available historical electricity and propane bills from 2011-2013, as well as the consultant's knowledge of other "comparable communities" and interviews with the community (MacLeod Farley & Associates, 2015). The current MoCreebec Energy Profile is composed of data from four types of buildings:

- Project 93 (Duplex dwellings, 8 units out of 20);
- The Cree Village Ecolodge (a hotel);
- The MoCreebec Office Building; and,
- One home heated with wood for the year 2012-2013.

Although the sample is small, the CEP offers some of the first quantifiable insights into MoCreebec's energy use. The plan quantifies the total, direct monetary costs associated with electricity use in the community, and estimates the cost and breakdown of home energy use. The CEP showed that the community spent approximately \$800,000 annually on energy costs that consisted of costs for both electricity and propane. According to the CEP the residential sector costs the community \$624,000 annually or 78% of total community energy costs (see Figure 3). The methods used by the CEP to derive the total annual energy costs are not clear and therefore it is difficult to say how much this value

would be per household (MacLeod Farley & Associates, 2015). Differences between average electricity costs for the rest of Ontario and northern/remote communities, or those that depend on electricity to meet their space heating needs, has been recognized as a provincial energy issue.

Figure 3. Total annual energy costs for MoCreebec based on a sample of nine residential units and two commercial buildings. Data was gathered using electricity and propane bills for the years 2011-2013 (MacLeod Farley & Associates, 2015)

Data from the CEP helps illustrate the discrepancies between MoCreebec and average Ontario households. The Ontario Government recognizes the discrepancies in the cost of energy for those that heat their homes solely with electricity and those that are connected to the natural gas network. According to the Environmental Commissioner of Ontario's 2018 report: *Making Connections – Straight Talk About Electricity in Ontario*, households that rely solely on electricity for space heating pay on average \$200¹¹ more

¹¹ The Ontario Energy Board (OEB) uses the estimate of 750 kWh to represent the average monthly electricity usage in an Ontario home with natural gas heating and uses an estimate of 2,400kWh to represent the average monthly electricity usage a residence relying on electricity to meet space and water heating needs (Environmental Commissioner of Ontario, 2018). For more details about this estimate see *Making Connections – Straight Talk About Electricity in Ontario*, page 23, endnote 10.

per electricity bill than those households that rely on natural gas (see Table 1).¹² The CEP does not provide an estimate on household electricity bills, which makes it difficult to compare to the provincial average. Recognizing that First Nations and remote communities are more likely to rely on electric heating, the Ontario Government created programs to decrease the cost of energy for First Nations communities. These include exemptions from electricity delivery charges and HST (see next section for further details on Hydro One billing and programs). Although the CEP does not provide information on monthly electricity costs, it does establish a break down of home energy use.

Table 1. Sample average monthly electricity bills for two types of medium-density residential consumers with Hydro One Networks Inc. as the Local Distribution Company

2,400 kWh (Electricity resistance heated)		750 kWh (Natural gas heated)	
<u>Electricity Charges</u>		<u>Electricity Charges</u>	
<i>Electricity</i>		<i>Electricity</i>	
Off-Peak @ 6.5¢/kWh	\$101.40	Off-Peak @ 6.5¢/kWh	\$31.69
Mid-Peak @ 9.4¢/kWh	\$38.35	Mid-Peak @ 9.4¢/kWh	\$11.99
On-Peak @ 13.2¢/kWh	\$57.02	On-Peak @ 13.2¢/kWh	\$17.82
<i>Delivery</i>	\$80.05	<i>Delivery</i>	\$50.06
<i>Regulatory Charges</i>	\$14.97	<i>Regulatory Charges</i>	\$4.85
Total Electricity Charges	\$291.80	Total Electricity Charges	\$116.40
HST	\$37.93	HST	\$15.13
8% Provincial Rebate	(-\$23.34)	8% Provincial Rebate	(-\$9.31)
Total Amount	\$306.39	Total Amount	\$122.22

The CEP breaks down home energy use by space heating, lights and appliances and hot water. According to the CEP, space heating made up the largest portion of energy use (57%), followed by lights and appliances¹³ (28%), and then hot water use (15%) (see

¹² Table 1 was created using the bill calculator provided by the OEB. OEB electricity usage estimates were used for the monthly average usage of one home that is natural gas heated and one that is electric baseboard heated. Hydro One Networks Inc. was set as the local distribution company and medium density rates were used to more accurately reflect MoCreebec's billing density.

¹³ The CEP does not define what they included as "appliances".

Figure 5). Data from the 2016 residential sector can help illustrate how residential energy use in Canada compares to community data, however the Canadian data presented is most likely an underestimate of the differences in remote northern communities. National level data from 2016 in the residential sector shows similar proportions for energy use for space heating (61%), but different ones for water heating (19.5%), and lights and appliances¹⁴ (17%); the data also includes a category for space cooling which takes up 2.5% of energy use (Canada, Residential Sector, Table 2: Secondary Energy Use and GHG emissions by end-use, Natural Resources Canada, 2016). The data for Ontario is similar. In Ontario, space heating makes up the majority of energy end-use (60%), followed by water heating (20%), and lights and appliances (15%) (Ontario, Residential Sector, Table 2: Secondary Energy Use and GHG emissions by end-use, Natural Resources Canada, 2016). Space cooling makes up a slightly larger proportion in Ontario (5%) compared to the national level (2.5%) (Ibid.). Advancements in energy efficient technologies cannot be ignored.

Across Canada, the efficiency of major appliances (refrigerator, freezer, dish washer, clothes washer, dryer, range) has increased, however these energy efficiency gains have been offset by the increased use of minor appliances (electronics) (Natural Resources Canada, 2018a). Nonetheless, lights and appliances make up a smaller percentage of energy use than hot water and space heating in Ontario and Canada. In the MoCreebec community, lights and appliances make up about a third of overall energy use which differs from the data from provincial and national levels (see Figure 4 below),

¹⁴ The Comprehensive Energy Use Database lists the following appliances in their data: refrigerator, freezer, dishwasher, clothes washer, clothes dryer, range (oven and stove) and other appliances. Other appliances are listed as: microwaves, televisions, cable boxes, video cassette recorders, stereo systems and computers (Natural Resources Canada, 2016).

however the CEP did not define what was included as an appliance in their data, therefore the differences between MoCreebec and Canadian and Ontario energy use breakdown can only be speculated.

Figure 4. Energy-use breakdown for the residential sector. MoCreebec data from the CEP compared to Ontario and Canada data. CEP data is based on a sample of nine residential units

3.4 Billing

Hydro One is the local distribution company responsible for keeping track of electricity consumption and billing residents for the consumption of electricity in Moosonee and Moose Factory. At the time of this research, the area is classified as a residential medium density service type¹⁵ and only recently began being billed according

¹⁵ Hydro One has three different service types or rate classes for residential consumers. These service types are: Urban High Density Zone, Medium Density Zone and Low Density Zone. Moosonee and MoCreebec are billed according to the Medium Density Zone, which is defined as an area that contains 100 or more customers or at least 15 customers for every kilometre of power. For more information on Hydro One service types, see Appendix B (Hydro One, 2019b).

to Time-of-Use (TOU) pricing¹⁶, a form of electricity pricing that is structured according to peak and off-peak times of day. At the time the CEP was created, residents were being billed according to monthly estimates and Hydro One would only take meter readings once or twice per year (MacLeod Farley & Associates, 2015). If these estimates were incorrect, Hydro One would eventually provide a corrected bill. This often meant that community members would receive credit from bill overpayments if estimates were too high, or additional bills with outstanding amounts that needed to be paid if estimates were too low. Hydro One used historical usage as the basis for these estimates; this practice contributed to unexpected bill corrections especially when occupants changed residence and took over from someone with drastically different consumption habits. To make things more confusing for residents, they were billed according to tiered pricing before smart meters were installed. Tiered pricing allocates a certain number of kilowatt-hours at a certain price and then anything over that amount is subjected to a different rate which can make it difficult to track consumption. In one instance, a member reported that after moving into a new property and receiving bills within a certain range for a few months, their bill was adjusted to their new usage and the member received a charge of \$5000 in bill corrections (Russell, 2018c). To ensure accuracy, Hydro One allowed residents to submit their own meter readings, however it is unclear to what extent this took place. In addition, Hydro One has offered a budget billing option for a number of years that averages out electricity costs over the course of a year. However, like meter reading, it is unclear if residents utilized this option during the years prior to the CEP. This manner of billing, and perhaps how it was communicated to residents, contributed to confusion and uncertainty within the community.

¹⁶ See Tables 11-14 in the Appendix A for TOU prices by season.

Hydro One's billing practices, cost of electricity, and lack of transparency of bill corrections created an unsustainable situation for MoCreebec residents. Not only was it difficult to determine how much electricity residents were using based on the tiered rate, but it also meant that residents did not know what costs to expect from one hydro bill to the next, which made it difficult to budget for expenses. This was especially difficult for lower-income residents. From discussions with community members, it was clear that the cost of electricity was a major source of stress for those that paid for their own electricity and for MoCreebec Eeyoud Council that subsidized the cost of electricity for certain housing units. In some instances the high cost of electricity led to residents having to move out of their homes or writing to Chief and Council for assistance because electricity costs became too great. The billing practices created a situation where residents experienced discomfort not only in terms of monetary cost itself, but also by the uncertainty and lack of transparency of bill corrections for their electricity bills.

There are a number of initiatives that have altered electricity costs for the community since the CEP was developed. The Ontario Fair Hydro Plan, omission of delivery charges for 'recognized' First Nation communities, and the installation of smart meters have all modified the energy situation for the community.

The *Fair Hydro Act*, introduced by the Ontario Liberal Government in 2017, created the Ontario Fair Hydro Plan, which reduced electricity bills of all residential and small-business customers by 25% on average (Environmental Commissioner of Ontario, 2018). The reduction was achieved in two steps. In January 2017, all electricity bills saw a rebate of 8%, and in May and July 2017, further reductions from the Ontario Fair Hydro Plan resulted in reductions of 25%, bringing the average Ontario home electricity bill

down to lower than they were in 2006. These reductions were achieved due to cost transfers, and not actual savings. According to the Environmental Commissioner of Ontario, today's customers pay only 80% of the cost of the electricity system through their electricity bill while the remaining 20% has been shifted to taxpayers and future ratepayers who will pay \$21 billion in interest on money the province has borrowed to temporarily decrease rates. Although controversial, the Fair Hydro Plan has decreased electricity bills for now, but that situation will change after 2021 when interest will have to be repaid.

Hydro One initiatives such as smart meter installation and certain cost exemptions for First Nations have implications for the community. Smart meters have been installed in the community and are coming online. At the time this research was conducted, I confirmed that smart meters have been installed in Moose Factory and Moosonee and at least 36 community buildings have started being billed according to their smart meters with TOU pricing (J. Russell, personal communication with Hydro One, December 7, 2018). Discussion with community members through community engagement workshops, focus groups and engagement with the MoCreebec Housing Department indicated that community members were still largely unaware that they were now being billed according to TOU pricing. Hydro One has also introduced a policy that allows "Status" First Nations to be exempted from either delivery charges or HST. Only First Nations with status that live on a reserve are eligible for the exemption from the delivery charges; the requirement of living on reserve land excludes some MoCreebec members from accessing this program. All of these policies have had an effect on the MoCreebec community. Although some of the policies, like the Fair Hydro Plan and the installation

of smart meters affect all members, their situation as a non-status community disqualifies them from other policies. MoCreebec members are well aware of the effect of government policies on their community and although some have expressed praise for the new policies, they are aware that these could change from one government to the next leaving them vulnerable.

3.5 Community Buildings Profile

MoCreebec owns and operates a number of buildings in Moose Factory and Moosonee. They own five commercial buildings in Moose Factory:

- The Cree Village Ecolodge;
- The MoCreebec Office Building;
- The MoCreebec Daycare;
- The Maintenance Garage; and,
- The Billy Bayou Centre.

In addition, MoCreebec manages a total of 81 residential units, 54 in Moose Factory and 27 in Moosonee. Of these units, MoCreebec is the owner of 14 rental properties; all properties are managed through the MoCreebec Housing Association. The units, through different rental agreements with the community, provide rental opportunities for individuals and families of different levels of income. Tenants do not have to be MoCreebec members to live in the units. Residential units can be broken down into three categories:

- Project 93;
- MoCreebec Housing Rentals; and
- Ontario Aboriginal Housing.

The community owns 14 rental-housing units located in Moose Factory (MoCreebec Housing Rentals). Rent for these units range from \$350/month for a basement “bachelor”, \$450/month for a main floor “bachelor”, and \$800/month for a full house; tenants in these units are responsible for their own utility bills. In addition, the MoCreebec Housing Association manages properties for lower income residents. The community manages 20 properties on behalf of the Cochrane District Social Services Administrative Board (Project 93 units) and 47 properties on behalf of Ontario Aboriginal Housing. Rental rates for these units are not determined by MoCreebec, but the property owners themselves and are currently geared to tenant income with rates set to 30% of income for Project 93 units and 25% of income for Ontario Aboriginal Housing units. Tenants of Project 93 have their utilities included in their rent at a flat rate based on the number of bedrooms in the dwelling: three bedroom units pay \$61/month, while four or five bedroom units pay \$66/month. In addition, an undetermined number of MoCreebec members live in privately owned units. A breakdown of the residential units owned or operated by MoCreebec is shown below in Table 2.

Table 2. MoCreebec Residential Units

Unit Group	# Of Units	Building Type	Status	Rent	Utilities included	Heating Equipment
Project 93	20	Duplex	Manager	30% of income /month	Yes	Electric Furnace
MoCreebec Housing Rentals	14	Detached and Duplex	Owner	\$350-\$800 / month	No	Electric Baseboard/wood stoves
Ontario Aboriginal Housing (Moose Factory and Moosonee)	47	Detached	Manager	25% of income / month	No	Electric Furnace/electric baseboard

3.6 Progress to Date

The community has taken action to work towards the goals set out in the CEP. Many of their initiatives to date have focused on conservation, energy efficiency and capacity building programs to tackle issues in the residential sector. Most recently, they have trained three energy auditors through the Independent Electricity System Operator's (IESO) Education and Capacity Building Program and have worked with Green Saver to implement Hydro One's Home Assistance Program (HAP). The HAP offers free energy efficient appliance upgrades, plus in-home energy assessments (Hydro One, 2018a; Save on Energy, 2019). Green Saver visited the community during the fall of 2017 to implement the HAP. According to the MoCreebec Housing Department, Green Saver swapped freezers, fridges, and window air-conditioning units (depending on their age), as well as provided residents with wraps for hot water heaters, low-flow shower heads, faucet aerators, lights, and timers (J. Russell, personal communication with MoCreebec Housing Department, November 2, 2018). Community staff mentioned that the program experienced some issues delivering appliances due to the availability of occupants, and they are currently working to try and determine the uptake of the program (J. Russell, personal communication with MoCreebec Housing Department, November 2, 2018).

3.7 Conclusion

The community of MoCreebec has evolved substantially since their origins and have taken steps to better understand the energy issues their community faces. This chapter has given an overview of the CEP that gathered baseline data on the community's energy situation and discussed the community's objectives, historic energy issues, and some of their most recent actions to improve their situation. The CEP provides a good

starting point of analysis, however more specific analysis can be done to better understand what steps should be taken next. It is clear that the MoCreebec are ready for change and want to take greater control to address the energy issues the community faces. The next chapter provides an overview of the literature that informed the methods and approach behind my research.

Chapter 4: Literature Review

4.1 Introduction

There are an increasing number of energy efficient appliances and technologies becoming available to occupants that allow them to have a greater ability to understand and reduce their energy use. Although the availability of these technologies have increased, they have not yielded the expected energy savings; this is in part due to occupant behaviour (Blight & Coley, 2013; Gill, Tierney, Pegg, & Allan, 2010; Haldi & Robinson, 2011). My focus on the social aspect of energy use in the residential sector merits a review of the role of occupant behaviour in energy consumption and possible methods to influence this behaviour.

This literature review begins with a review of the research related to the energy situation of Indigenous communities and then focuses on three areas: occupant behaviour, the alignment of incentives that may affect occupant behaviour in the residential sector, and finally, influencing behaviour to decrease energy demand.

4.2 Energy Use and Energy Planning in Indigenous Communities

Context is crucial in understanding how energy is used. Indigenous communities must grapple with unique social and economic issues stemming from centuries of colonialism; these issues have impacted existing energy infrastructure, the state of houses and the remote locations of many Indigenous communities. All these factors affect how energy is consumed. Although there is a considerable amount of literature on energy development in Indigenous communities in Canada, there is little academic literature focusing on energy use, and even less on occupant behaviour in these communities. The lack of information points to a clear gap in the literature, however research is building that can help better understand the energy context and community experiences, government reports as well as research from other sources can help fill some of the void.

In Ontario Indigenous communities have come together to establish transmission companies to reduce their reliance on diesel fuel and are beginning to develop conservation materials catered to their unique needs. Five Nations Energy Inc. is a transmission company established and wholly owned by the Cree communities of Attawapiskat, Fort Albany, and Kashechewan on the West coast of James Bay. The company was created to improve the quality of life of community residents by providing them with stable power, and by 2003, all communities were connected to the provincial electricity grid (Conservation on the Coast, 2018a). To further support their community members, the communities established Conservation on the Coast (COTC), an organization that provides energy conservation and energy efficiency education and awareness programming. Facing different issues than southern Ontario, COTC has developed programming that meets their unique needs such as promotional contests,

demonstrations of energy efficient technologies, conservation measures, and an annual energy fair (Conservation on the Coast, 2018c). In addition to these measures, COTC maintains a number of energy saving tips based on seasons on their website. However, Five Nations Energy Inc. is not the only Indigenous transmission company. Wataynikaneyap Power is a partnership of 24 First Nations communities and Fortis Inc. that will bring grid connection to 17 remote communities (“Wataynikaneyap Project,” 2018). Although still in a phase of construction, the project holds great potential for the communities involved. These projects are success stories of Indigenous communities in Ontario. They exemplify the desire and capability of Indigenous communities to take control over their energy situation and design programming to fit their unique need. Yet there is still little academic research about these projects as most resources focus on renewable energy development and not electricity transmission or energy conservation. One such source is *Aboriginal Power*.

Chris Henderson’s *Aboriginal Power* (2013) builds on Henderson’s extensive experience working on developing renewable energy projects with Indigenous communities (Henderson, 2013). Henderson highlights the enormous economic potential of renewable energy projects¹⁷ for Indigenous communities if communities seize the opportunity to develop these resources, whether on their own or as part of a partnership. Henderson stresses the importance of recognizing the agency of these communities in the development of these projects. The Ontario government is also starting to recognize the unique energy issues in Indigenous communities.

¹⁷ In *Aboriginal Power*, renewable energy projects are described as solar photovoltaic, wind, and hydroelectric.

There is a recognized difference between the energy challenges facing homes in Indigenous communities in remote locations who may depend on diesel or electricity to meet their space heating needs and the “average” Ontario home (Environmental Commissioner of Ontario, 2018). This is reflected in documents from the Environmental Commissioner of Ontario, and in important planning documents such as the Ontario Long Term Energy Plan (Government of Ontario, 2013, 2017b). These government documents recognize the unique situations of Indigenous communities and have established funding and programs to provide some economic relief to high energy costs (e.g., the delivery credit for status First Nations by Hydro One), as well as build capacity through energy planning, and energy development. (e.g., the IESO’s Education and Capacity Building Program). Academic literature has focused on energy planning and barriers to renewable electricity generation.

Barriers to energy planning and electricity generation have been identified for Indigenous communities. Rakshit, Shahi, Smith and Cornwell (2018) conducted a study to identify gaps and provide recommendations to inform more productive community energy planning (Rakshit, Shahi, Smith, & Cornwell, 2018). Their research examined Ontario government support for community energy planning and found that although funding is needed to support energy planning, past approaches to developing community energy plans did little to increase capacity in communities, and instead led to consultant dependency (Rakshit et al., 2018). In light of these observations, the authors demonstrate that there is a gap in the theory and the practical implications of energy planning (Rakshit et al., 2018). The authors call for greater community involvement in the development of energy planning in order to increase capacity within the communities themselves to better

address energy issues (Rakshit et al., 2018). These recommendations align closely to the discussion in the 2017 proceedings of “Renewables in Remote Communities” conference hosted by the Pembina Institute and the Yukon territorial government. The two-day conference included presentations, discussions, and polls to further explore the topics of human capacity and financial capacity related to electricity generation projects within Indigenous communities. The conference highlighted, among other themes, the importance of developing human capacity. Success can be achieved when the community is able to follow their own development pathways which may start with upfront engagement and the sharing of traditional and western knowledge (Lovekin, 2018). When pursuing energy planning, this engagement should start with identifying community preferences. Some examples of these exchanges are documented in further literature.

Joel Krupa has been researching extensively on the barriers to renewable energy projects in Indigenous communities in Ontario. Krupa identifies three main barriers to Indigenous energy development: access to capital, existing capacity, and long-term policy clarity, including settlements such as land claim agreements (Krupa, 2012b, 2012a). A common theme in the literature, as described above, is the need to bridge theoretical knowledge with practical actions and the importance of capacity building in whatever initiatives are pursued. In his case study of the success of Biigtigong Nishnaabeg (Ojibways of Pic River First Nation) renewable energy development, Krupa (2012a) cites community vision and effective, but minimal liaising with outside experts as essential (Krupa, 2012a). Other researchers have found a more integrated way to engage with communities while ensuring community preferences are at the forefront of projects.

Identifying community preferences, and working with community members and utilizing community strengths are integral to the success of energy planning in Indigenous communities. Although the literature is scarce in the Canadian context, research from other countries can demonstrate how this may be employed for community energy planning and the development of local electricity generation facilities. Researchers, van Gevelt, Holzies, George and Zaman (2017), worked with Indigenous villages in Sarawak, Malaysia to assist two remote, off-grid villages pursue electricity generation development to power their communities (van Gevelt, Canales Holzeis, George, & Zaman, 2017). The researchers utilized participatory workshops and choice experiments to ensure the system aligned with the communities unique needs and values (van Gevelt et al., 2017). Understanding the importance of community engagement, van Gevelt et al., (2017), were able to cater their recommendations and findings to community preferences. Although the literature is growing, researchers have begun to define the problems and outline potential ways communities can move forward.

There is a gap in the literature with regards to the unique energy situation of remote Indigenous communities in Canada. Although academic literature is slowly growing, occupant behaviour in Indigenous communities, with their unique social, economic, and environmental issues, is an area that could benefit from more study. While the research continues to grow, it is clear that community engagement and capacity building are integral factors in proper energy planning with Indigenous communities. Identifying community preferences and ensuring community values remain at the forefront of energy planning is integral to the success of a project. In light of the scarcity of sources on more specific issues of energy planning in Indigenous communities, such as

occupant behaviour, research from broader literature is reviewed in order to further inform my approach.

4.3 Occupant Behaviour and Energy Use

The role of energy use driven by occupant behaviour is increasingly a focus in understanding energy consumption. In residential buildings, heat settings, appliances, lighting and domestic hot water use are all heavily dependent on occupant behaviour, as well as the demographic of the household (O'Brien et al., 2016; Swan, Ugursal, & Beausoleil-Morrison, 2011). Many studies have been developed to quantify how occupant behaviour has an effect on residential energy use. Studies have shown the effects of energy use through behaviour from actions as simple as window opening, to occupant preferences for heat settings (Bae & Chun, 2009; Fabi, Andersen, Corgnati, & Olesen, 2012). Researchers have also explored the proper use of conservation methods and technologies and retention rates of devices such as smart thermostats and low-flow showerheads. For example, Peffer, Perry, Pritoni, Aragon, and Meier (2012) demonstrated that the proper use of thermostats could save occupants between 5-15% of annual heating and cooling costs (Peffer, Perry, Pritoni, Aragon, & Meier, 2012). While Critchley and Philipps (2007), showed that aerated showerheads had a better retention rate than low-flow showerheads (Critchley & Phipps, 2007). The research continues to grow and demonstrate the importance of understanding occupant behaviour when implementing measures to reduce energy demand. Although estimates vary for how occupant behaviour can be quantified, some estimate that basic behavioural changes can result in a 10-20% decrease in energy usage even without the introduction of energy efficient appliances (Huebner, Cooper, & Jones, 2013; Owens & Wilhite, 1988). Further

contributions to understanding occupant behaviour in residential energy-use are explored in the area of economics.

4.4 Split Incentives

Different living arrangements, and certain responsibilities that come with it (for example, paying electricity bills) can have an effect on decisions occupants make within their dwelling. In the context of energy-use, the type of living arrangement and the associated responsibilities can affect occupant behaviour. The role of living arrangements and the effects on energy use is therefore an important concept to understand when studying energy use in the residential sector due to its influence on occupant behaviour. As many MoCreebec members are tenants and not owners, this review is particularly relevant to my research.

Economists have explored how split incentives exist in certain rental living arrangements and that this misalignment can effect how occupants use energy. These split incentives can occur between landlords and tenants when those responsible for paying the energy bills (e.g., tenant) do not pay capital costs (landlord). In this scenario, the landlord does not reap the benefit of the investment in energy efficiency measures. On the opposite end, neither does the tenant reap the long-term returns on the investment of energy efficiency measures. The situation can be described as a principal-agent problem, or a problem where the principal (tenant) cannot be sure that the agent (the landlord) is working in their best interest (investment in energy efficiency) due to asymmetric information. However, if the tenant is willing to pay a rent premium for energy efficiency investments, recognizing the longer-term savings in lower utility bills, the landlord could reap benefits from investing in energy efficiency measures. The split

incentives scenario was first identified by Blumstein, Krieg, Schipper, and York (1980), as they explored landlord-tenant issues that observed less insulation and less energy efficient appliances than might have been expected in rental buildings (Blumstein, Krieg, Schipper, & York, 1980). Variations of this scenario and its impediment to investments in residential energy efficiency have further been discussed since the issue was first acknowledged and specific cases have been explored to illustrate this problem further.

The principal-agent problem has been further observed and quantified in rental living arrangements. Levinson and Niemann (2004) identify and quantify a principal-agent problem between landlords and tenants when landlords pay for heat (Levinson & Niemann, 2004). Using the US Residential Energy Consumption and the American Housing Survey, Levinson and Niemann found that tenants living in utility-included apartments set their thermostats warmer during the winter months when absent from the apartment when compared to those who pay for their utilities (Levinson & Niemann, 2004). Similarly, Maruejols and Young (2011) conducted a study on multi-family dwellings in Canada where landlords pay for utilities and found that those households who do not pay directly for heat tend to select higher temperature settings by about 1°C; this can increase to 3-4°C for older buildings (Maruejols & Young, 2011). Davis (2012) empirically examines the principal-agent problem in the investment in energy efficient appliances. Davis finds that landlords who do not pay for electricity bills are less likely to purchase “Energy Star” appliances (Davis, 2012). Gillingham et al, explore split incentive issues between owners and occupants of residential dwellings in California (2012). They find little evidence for a split incentive in the level of temperature in dwellings, however they do find evidence to suggest that heating or cooling incentives

are sub-optimal when the occupant does not pay for energy (Gillingham, Harding, & Rapson, 2012). New methods have been proposed to overcome the landlord disincentive to invest in energy efficiency; one of these is the concept of the “green lease”.

“Green leases” are designed to overcome split incentives in living arrangements. Although no exact definition of a “green lease” exists, there is a general agreement that they are leases designed to decrease energy and water use through the use of clauses to better align financial incentives and sustainability goals between a landlord and a tenant (Feierman, 2015; Oberle & Sloboda, 2010). As discussed above, a landlord can invest in energy efficiency measures that may decrease the tenant’s energy bills, however their ability to profit from this lease structure is impeded by unattractive returns on their investments. By changing certain clauses in a lease, a green lease helps to align financial incentives so that the benefits of investing in energy efficiency are shared between the landlord and the tenant (Feierman, 2015). This can be done in a few ways.

According to Feierman (2015) green leases can be constructed through cost recovery clauses and energy efficiency agreements (Feierman, 2015). Cost recovery clauses that allow for amortizing (spreading out capital expenses for assets over a specific period of time) capital expenses or a clause that allows the landlord to recoup operational savings from the energy efficiency improvements until the landlord has been repaid for their original investment are two ways to recover costs, however there are drawbacks (Feierman, 2015). Amortization schedules may be too long to be attractive for landlords and a clause to recoup costs may not work if the energy efficiency investment does not deliver the projected savings (Feierman, 2015). Energy efficiency agreements are another way green leases can be constructed. These agreements can take the form of a simple

requirement that Energy Star appliances be used in the dwelling (Feierman, 2015). There are a few ways these types of leases can be developed.

When constructing green leases, there have been two observed methods. According to Brooks et al. (2008) there are two main methods to construct a green lease arrangement, a paternalistic approach and a cooperative approach (Brooks et al 2008, as cited in Collins, 2018). The paternalistic approach prescribes the sustainable clauses to the potential tenant, while in the cooperative model, both parties outline mutual objectives as well as the liabilities and obligations of both parties (Brooks et al 2008, as cited in Collins, 2018). Both models have been used to construct green lease agreements.

The concept of the green lease can potentially overcome the split incentives in living arrangements. It can be applied to living arrangements where tenants pay for utilities but have an agreement to pay a premium on their rent, recognizing the cost savings of reduced energy bills (Oberle & Sloboda, 2010). Landlords can receive benefits from this arrangement as well. Not only would they receive a return on their energy efficiency investments, but they could also attract and retain tenants that value the arrangement, realize cost savings through lower energy use, and minimize the risks of applying new environmental restrictions as they emerge (Oberle & Sloboda, 2010). The concept of the “green lease” is one method to help address the split incentive observed in certain living arrangements, however occupant behavioural changes are also an important aspect of reducing energy consumption.

It is evident that achieving energy efficiency goals through technological changes alone is not sufficient to reduce energy demand. Successful energy reduction goals require both technological and behavioural changes. Indeed, the increasing focus on

occupant behaviour has shown that “behaviour change is fundamental to the success of energy efficiency schemes” because without proper use of technologies or knowledge of energy use by the people who use the technology, the full gains from the technology cannot be achieved (Fylan et al., 2016). Addressing this split incentive, especially in units that do not pay for their own utilities, can possibly save up to 25% in energy reductions (Elinder, Escobar, & Petré, 2017). It is worth noting, however, that the study’s largest customers were the main cause of reductions of 25% from the above study and the same savings may not be realized if there is not a large heterogeneity in the size of customers. The above literature demonstrates the importance of understanding occupant behaviour in energy use and documents the misalignment of incentives in certain living arrangements, however it has not explored how occupants themselves can be influenced to increase their understanding of their energy use and alter their behaviour. To understand this aspect of energy use in the residential sector, we must further explore what motivates the individuals within their homes to change their behaviour.

4.5 Changing Energy Demand Behaviour

The increasing focus on the occupant has not only demonstrated the importance of factoring in occupant behaviour in our understanding of energy use, but also in understanding why individuals make the decisions they do and exhibit certain behaviours. This knowledge can help policy makers understand how successful measures and technologies to reduce or shift energy demand will be accepted and utilized once deployed, and how to modify behaviour to achieve the best results for the occupants and energy systems. There are two aspects of this that are relevant to this discussion: price incentives and non-price incentives. Considering the affordability of electricity is an

existing issue within MoCreebec's current energy system, the review gives more attention to non-price incentives.

4.5.1 Introducing Demand-Side Management

One way to achieve greater energy conservation is by changing the behaviours or patterns of consumption of the individual consuming the energy. These initiatives or programs can be referred to as Demand-Side Management (DSM). DSM can be defined as “an organised set of programs and initiatives that primarily aim to change the quantity and patterns of energy consumption on the end-user level...by initiating interaction schemes between end-users and program initiators to motivate and facilitate end-user energy demand reduction” (Kauffman & Lee, 2013). The types of strategies used in DSM can vary.

The scale and strategy of DSM initiatives can vary from local to national, and can take many forms. DSM initiatives can include energy audits provided to households, financial instruments, voluntary programs and the use of feedback devices (Kauffman & Lee, 2013). Energy audits target investment behaviour by providing occupants with information about their dwelling and sometimes calculating the most cost-effective measures (Kauffman & Lee, 2013). Financial instruments, such as TOU pricing can be used to shift or decrease demand during peak. The latter approach has seen varying degrees of success with studies showing up to 20% reduction in peak load (Bartusch & Alvehag, 2014). Other studies provide insight into the types of appliances that are most flexible to be shifted, such as washing machines, dryers, and dishwashers (Klaassen, Kobus, Frunt, & Sloodweg, 2016). Voluntary programs aim to enhance consumer knowledge and generate social support and pressure through a sense of responsibility

(Kauffman & Lee, 2013). Finally, feedback instruments such as energy display monitors (EDMs) or in-home displays (IHDs) provide consumers with information that can help them make more informed energy efficiency and conservation choices (Kauffman & Lee, 2013). Darby (2006) indicates that direct feedback can result in household energy savings of 5-15%, while an international net-study of feedback approaches (Ehrhardt-martinez, Donnelly, & Laitner, 2010) found the impact to be between 9-12%. However, lasting behavioural changes can be difficult.

Achieving lasting changes in energy demand behaviour, even through DSM initiatives, faces many challenges. Studies have shown that DSM interventions can be successful as long as the intervention lasts, but occupants revert to previous behaviour shortly after the program ends (Abrahamse, Steg, Vlek, & Rothengatter, 2007). Breuker et al., (2013) contribute this reversal to the problematic approach of DSM programs based on the application and transfer of expert knowledge to situations without first thoroughly understanding the physical, social, cultural, economic, institutional, and political environment (broadly referred to as “context”) (Kauffman & Lee, 2013). Breuker et al., (2013) advocate for a more interactive, user-oriented, and context sensitive approach to DSM grounded in economic, psychological, and sociological thinking. The approach acknowledges that individual behaviour interacts with and is shaped by its context, therefore a successful DSM approach must cater to the unique context or behaviour that DSM seeks to change or, it needs to be supported by existing or newly rising norms (Kauffman & Lee, 2013). This thinking recognizes the importance of understanding the context and the group the DSM approach is targeting. One of the approaches to better understand the context is by researching your target group.

4.5.2 The Importance of Trust and Stakeholders

To deliver a successful DSM program, it is necessary to obtain as much information about the target group as possible. Having an understanding of the people the program is targeting, helps define how to move forward with content and instrument choice (Kauffman & Lee, 2013). Research on energy use in Canada is done at the national level through surveys such as the Natural Resources Canada's Survey of Household Energy Use or Statistic Canada's Households and the Environment: Energy Use report, as well as on the provincial level through the Ontario Energy Board, the IESO and the Environmental Commissioner of Ontario. However, these documents give a very broad overview of usage and although they can give an idea of how energy is used, they are not as useful when targeting specific populations who may face unique challenges and exhibit unique behaviour based on their context.

Different tools can be employed to better understand a target group. To understand energy-use behaviour, metering instruments can be deployed, surveys can be administered and interviews can be conducted. Surveys with questions similar to those administered by federal departments can be used to determine information on fuel sources, appliance use and age, lights, and energy saving practices. This can be expanded to explore occupant behaviour as well. Yohanis (2012) carried out a general population survey in Northern Ireland using a statistically significant sample to investigate the drivers that affect domestic energy use. Yohanis paid special attention to energy behaviour and assessed the success of information resources provided to households from regional energy saving agencies. Yohanis' study included an examination of peoples' awareness of energy saving measures and found that although awareness was high, conservation behaviours did not match the claim of awareness (Yohanis, 2012).

However, knowing a group consists of more than understanding their attitudes and behaviours related to energy use, sometimes it is also about understanding who can be a perceived trusted source of information.

The success of conservation and energy efficiency measures may be influenced in part by those who deliver the information to the end-user. Brown et al., (2014) explore the success of energy retrofits in social housing units and like Breuker et al., they emphasize the importance of context, especially understanding current occupant energy use behaviour when delivering energy initiatives (Brown, Swan, & Chahal, 2014). By working closely with the tenants, Brown et al., (2014) observe how trust was a factor in successful energy retrofits in the units they examined. Trust could be in relation to the landlord, contractors, perceived experts, or the technologies themselves (Brown et al., 2014). The importance of trust is further explored in other studies, leading some to conclude that trust can eclipse other barriers to acceptance of energy technologies (Brown et al., 2014; Reames, 2016; Ricci, Bellaby, & Flynn, 2010). Further demonstrating the importance of context and understanding end-users, Simcock et al, (2014), expand on the concept of trust by exploring how domestic energy information was perceived (Simcock et al., 2014). They observe that there was a distinction between “perceived expertise” and trustworthiness, in other words, there is a distinction between expert sources and trusted expert sources (Simcock et al., 2014). A growing body of literature is demonstrating that context is crucial when implementing DSM initiatives, however, it is worth exploring further how these strategies apply to actual DSM or conservation initiatives in practice.

4.5.3 DSM Approaches

Research suggests that non-price behavioural interventions can be a powerful tool to conserve energy. Mark Andor and Katja M. Fels (2018) conducted a comprehensive review of four non-price interventions and their effects to determine their potential to reduce energy consumptions in private households (Andor & Fels, 2018). Their research examines four non-price interventions referred to as: social comparison, commitment devices, goal setting, and labeling. Their review seeks to determine the effectiveness of the above approaches and concludes that social comparison demonstrates the most significant reductions for energy reduction, while the other interventions, although promising, may still require further research. A brief description of their results is described below.

Social Comparison

Social comparison is an intervention that provides households with energy-use information, or feedback, in relation to comparable households. Representation for comparison could include consumers with the same energy provider or within a certain geographical range (for example, a postal code). This approach addresses biased beliefs about one's own energy consumption as being lower than those around them and can motivate them to conserve. Through their review, Andor and Fels (2018) conclude that social comparison can result in reduced energy consumption for private households ranging from 1.2% to 30%.

Commitment Devices and Goal Setting

Commitment devices and goal setting help consumers commit to certain energy reduction actions and may include creating a concrete target in which to achieve their commitment by. The intervention addresses the tendency of individuals to prefer

immediate satisfaction over future satisfaction, or time-inconsistent preferences (van Houwelingen & van Raaij, 1998). When used by an individual, the intervention creates an opportunity to satisfy the individuals' own expectations (Andor & Fels, 2018). When used publicly, the intervention can generate social pressure (Abrahamse, Steg, Vlek, & Rothengatter, 2005). Andor and Fels' (2018), review acknowledges that more research is needed around these interventions, although some studies have shown the potential of conservation of around 10% through realistic, self-set goals (Andor & Fels, 2018).

Labelling

Labels summarize information in an easily accessible way that can help inform consumers of the energy usage levels or energy efficiency standards of goods. Generally, there are two types of labels. There are voluntary programs such as the US Energy Star Label, or mandatory labels, such as the EU Energy Label. Labels can help consumers make more informed choices when purchasing goods, which draws consumer attention to specific features of the good that may be overlooked and also assists providing the potential purchaser with information that may be difficult to acquire themselves. Andor and Fels (2018), conclude that although, promising potential, more research is needed to assess its effectiveness.

4.6 Conclusion

This review has summarized and examined some of the relevant literature related to residential energy use. It has briefly discussed the gap in literature on Indigenous energy in Canada citing that literature focusing on renewable energy generation is growing slowly but there remains little information available about energy use in

Indigenous communities. It also summarized the discussions and observations around the potential and obstacles to renewable electricity generation in Indigenous communities as well as identified some of the barriers and challenges some communities face. It then presented the importance of occupant behaviour in understanding residential energy use, as well as the split incentives that can occur based on living arrangements. Finally, it discussed some of the factors and non-price incentives available to help shape occupant behaviour to help decrease energy demand.

The literature has implications for my research on energy use and energy planning in MoCreebec. It stresses the importance of understanding context and establishing trust when seeking to influence occupant behaviour and also provides approaches that can be applied in MoCreebec. Notably, DSM approaches that provide tailored feedback information allowing for social comparison and goal setting could be used as incentives or behavioural change mechanisms in the community. The next chapter describes the methodology used to show how the research builds on the current community data to provide new insights into the community's energy issues in support of my research objectives to better understand community preferences and occupant behaviour.

Chapter 5: Methodology

5.1 Introduction

This thesis seeks to build on the current CEP in order to provide a more detailed analysis of the energy situation of MoCreebec. To do so, it seeks to better understand community preferences for different electricity generation sources as well as preferences for desired qualities in an energy system, and energy use in the residential sector. These

issues are not explored in isolation, but contribute to a larger study on the potential of renewable electricity generation potential (solar, wind, and hydrokinetic) and district heating potential for a new community build. Research on these topics is being conducted as part of a Master of Applied Science thesis by Keelia LaFreniere. This interdisciplinary approach provides a unique and more complete approach than if either research was conducted in isolation. Data will be shared between both researchers in order to inform recommendations that will be provided to the community.

The research approach is described below and outlined in three main sections. Section 1 outlines the ethical considerations involved in this type of research and states the funding that supported it. Section 2 explores the methodology behind the approach. Section 3 outlines the methods of data collection.

5.2 Ethical Considerations and Funding

This research project was funded by the IESO through the Education and Capacity Building Program (ECBP); both Carleton University and the MoCreebec Eeyoud Council were co-applicants in the proposal. The proposal was a result of a collaborative development approach where researchers from Carleton University worked closely with MoCreebec to identify research objectives. The project and its methods of data collection was reviewed by the Carleton University's Research Ethics Board prior to data collection and received ethics clearance on August 1, 2018 under ethics clearance CUREB-A #108843. Ethical clearance for the collection of data expires June 30, 2019. To protect participants in the research process, all data is presented under the condition of anonymity. In addition, to ensure accuracy of historical information, the aspects of the thesis that deal with community history has been reviewed by a panel of MoCreebec

elders to ensure information presented was represented correctly and incorporated the community's perspective.

5.3 Methodology

5.3.1 Participatory Action Research

Participatory Action Research (PAR) guided the research approach for this thesis. There are two components of PAR that make the approach particularly relevant for working with communities. They are: (1) to study the process of the changing system and (2) to work with members to change a system in a desirable direction. MoCreebec's energy history has developed in a direction without much input from the community; this has affected the community in a number of ways that the previous chapters addressed. The community has signalled in their CEP that they would like to pursue a new direction. PAR allows the researcher to work closely with the community in the design and research process in order to ensure that the research represents the desired direction of the community.

The community and researchers were active partners in the development of the research approach. The two parties had been involved in designing the aims of the research since October 2017 in preparation for applying to the IESO ECBP. This process helped clarify roles of the two researchers as well as define the research questions that the community was most interested in addressing. When we arrived in the community, I played an active role during the fieldwork to gather data. I presented at two capacity building workshops held in the community in order to inform broader members of the community about the research direction and to solicit community member input to further

shape the research direction. During data collection, I facilitated focus groups and administered surveys over the course of 18 days in the community.

5.4 Data Collection

Two methods of data collection were used to gather information in order to answer the research questions: focus groups, and questionnaires. Focus groups were used to explore community preferences while questionnaire were chosen in order to better understand occupant behaviour, cost of energy, heating and appliance profiles, and willingness to shift demand. Both methods were shared with staff from the MoCreebec Council office for input and feedback prior to data collection began. A community energy auditor also reviewed the questionnaire before the final version was administered to MoCreebec residents.

I used stratified purposeful sampling to conduct my data collection due to the exploratory nature of the research as well as time and resource constraints. Stratified purposeful sampling is a form of non-probability sampling where the study population is broken down into strata. For the focus groups, this was done by the role of participants within the community, while for the questionnaire it was characterized by housing type. Unlike random sampling, where each member of the population has an equal chance of being selected as a research subject, non-probability sampling does not give all the individuals in the population an equal chance of being selected. It is therefore difficult to guarantee statistical representation of the entire population in the sample. This means that the presented results should not be considered an exact reflection of the whole population of MoCreebec. The research is exploratory and designed to further explore the social side of energy issues in the community and statistical representation was not the primary aim,

especially for the focus groups. Focus groups were chosen for their usefulness in exploring opinions and insights that would be difficult to elicit from more quantitative approaches (Guest, Namey, & Mitchell, 2013). The questionnaires were chosen to gather more specific information on household energy use to better understand MoCreebec energy demand. Although a confidence interval cannot be applied to the results, they can provide new insights on the population, as they were the first of their kind to be conducted. For these reasons, they were determined to be the most appropriate method for gathering data on community preferences.

5.4.1 Focus Groups

Focus groups were chosen as the primary method for gathering data on preferences in the community. Focus groups are a qualitative data collection method used to obtain perceptions and opinions on a defined area of interest through carefully planned discussions where participants are encouraged to share without pressure to vote or reach consensus (Guest et al., 2013; Krueger & Casey, 2009). The focus group method was chosen for its strengths in identifying similarities and differences among people (Stewart, Shamdasami, & Rook, 2009), and providing participants with the opportunity to frame issues in their own way (Kotchetkova, Evans, & Langer, 2008); this made the method a useful tool when seeking to better understand the perspectives of different segments of the community. They also yield a wider array of arguments and data than can be obtained in a one-on-one interview which made them useful for gathering large amounts of data in a relatively short time frame (Gailing & Naumann, 2018). The approach has been criticized for its subjectivity and for lacking standardized procedures for the evaluation of data; nonetheless, it has been employed in a wide variety of social science research,

including energy policy (Berdahl, Bourassa, Bell, & Fried, 2016; Gailing & Naumann, 2018; Ho, Oshita, Looi, Leong, & Chuah, 2019; Mesarić, Dukeć, & Krajcar, 2017; Silk, Hurley, Pace, Maloney, & Lapinski, 2014; Soland, Loosli, Koch, & Christ, 2017).

Focus groups are a qualitative research method and although representativeness of the population can be sought, the small number of participants that usually participate in the groups makes it difficult to claim results always reflect the opinions of the whole population. When studies use focus groups when populations are large, the qualitative research is usually followed up by more representative quantitative approaches to test specific areas of the qualitative research. This is not as significant concern for this research as I am seeking to better understand community preferences, a small population to begin with. Furthermore, to seek results as statistically representative ignores the purpose and strength of the focus group method to explore opinions, generate new insights and arrive at new ways of thinking (Guest et al., 2013; Patton, 2002). Nonetheless, I have done my best to stratify the population, and conduct groups within these strata in order to be able to draw some comparisons between focus groups.

5.4.2 Sampling and Recruitment

I worked closely with the community to identify participants willing and available to attend a focus group session. After logistical discussions between the community and myself, it was determined that non-probability sampling would be used. I relied on a stratified purposeful method to determine participants. This method stratifies the population in different groups and selects a certain number of participants based on these groups. The community office conducted all outreach to participants.

The population was stratified into two main groups:

- Official decision makers, and

- Members at large

These two groups were then further divided:

- Voting decision makers¹⁸
 - Chief and Council
- Members at large
 - Youth
 - Elders, Energy Auditors, Departmental Staff, and other members
 - Business owners or operators

A total of five focus groups were held over eighteen days in Moose Factory and Moosonee; a minimum of four participants were required for each focus group to allow for a certain level of diversity in opinions and perceptions. One focus group was conducted solely with Chief and Council members; one group was conducted with youth community members; two with participants that included elders, energy auditors, departmental staff, and other members; and one with business owners and operators. The focus group with business owners and operators did not meet the minimum number of participants to be included in the study, however qualitative insights from the discussion are still valuable for the research. Table 2 below shows the profile of the focus groups.

¹⁸ Elders and youth participation are both included in the community decision making process and undoubtedly play an important role in the community, however I decided to define “decision makers” as voting members of the MoCreebec Council as per Section 13 of the MoCreebec Constitution. This limits decision makers to the Chief, Deputy Chief and voting Council members (MoCreebec Eeyoud, 1993).

Table 3. Profile of focus group including represented populations, location of focus group, and number of participants

Focus Group	Population	Location	Number of Participants
Focus Group 1	Members at large (MoCreebec staff, elders, energy auditors)	Moose Factory	6
Focus Group 2	Members at large (elders, youth, Moosonee staff, Contact North staff)	Moosonee	9
Focus Group 3	Decisions Makers (Chief and Council)	Moose Factory	4
Focus Group 4	Members at large (youth)	Moose Factory	4
Group did not meet threshold for participants	Members at large (Business owners/operators)	Moose Factory	2

5.4.3 General Procedure

Five focus groups were held over eighteen days in Moose Factory and Moosonee. Sessions were scheduled for two hours and approximately 20 minutes were reserved for lunch, which was provided to the participants. I moderated the focus groups with the assistance of Keelia LaFreniere who took notes and assisted in answering technical questions about technologies. At the beginning of each session I explained the research objectives, research funding, ethical clearance and participants were then asked to sign a consent form. Focus groups were audio recorded for accuracy and notes were taken throughout focus group discussions. I emphasized that results from the sessions were to inform research and recommendations, and that participants were not deciding on an energy system solely based on their participation in the focus groups.

5.4.5 Questionnaires

The CEP gives a high-level overview of energy consumption based on end-use and identified the residential sector as the largest total energy costs for the community

(78%). The community, however, does not have data available about occupant behaviour that contributes to this energy use. The purpose of the questionnaire is to gain a better understanding of occupant behaviour in the residential sector and to determine how demand-side management could be used to balance demand better with local supply. Questions in the questionnaire were derived from other surveys of household energy use, such as Natural Resources Canada's Survey of Household Energy Use, and Yohanis' (2012) study on household energy use and energy behaviour of Northern Ireland for its similar research objectives (Natural Resources Canada's Office of Energy Efficiency, 2011; Yohanis, 2012). The questionnaire method was selected for its ability to better identify and explore energy-use behaviours, habits and practices in order to fill in the gaps of the CEP on energy end-use in the residential sector.

5.4.6 Sampling

The MoCreebec Housing Department owns or manages a total of 81 residential units. These units can be subdivided into three main categories: Project 93, MoCreebec Housing Rentals, and Ontario Aboriginal Housing (see Table 3). In addition, there are a number of private units in the community and some MoCreebec members that are also part of the Moose Cree First Nation were surveyed as well. After discussing with the community, I determined a stratified convenience sampling method would be best suited to gather the data. I stratified the population by housing unit type and I sought to gain equal representation between units. All responses are from housing units in Moose Factory. A total of 42 questionnaires were delivered; 35 questionnaires were completed, however I was unable to identify the units of two questionnaires, therefore the completed sample consists of 33 completed questionnaires.

I attempted to reach equal numbers of units surveyed among the community owned or managed properties, and used a door-to-door method of survey administration. This method provided both benefits and drawbacks. In some instances I was able to administer the survey directly, which had the advantage of providing the greatest accuracy to questions, however most respondents preferred to complete the survey on their own time, and requested that I pick them up at a later date. This approach allowed for the greatest flexibility to accommodate the respondents' schedules and assured a high number of surveys returned, however there is a risk that accuracy may have been sacrificed if respondents were unsure of a question. Table 3 below displays the total number of units surveyed.

Table 4. Number of units surveyed out of total number of units on Moose Factory.

Housing Unit	Total # of Units (Moose Factory)	Total # of Surveyed Units (Moose Factory)	Building Type	Status	Utilities included
Project 93	20	10	Duplex	Managed	Yes
MoCreebec Housing Rentals	14	8	Detached and Duplex	Owned	No
Ontario Aboriginal Housing (Moose Factory)	20	10	Detached	Managed	No
Ontario Aboriginal Housing (Moosonee)	27	0	Detached	Managed	No
Private and Moose Cree	?	5	Detached	Privately Owned/ Band owned	No

5.4.7 Sections

The questionnaire was divided into five sections. Section One gathered general information on the occupants and dwelling information. Section Two explored the cost of electricity for each household based on seasons. Section Three sought information on heating, lights and appliances of respondents. This consisted of questions related to primary and supplementary heating equipment as well as their use. In addition, this section explored the number and age of certain appliances, as well as information on lights and thermostats. Section Four explored daily occupant behaviour and energy conservation behaviour. The section sought to determine when certain activities were occurring throughout an average day in order to better understand energy use throughout the day. In addition, respondents were questioned on a number of different conservation behaviours to gauge awareness of energy conservation based on widely available resources, such as Hydro One's Tips and Tools to Save on Energy at Home and Conservation on the Coast's Energy Saving Tips (Conservation on the Coast, 2018b; Hydro One, 2018b). Section Five explored respondents willingness to shift their energy use based on three scenarios, and asked their preferred method of obtaining information on energy saving tips.

5.5 Conclusion

This chapter has outlined the methodology I applied throughout my research. It has presented and defined the PAR methodology and it was applied throughout the research process of this thesis. This has been demonstrated through the active involvement of MoCreebec in the co-development of research goals and questions that drive the findings of the thesis. Ethical considerations have been presented as well as how

anonymity has been used to protect participant identities. Finally, data collection methods were presented. Focus groups and questionnaires were implemented. Focus groups were used in order to explore community preferences for electricity generation technologies as well as preferences for desired qualities in an energy system. Questionnaires were used to better understand energy use and occupant behaviour in the residential sector.

Chapter 6 – Focus Groups: Preferences for Electricity Generation Sources and Qualities in an Energy System

6.1 Introduction

MoCreebec’s community energy plan outlined an energy vision and energy goals to guide future community energy planning. This chapter seeks to further define elements of the community’s energy vision and goals by exploring community preferences. The community’s energy vision identified certain preferences in an energy system, highlighting qualities such as “secure access to energy”, “wise use of mother earth’s resources”, and “self-sufficiency”. In addition, the community set a number of community energy goals, including Goal #5 that emphasizes the pursuit of renewable energy development to increase MoCreebec’s energy security and financial self-sustainability.¹⁹ I facilitated focus groups to better understand community preferences for different electricity generation sources and to gain a deeper understanding of the qualities specified in the CEP. In order to obtain a diversity of perspectives on these subjects, I sought participants based on different roles they played in the community and organized

¹⁹ Energy Goal #5: “to pursue renewable energy development where possible in order to increase MoCreebec’s energy security and financial self-sustainability”.

the focus groups accordingly. This provided an opportunity to hear a diversity of perspectives but also allowed some ability to compare these perspectives across different groups. By analyzing these different perspectives, I hope to further define community preferences for generation sources and identify desired qualities in an energy system in order to provide information that may be used to inform energy planning decisions that reflects the community's needs.

6.2 Approach

I facilitated the focus groups and moderated the discussion according to a structured questioning route. Keelia LaFreniere assisted with note taking and answering questions. The questioning route was divided into four main sections. The first section introduced participants to the topic addressing energy use in the home, and community energy-related issues (15 minutes); the second section explored perceptions and preferences for different electricity generation sources (20-30 minutes); the third section asked participants to describe desired qualities for a community energy system and rate the preferences for each quality (20-30 minutes); the fourth section asked participants to reflect and bring up anything they think may have been missed throughout the discussion (15 minutes). Each section is described in greater detail below.

Section One introduced participants to the discussion topic. I welcomed all participants to the group and explained the purpose of the research. I used this time to welcome questions about the research funding, ethical clearance, the research process, and what the information would be used for. I then began the discussion topic by asking participants to reflect on where they use the most electricity in their homes. The

discussion was then brought up to the community level and I asked participants to share what they think are the recurring energy-related issues in their community. Depending on time, the latter question was left out and I moved onto to Section Two.

Section Two sought to explore community perceptions and preferences for different electricity generation sources. Participants were asked to list different technologies used to produce electricity. I then asked if participants understood how each type of technology worked and the moderators provided a brief explanation if they said they did not know. The discussion was used to not only list different electricity generation sources, but also have a discussion around participants' perceived impacts of the technology. Once the groups had listed all of the technologies they knew, I gave participants three different coloured stickers that represented different preferences: green-most preferred, yellow-neutral, and red-least preferred. Participants were given three of each colour and were invited to rank the generation sources based on their preferences. I stated that voting was encouraged but not mandatory and not all stickers had to be used. Once voting took place, I invited participants to share how they voted and why. Focus was placed on the most preferred and least preferred items that had the most votes. Discussions concentrated more on perception of technologies rather than financial cost and feasibility.

Section Three sought to explore preferences for qualities in a community energy system. I used a hypothetical scenario to start the discussion whereby the community had the opportunity to design an energy system from scratch. Community members were then asked to describe what they wanted the energy system to be able to do and what benefits

they wanted it to provide. The discussion progressed in three phases: a brainstorming phase, a prioritization phase, and a finalization phase.

In the first phase, participants were asked to list desired qualities in an energy system (for example, reliable access to electricity or the ability to generate revenue for the community). In the second phase participants were asked to prioritize these qualities by only selecting five of them from the list and eliminating the remaining. I emphasized that the elimination of certain qualities did not signify they were not important nor unachievable, but that we were trying to determine which were the most important to them. In the third phase, the group voted on the remaining five qualities and discussed how they voted. To document the vote, I distributed two sets of coloured stickers that represented two preferences: green-primary preference and yellow-secondary preference. Participants were then invited to rank these qualities based on their preferences. This process produced a visual display of participants' preferred qualities and gave an opportunity to discuss the differences between why certain qualities were prioritized over others.

Section Four concluded the focus group session. Participants were asked to reflect on the discussion and share if they believed anything was missing from the session.

6.3 Analysis

Notes were taken during each focus group and each session was recorded to ensure accuracy. Abridged transcriptions based on these notes and audio recordings were created and then analyzed using NVIVO software, a program used to help organize and code transcriptions often used in qualitative research. All sources appear in the research as anonymous to protect participant confidentiality.

Voting and thematic analysis were used to gain specific insights into the data. Preferences were documented throughout the focus group discussions and clarified through prioritization and voting stages that took place at the end of each discussion on electricity generation and desired qualities in an energy system. These votes were used to document preferences expressed in each group. In addition, thematic analysis was applied to the transcriptions in order to understand themes related to the CEP.

Data was organized according to four main themes: autonomy, cost, sustainability, and reliability. These primary themes were anticipated based on community energy planning documents. I further explore how community members describe these themes and how they express their relative preferences for them through prioritization and voting exercises. Overarching themes that were used to code the data are described below.

Autonomy: Described as economic and social autonomy. These comments expressed the desire for the community to be economically self-sufficient and have greater control of decisions over their energy situation. This encompassed themes such as ownership, revenue generation/economic development, capacity building, and education/user awareness.

Affordability: The affordability of electricity and other energy sources used for power and heating in the MoCreebec community. These comments described the perceptions of affordability including, current and past issues with being able to financially afford electricity and what participants felt was an appropriate amount to be paying for electricity and energy sources used for heating.

Sustainability: The importance of how energy planning decisions could affect environmental and human health. This theme encompassed comments related to traditional land use, Indigenous spirituality, and the health of terrestrial and aquatic animals.

Reliability: The ability of the community to reliably produce and access power. Themes related to the community's ability to produce and access power even when affected by external events, and the ability of the community to always have reliable access to power.

6.4 Results

Results are presented by focus group, first according to preferences for electricity generation, and then by preferences for qualities in an energy system. The end of the section concludes with a presentation of the combined data from all groups. Generally, focus group data suggests solar, wind, and small-scale hydro²⁰ are the most preferred sources of electricity generation, while coal, nuclear, and large hydro are least preferred. Focus groups expressed a strong desire for greater autonomy or to have the capability and authority to address their unique energy issues as a community. “Autonomy” was expressed as the primary preference in Focus Group 2 and Focus Group 3. “Reliability” was the primary preference of Focus Group 1 while “Sustainability” and “Affordability” were the primary preferences of Focus Group 4. These observations were determined through discussion and voting that took place in each focus group. Although “Autonomy” was voted as the primary preference in two focus groups, the theme had a strong presence in all focus group discussions sending a strong signal that the community wants to take on a bigger role in energy planning.

6.5 Focus Group 1: MoCreebec Staff, Energy Auditors and Elders

6.5.1 Focus Group 1 Members

Focus Group 1 was conducted in Moose Factory and consisted of members at large. It included MoCreebec elders and staff from MoCreebec’s Departments. The Departments represented were the Department of Economic Development, the Department of Community Planning, and the Department of Housing. Representatives from the Department of Housing were trained energy auditors. Participants were between

²⁰ Small hydro was described in general terms and not in terms of generating capacity. Small hydro attributes included: minimal flooding and the absence of large dams/not stopping the flow of a river.

the ages of 35 and 79, an age group that makes up about 43% of the population (Statistics Canada, 2016).

6.5.2 Focus Group 1: Electricity Generation Preferences

Focus Group 1 participants indicated a desire for low-impact renewable electricity generation technologies while least preferred sources were perceived to pollute or to come with risks to environmental and human health and safety. Participants stated that solar, wind, and geothermal²¹ were the most preferred electricity generation sources. These sources aligned with preferences for “low-impact” generation or generation that was “least invasive on the land” that were identified later in the discussion (Russell, 2018a). Nuclear, propane/gas, and coal were identified as least preferred sources.

Participants perceived nuclear as “unsafe” referencing the Fukushima accident in Japan, while coal was associated with heating before the community was connected to the grid and local pollution (Russell, 2018a). One participant described that they used to see “miles of black snow” as they referred to the local pollution caused by the historic use of coal for space heating in the community; others agreed with this description (Russell, 2018a). No strong opinions were shared about why propane/gas was identified as a least preferred source.

Hydro, both small and large, as well as wood/biomass received the most votes as neutral options. Although the community has a history with large hydro, participants’ neutral stance was attributed to their current existence with hydro development. It is not

²¹ Geothermal was distinguished between methods used for heat production and methods used for electrical generation. The latter is not feasible in Moose Factory due to lack of available geothermal resources. Although efforts were made to distinguish the two concepts to participants, it is difficult to say with certainty that geothermal for heat production was always understood as the resource available in the area. Nevertheless, the connection between the desire for geothermal, understood as a resource with minimal environmental impact, and the community’s preference for low impact sources provides insights into the preferences of the community.

the number one choice, but it is already there and some people in Moose Factory (the Moose Cree First Nation) receive benefits from the expanded development on the Moose River (Russell, 2018a). Small hydro was viewed a little more favourably, however the majority of votes were allocated to the neutral category. In contrast, to the other perceptions, one participant described their strong negative perception of large hydro development. The participant cited the potential for human displacement and insufficient compensation for loss as their main reason to oppose large hydroelectric development. Wood/biomass was also viewed as a neutral resource and participants were curious about if it is feasible on a large scale. The participants' curiosity could indicate that the neutral votes were related to their lack of understanding of the resource. Figure 5 displays the results of the votes below.

Figure 5. Preferences for Focus Group 1 by electricity generation source.

6.5.3 Focus Group 1: Preferences for an Energy System

When asked to list desired qualities in an energy system, participants in Focus Group 1 contributed six qualities; these were limited to four when asked to prioritize the qualities (see Table 4 below for the list and the vote count). Participants decided that low-environmental and human impact (sustainability), cost for consumers, capacity building, and reliability were qualities considered to be the highest priority. When asked to distinguish these qualities by primary and secondary preferences, “Reliability” received the most votes as the primary preference. “Sustainability” and “Capacity Building” also received a number of votes as a primary preference. “Affordability” for consumers received the most votes as a secondary preference.

Results from Focus Group 1 show the importance of the themes “Reliability” and “Affordability” (see Table 4). For participants, reliability in an energy system and the ability to keep costs low were the most preferred qualities. As mentioned above, the community has historically faced reliability issues especially during times of severe weather conditions. Participants in Focus Group 1 clearly indicate that any system must not leave the community without power. Secondary to reliability, but nonetheless important, participants state the importance of keeping costs low for consumers.

Table 5. Preferences of Focus Group 1 by qualities in an energy system.

Quality	Primary Preference (Votes)	Secondary Preference (Votes)
Sustainable and Safe (low impact on the environment and the people)	3	3
Employment/Capacity Building/Education	3	4
Low Cost for Consumers	1	7
Reliability	5	4

6.6 Focus Group 2: MoCreebec Elders and Members at Large, and Town of Moosonee

6.6.1 Focus Group 2 Members

Focus Group 2 was conducted in the Town of Moosonee and consisted of “members at large” and external representatives. The session was held in Moosonee for two reasons: firstly, it ensured the inclusion of MoCreebec members living in the town in energy planning decisions; secondly, it was opened to representatives from the Town of Moosonee and businesses located on the Moosonee side. This decision was made by MoCreebec to engage not only with their members but also with the Town of Moosonee. The group consisted of MoCreebec members at large, a representative from the Town of Moosonee, as well as local business representatives. The group contained members from outside of the community, which makes it difficult to determine the proportion of participants that correspond to census data age brackets. Two MoCreebec staff organizers attended and participated in the discussion, however because they had participated in a previous focus group, their contributions have been omitted from the data. These individuals took place in the discussion however did not participate in voting. Some suggestions were provided by these participants, which were later voted on by the group. This affects the representation of the data, however every effort has been made to remove their contributions.

6.6.2 Focus Group 2: Electricity Generation Preferences

Participants in Focus Group 2 indicated preferences for generation sources with perceived limited environmental impact and listed coal as the least preferred source. One participant chose to only vote with neutral stickers during this section of the discussion. The participant claimed that more information was needed in order to have made an

informed opinion about which resource would be most or least preferred. The group as a whole indicated that solar, small hydro, and wind were the most preferred sources (see Figure 6 below for details). These sources were described as having “low or lower environmental impact” when compared to other sources such as fossil fuels (Russell, 2018b). Participants also mentioned that these resources could be easily adapted to the situation of remote communities due to the abundance of land and access to potential resources. One participant shared that they had seen a documentary where a remote cabin was powered by solar, wind, and river flow to illustrate the potential abundance of renewable natural resources (Russell, 2018b). Although wind was viewed favourably, it received one vote as least preferred resource. The participant shared their concern for the feasibility of installing the same size turbines as in the south. The participant identified lack of transportation infrastructure as being the main barrier to the adoption of the technology in the North, citing their experience in construction down south. There was limited discussion about neutral and least preferred resources.

Participants indicated that coal was their least preferred resource. When asked to elaborate, participants described the resource as “dirty” and that it produces greenhouse gas emissions. Safety of transportation, and the availability of these resources for the community also contributed to the negative perceptions. Natural gas and large hydro received the most votes as neutral resources.

Figure 6. Preferences for Focus Group 2 by electricity generation source.

6.6.3 Focus Group 2: Preferences for an Energy System

Focus Group 2 contributed eight qualities; of these eight, the group eliminated four in the prioritization phase (see Table 5 below). The group discussion focused around the theme of autonomy. One of the most developed conversations took place around the idea of an energy system that integrated electricity generation at the community level and household level; this was labelled “self-sustaining and localized design”. This was described as designing a community that could generate and utilize electricity as efficiently as possible. It included measures to reduce individual household electricity demand through conservation and energy efficiency measures, and small-scale generation. The idea was to remove some of the energy demand required by community production by shifting some production to the households or reducing demand through energy efficiency and conservation measures. The group also discussed ownership, technical capacity and the unique challenges posed by the remoteness of their

community; although the concept of ownership was appealing, there was concern over the technical capacity to be able to operate and maintain the system. The group decided that “self-sustaining/localized design”, “community ownership”, “low cost”, and “environmental sustainability” were the four qualities that should be considered the highest priority during the prioritization phase. “Self-sustaining and localized design” received the most votes as a primary preference, well beyond any other quality. “Environmental sustainability” received the most votes as a secondary preference. This quality was understood as the impact a new generation source would have on other peoples in the area, particularly that any project would have to be respectful of Treaty 9 territory communities.

Focus Group 2 indicated preferences for “Autonomy” and “Sustainability” (see Table 5). The group developed a multi-faceted idea for a system optimized for their local environment that would allow them to be self-sustaining. By identifying “self-sustaining and localized design” as their primary preference, participants in Focus Group 2 demonstrated the importance of “Autonomy” and outlined an aspiration of how this may be achieved. The group also raised the importance of “Sustainability” in terms of human and environmental health concerns. Participants sent a strong signal that they want self-sufficiency, but that this has to take into consideration neighbouring communities in Treaty 9 territory.

Table 6. Preferences of Focus Group 2 by qualities in an energy system

Quality	Primary Preference (Votes)	Secondary Preference (Votes)
Self-sustaining and localized design	6	1
Community owned or partnership if possible	0	7
Low cost of electricity and access to conservation methods	2	3
Environmental sustainability	1	10

6.7 Focus Group 3: MoCreebec Chief and Council

6.7.1 Focus Group 3 Members

Focus Group 3 was conducted in Moose Factory and consisted of decision makers. The group contained three councilors and the current Chief. The group represented individuals between 45 to 64 years of age a group that represents about 28% of the population (Statistics Canada, 2016). In addition, two MoCreebec staff organizers attended as observers but did not participate.

6.7.2 Focus Group 3: Electricity Generation Preferences

Participants in Focus Group 3 preferred sources that were perceived as clean, cheap and scalable, while least preferred sources were associated with safety issues. Multiple participants expressed concern that they did not have enough information to make an informed decision to vote on the options. The facilitator reiterated that the focus group is just a stage of the research and will not determine a system for the community solely on these results. Another participant decided to not use their least preferred

stickers, claiming that they did not have a strong negative opinion about any of the resources, instead the participant was most concerned about which resource had the most potential to be revenue generating.

Solar and wind were equally the most preferred choice, followed by small hydro. When asked about why solar and wind were preferred, participants described the resources as “clean” (low GHG emissions), and “cheap” (potential availability) fuels. Participants described how the potential scalability, and the ability to take advantage of long, sunny days in the summer made solar an attractive option. Although wind also received the most votes, there was hesitation towards the adoption of the resource. Participants viewed the resource favourably, however they wanted to know why wind was seeing resistance in the south of Ontario and in some prairie provinces. There was also concern for the safety of birds as the area is a major flyway for migratory birds. Another participant stated that they would be interested in learning more about the potential of the tidal resource in the area after learning about experiments in the Bay of Fundy. If the turbine could be taken out of the water during the winter and spring when the water freezes and breaks up, tidal could be a good energy source in the summer months. The group indicated a strong desire for renewable electricity generation sources over fossil fuel resources.

Least preferred resources were characterized by perceived human and environmental safety concerns. Although members of the group were concerned about safety, they expressed that they do not know enough about the resources to weigh the benefits against the risk. This was perhaps best exemplified in the discussion around nuclear. Participants indicated nuclear as one of their least preferred resources, however

throughout the conversation they sought to learn more about the resource to evaluate their perceptions. Participants asked questions about the safety of the resource to better understand why accidents occur and how they can be addressed. The group was especially conscious of risks associated with their remoteness. These safety questions were measured against potential benefits such as the stability of generation (reliability once a nuclear reaction begins) and low emissions associated with electricity generation. Additional questions about scalability (the advances in modular reactors) and the ability to deploy or take the source offline when generation was not needed further demonstrate the desire to learn more about all options at their disposal. Coal and large-scale hydro were also least preferred resources. The group viewed these resources as having negative impacts on environmental and human health. See Figure 7 below for a visual of compiled votes.

Figure 7. Preferences for Focus Group 3 based on electricity generation source

6.7.3 Focus Group 3: Preferences for an Energy System

Focus Group 3 participants contributed seven qualities; this was limited to five in the prioritization phase. Four of the five qualities expressed the theme of “Autonomy” being directly related to the ability of the community to be self-sufficient. See Table 6 below for a full list of qualities.

The Focus Group 3 identified the quality, “community owned/autonomy” as their primary preference. The group gives some insight into the community definition of “Autonomy” as it was directly related to community ownership. This desire for autonomy could be related to feelings of mistrust with the management of electricity planning by Hydro One especially as it related to changing electricity rates that have a direct and profound impact on remote consumers. Participants expressed the need for ratepayer

consultation before electricity rates change. Changes to electricity prices may have greater impacts on remote communities because they rely on electricity to meet their space heating needs, and it is unfair that they are not engaged in the process. There was also a feeling of being treated unfairly, with one participant expressing their belief that “Northern Ontario is always on high peak” pricing (Russell, 2018c). This was coupled with perceptions that rates changed during the expansion of capacity in the Lower Mattagami hydroelectric project. One community member asserted that rates were raised during the construction of this project and that communities were not adequately compensated. The participant insisted that consumers need to be made aware of when rates are going to be changed, other participants agreed that consumers have little say in the cost of the service, but do not have a choice but to accept what they are given.

“Revenue generating/revenue sharing” received the second most votes. Again, subjects related to the theme “Autonomy” came up during the discussion. Participants discussed how energy-related decisions were made without community involvement, but they have to pay regardless. Participants expressed the desire to have a system where they could provide for their own electricity needs and no longer have to rely on Hydro One. They suggested that this system could be community owned or a partnership that would create jobs for the community, which would help the local economy. Participants also expressed that it would be ideal if they could generate surplus electricity so that it could be sold back to the grid as this could provide another means of income for the community.

“User awareness” was identified as the secondary preference. “User awareness” was defined as the community’s ability to educate community members on their role as

energy consumers. Participants demonstrated an understanding that community members need to be more aware about how they are using electricity in order to make decisions that could help save them money. For participants, this knowledge would help empower community members to take more control of their energy consumption and possibly lessen the burden of the cost of electricity to the community.

It is worth noting that reliability did not come up as a standalone topic in Focus Group 3 until the facilitator brought it up during the conclusion section of the discussion. This is not to say that reliability was not an important theme. Participants discussed the idea that electricity should be considered a basic need as part of shelter in Maslow's hierarchy of needs. The group also reflected on growing up without power when they were younger. Participants stated that although they grew up without electricity, and they do not remember needing it, now they could not foresee living without it. This suggests that reliable access to electricity is assumed to be a necessary quality in any future energy system.

Focus Group 3 identified "Autonomy" as a key theme in the discussion. The group expressed the desire for community owned generation that could be used as source of income and to eliminate their reliance on Hydro One for the delivery of electricity. This discussion added some valuable insight into the perception of how the community views the current process of setting electricity prices or developing new generation projects. The group described the current process as one that does not have the community's best interest in mind, or at the very least, has not been considerate of their unique needs as a remote community. This has led to a feeling of mistrust of Hydro One

as the primary entity the community interacts with for its electricity. The discussion also shed light into the perception of how rates are set and how the grid operates.

Participants felt that remote communities are not adequately consulted when electricity rates are changed. They felt that because their situation is very different from southern communities (i.e., relying entirely on electricity to meet their space heating needs), they should have a chance to input into the decisions being made. Participants gave examples to illustrate how unaffordable electricity became in the community citing that one community member was paying \$1800-\$2000 a month for electricity and that several community members wrote to Chief and Council about help to pay for their electricity costs. Participants clearly expressed that there is little opportunity for remote communities to meaningfully input into price and rate changes. They stated that they have no choice but to accept what rates they are given and not enough is being done to understand how changes to the cost may affect their community. The group also discussed their views on the Lower Mattagami expansion. They attributed the rise of electricity rates with this expansion project in particular. This association may be due to the proximity of the Lower Mattagami facility to the community. MoCreebec is not a partner in the expansion, unlike their Moose Cree neighbours, however they have to live with the effects downstream just the same. Overall, the discussion provided some unique insights into some of the broader community perceptions. See Table 6 for a list of qualities discussed.

Table 7. Preferences of Focus Group 3 by qualities in an energy system

Quality	Primary Preference (Votes)	Secondary Preference (Votes)
Community owned/Autonomy	4	0
Cost/Affordability	2	2
User Awareness/Education	1	3
Revenue Generating/Revenue Sharing	3	1
Capacity Building	0	2

6.8 Focus Group 4: MoCreebec Youth

6.8.1 Focus Group 4 Members

Focus Group 4 was conducted in Moose Factory and consisted of youth members at large. This group included four participants, all under the age of 30. The group contained individuals aged 15 to 29, a group that represents about 28% of the population. Two MoCreebec staff organizers attended and provided some comments throughout the discussion, but did not vote. This does affect the representation of the data, as the larger group voted on some of the suggestions. Every effort has been made to omit these comments and represent the discussion of the target participants.

6.8.2 Focus Group 4: Electricity Generation Preferences

Participants in Focus Group 4 displayed preferences for generation sources that were perceived as having few negative consequences for human and environment health and in contrast, the sources that were perceived to have the most negative consequences to these values were viewed as the least preferred sources. Focus Group 4 indicated that wind was the most preferred resource, followed by solar. To the group, these technologies were described as easily accessible, abundant, and natural, as well as having few to no negative consequences for the environment or people. The group viewed these resources as favourable when compared to resources that were perceived to have negative environmental impacts such as fossil fuels that have to be mined. Although fossil fuels were used to illustrate negative impacts on the environment, large hydro was selected as the least preferred resource. Participants perceived large hydro as having negative consequences for both animals and humans, due to widespread flooding. The group elaborated on their concerns for human health by explaining that flooding can negatively affect indigenous traditional ways of life especially when they flood traplines. Participants also stated that the widespread damage of the environment due to flooding could harm the spiritual relation Indigenous People have with the land and water, in turn the damage to this relationship can harm human health. See Figure 8 below for votes for Focus Group 4.

Figure 8. Preferences for Focus Group 4 based on electricity generation sources

6.8.3 Focus Group 4: Preferences for an Energy System

Focus Group 4 contributed five qualities (see Table 7 below). The discussion focused primarily on themes of “Affordability”, “Sustainability” and “Autonomy”. The group discussion also offered some insight into the need to support community members in better understanding electricity use within the community.

The group identified “cost/affordability” and “environmentally friendly” equally as their most preferred preference. The theme of “Cost” arose frequently as a problem for the community throughout the discussion. Participants described that increases to electricity prices can significantly affect them because the cost of living in remote communities is already high. Reliance on electricity to meet their space heating needs and lack of access to other heating alternatives also affects their ability to reduce their consumption.

The group discussed how cost to individuals could be reduced through conservation as well as the difficulty in altering certain energy-use behaviour. A participant expressed the futility of keeping electricity expenses down, especially in the winter, when they stated, “sometimes it feels like there is not much people can do to keep costs down. You need to stay warm in the winter” (Russell, 2018d). When asked if they believe the community is conscious about energy conservation, the group felt that people knew about ways to save energy. Participants cited unplugging appliances when they are not in use, turning off lights and baseboard heaters when vacant from the room, and doing laundry after 7:00pm when it is “cheaper” (Russell, 2018d). However, the group still felt that these actions were not enough to decrease expenses. In response to these comments, a participant suggested that more feedback on energy-use could help community members make more informed decisions about how they use their energy. The suggestion was placed as a stand-alone theme, however was cut during the prioritization phase. Nonetheless, it points to the perceived lack of available tools to better understand energy consumption and the role they could play in helping people make informed conservation decisions, or decisions to shift certain activities. “Sustainability” was also a recurring theme, and the group indicated that a system that was “environmentally friendly” received equal votes to an energy source that could provide affordable prices to community members.

Focus Group 4 participants stated the importance of an energy system that is “environmentally friendly”. The group discussed how the land and its resources hold a special significance for Indigenous Peoples. Although the damages from fossil fuels were discussed in relation to mining and processing, much of the discussion focused on the

resulting damage from flooding due to large hydroelectric facilities. One participant expressed doubts that historic and current electricity generation gave adequate thought to the environment before being constructed. Participants agreed the theme “Sustainability” needs to be included when developing an energy system for the community. The theme of “Autonomy” was also relevant to the discussion.

The group chose “capacity building” as their secondary preference, expressing a desire for greater autonomy. Participants discussed that it would be important to ensure opportunities are available to build capacity in the community “no matter which energy system is chosen” (Russell, 2018d). The group suggested that locals should be trained in relevant skills prior to the development of a generation source. This way, capacity could be built in the community in preparation for taking over operations or merely to lessen the reliance on outside expertise to address issues with their system.

Focus Group 4 identified themes of “Affordability”, “Sustainability” and “Autonomy” throughout the discussion. The group discussed how they feel vulnerable to increases in electricity prices because of their reliance on electricity to meet their space heating needs and the already high cost of living in Northern Ontario. They mentioned that it would be useful to have a tool that provides feedback on energy use so that occupants could make more informed decisions about energy use, but they also expressed the perceived futility of certain conservation measures due to their cold climate. Environment was a prominent theme throughout the conversation as participants’ highlighted Indigenous Peoples relation to the land, and the need to incorporate the environmental impacts in decision- making. Lastly, participants discussed the importance of autonomy. They recognized that the community may not have all the capacity needed

to be completely self-sufficient, but this should not stop them from pursuing training that could help the community lessen its reliance on outside expertise. The group discussion also led to some insights on the perception of electricity generation and the Ontario grid.

The group made links to hydroelectric generation in many of their comments. Their proximity to Otter Rapids generating station and their knowledge of Québec's hydroelectric developments could have shaped the perception that hydroelectricity provides most of their power. One participant associated electricity from hydroelectric generation with higher electricity costs and asked if electricity from Otter Rapids generating station was being sold to the U.S. It is unclear what led to this perception but the comment does show that individuals in the community may feel like the benefits from these projects are not going to them even though they feel like they have to live with some of the negative consequences such as flooding or concern for eating fish from the river. See Table 7 below for qualities discussed in Focus Group 4.

Table 8. Preferences of Focus Group 4 by qualities in an energy system

Quality	Primary Preference (Votes)	Secondary Preference (Votes)
Cost/Affordability	4	0
Environmentally Friendly	4	0
Offer training so that the community members can work and maintain their own system.	0	4

6.9 Discussion: Results Compiled

6.9.1 Preferences for Electricity Generation Sources

Concern for the impact generation sources would have on the environment and human health were a common theme when discussing preferred electricity generation sources. All groups raised and cited sustainability as a concern when discussing both most preferred and least preferred options. Environmental concerns were cited as both their impact on the immediate environment and GHG emissions. This could indicate a strong preference for sustainability when considering future energy options for the community both in terms of local impact and wider impact for the climate.

Results compiled from all focus groups indicate that solar and wind were the most preferred sources of generation. Over 50% of votes for most preferred sources of generation were attributed to one of these resources. Groups described these resources as having little impact on the environment (in terms of GHG emissions and local pollution) and human health, as well as described them as accessible, scalable, and cheap. After these types of generation, small hydro was the most preferred. Preference for small hydro was due to the community's proximity to water resources and like solar and wind, it was perceived as having little impact on the environment, especially in contrast to large hydro. In general, community members pointed to the environmental benefits of these resources, citing that they had low impact on the natural environment and human health. Solar was also described as scalable and well suited for the area; it could be used at the individual household level or scaled up to community-wide generation. Due to the community's northern location, they are well situated to take advantages of the plentiful solar resource during long summer days. This could indicate that environmental

considerations will be an important consideration when moving forward with any type of generation source in the area. In addition to these discussions, participants in Focus Group 2 and Focus Group 3 raised their concern that more information was needed about each generation source before they could adequately state their preference. Participants in Focus Group 3 also mentioned that they would be more concerned with which resource has the most potential to make money. These provided additional considerations to the overall discussions when choosing a most preferred energy source.

Generation sources most voted as “least preferred” in order of votes were: coal, nuclear, and large hydro. Groups described coal as dirty, both in terms of local pollution and GHG emissions, and described nuclear as unsafe. Although large hydro received many votes as “neutral”, it was also associated with destructive environmental impacts. Groups were conscious about how the construction of dams and flooding could affect the environment and how people use the land. In one focus group, a participant connected the damage associated with large hydro as having not only negative consequences to the environment but to human health through Indigenous Peoples’ spiritual relationship with the land. Again, a common theme when discussing least preferred options was the impact the sources had on the environment and human health. The discussion around coal generation sources also discussed GHG emissions, which indicates a concern for the larger implications of climate change and not just a concern for the local environment.

Generation sources most voted as “neutral” were natural gas, large hydro, and biogas (in order of most votes). See Figure 9 below for compiled results by generation source.

Figure 9. Combined focus group preferences based on electricity generation sources

6.9.2 Primary Preferences for an Energy System

Focus groups suggested numerous preferred qualities for an energy system. These qualities spanned the pre-determined research themes and added greater depth to their definitions. The focus groups were conducted with different strata of the community population. Distinctions were made between “decision makers” and “members at large”. Three focus groups were conducted with “members at large”, and one was conducted with “decision makers”. See Figure 10 for a visual comparison of focus group primary preferences. A summary of each focus group is described below.

Focus Group 1

“Reliability” emerged as the primary preference in Focus Group 1. Focus Group 1 participants were considered “members at large” and held two distinct roles in the community. Participants in this group consisted of elders and MoCreebec staff, including energy auditors. The group combined elders, who hold traditional knowledge, and

MoCreebec staff, who have specialized knowledge of energy issues and government functions in the community. Focus Group 1 rationalized that secure production of energy and reliable supply to community members should be the fundamental quality of an energy system. Motivated by the ability of the community to have access to energy even in extreme weather conditions, this group highlighted the importance of a resilient system that would not leave the community without access to electricity.

Focus Group 2

“Autonomy” was the primary preference in Focus Group 2. The group consisted of “members at large”, and represented the most diverse group of participants, as well as the greatest number participants. Participants in this group operate a number of roles within and outside of the community. They ranged from elders, who hold traditional knowledge, to specialized expertise from the Town of Moosonee and other businesses in the area. The theme of “Autonomy” manifested in the quality “self-sustaining and localized design”. The group described this quality as a holistic approach to energy development where houses would be designed to minimize some of their own energy demand through conservation as well as their own generation. These developments should be made alongside the development of a local electricity generation system.

Focus Group 3

“Autonomy” emerged as the primary preference for Focus Group 3. The group consisted of the Chief and three councillors, or representatives of the community’s official “decision makers”. Focus Group 3 created a direct link between autonomy and ownership. The group discussion demonstrated that they felt their interests or concerns

were not represented in the current energy system and the only way to alter this would be to have direct control.

Focus Group 4

“Affordability” and “Sustainability” were the primary preferences of Focus Group 4. The group consisted of “members at large” represented by community youth, or community members under 30. Participants identified “Affordability” as an important quality due to the already high cost of living in Northern Ontario and the difficulty in conserving energy because of electric heating. “Sustainability” was also identified as a primary preference. Participants called for greater environmental considerations when developing energy sources; they highlighted that this was especially important for Indigenous Peoples because of their relationship with the land.

All Groups

Although the theme “Reliability” only came up as a primary preference in Focus Group #1, it would be unwise to dismiss its relevance in the broader discussion or to assume a trade-off between reliability and other themes. Discussions often related to reliability of electricity, especially when referencing past energy issues. Although reliability may have been an issue historically, it is hard to say how relevant it still is today. Participants in Focus Group 3 may help provide insight in this issue. One participant described how access to electricity should be understood as a basic need under Maslow’s hierarchy of needs. This could be understood that reliability is assumed to be a basic function of whatever system is chosen and thus, is not a standalone quality.

Figure 10. Comparison of primary preference votes between the four analytical themes

6.9.3 Secondary Preferences for an Energy System

Secondary preferences add another level of depth to understanding preferences and priority setting in the community. It provided an opportunity for participants to describe why certain preferences were prioritized over others and allowed me to further compare between groups. Secondary preferences by focus group are described below and are displayed in Figure 11.

Focus Group 1

Focus Group 1 identified “Affordability” as their secondary preference after “Reliability”. Participants showed the significance of having reliable access to electricity; this was further demonstrated in their secondary preference of “Affordability”. It is one thing to be able to produce electricity reliably, and another for community members to be able to afford it. Focus Group 1 identified that accessibility of electricity was of

fundamental importance to them demonstrated by their emphasis on “Reliability” and “Affordability”.

Focus Group 2

Focus Group 2 overwhelmingly chose “Sustainability” as their secondary preference. The group introduced the concern of treaty rights into the discussion. Participants stated that any energy system would need to take into consideration how development would affect neighbouring Treaty 9 communities. This point acknowledged the impact any development would have on the land in Treaty 9 territory. This was the only group that specifically referenced this as a standalone concern.

Focus Group 3

Themes of “Autonomy” were identified as both primary and secondary preferences for Focus Group 3. Their primary preference was “community ownership/autonomy” while their secondary preference was “user awareness/education” to empower residents to make more informed decisions about energy use to cut down on costs. This group expressed the desire for greater control over their energy situation, both at the community level and at the level of households. For a focus group that contained decision makers, they sent a strong signal that greater control and self-sufficiency is their preference.

Focus Group 4

“Autonomy” was identified as the secondary preference in Focus Group 4. They expressed their desire for greater autonomy through capacity building. Participants stressed that no matter what system is chosen, there should be opportunities for locals to gain new skills.

Figure 11. Comparison of secondary preference votes between the four analytical themes

6.10 Other Insights

Focus groups provide important insight and data, and although the information above represents what information I was directly looking to measure, the groups provided much more information that adds depth to the research. Throughout the discussion, the groups provided insight into participants' opinions and understanding of energy-related issues. The discussions showed a desire to better understand energy systems. Participants highlighted this when they expressed their concern for rating their preferences for different electricity generation sources. The groups also explored the mistrust of development, especially when it occurs close to, or could have consequences for the community (Lower Mattagami expansion). Participants also demonstrated their curiosity with electricity rates and the transmission of electricity. For example, some asked if local

wind or solar generation would be cheaper than their current rates while another participant asked if electricity from Otter Rapids was specifically being sold to the US. Food security was also brought up in the businesses focus group. Unfortunately not enough participants were available to meet the focus group threshold, however the participants did discuss the role of affordable fuel sources and food security. To this group, energy was more than the generation of electricity but included the price of transportation fuel, which affects the price of food and other goods that are transported from the south. Food security through locally harvested food was not discussed. A number of groups also discussed the importance of information to understand electricity use, acknowledging that community members themselves also have a role to play in keeping costs down.

Groups brought up recurring themes, however there may be tensions between preferences and what is economically and technologically feasible. The theme autonomy and affordability was common in the group discussions, however most groups expressed preferences for renewable energy. A tension might exist between the community's desire for renewable energy, autonomy and affordability. Depending on technology feasibility (e.g., renewable energy), and priorities (e.g., financial self-sufficiency), the community may find that their most preferred technologies are not the most feasible for their goals. This tension will need to be explored in the future when the community begins economic and technical feasibility studies of potential resources. Overall, the groups provided a wealth of data and insight into community perspectives on energy-related issues that would have been difficult to gather with other methods.

6.11 Conclusion

This chapter has presented the information gathered from the focus group sessions. It explored community preferences for different types of electricity generation as well as preferences for aspects of an energy system. The data was presented by focus group and combined results to draw similarities and comparison between the different groups. This allowed for specific members of the community to have their input incorporated as stand alone data. All focus groups stressed that northern communities have unique needs that differ from the south and that this needs to be reflected when discussing energy issues. The theme of “Autonomy” was consistently brought up throughout the discussions, which aligns with the CEP’s energy vision and goals. It is also apparent that autonomy was related to mistrust of how energy decisions have historically been made from outside of the community and with little meaningful input from the community.

Chapter 7 – Energy Cost and Occupant Behaviour in the Residential Sector

7.1 Introduction

The CEP gives a high-level overview of community energy consumption. It identified the residential sector as the largest consumer of energy for the community and the source of the majority of the community’s energy-related costs. The CEP also provided a breakdown of this energy use in the residential sector based on end-use. The breakdown is as follows: 57% to meet space heating needs, 28% to meet hot water needs, and 15% to meet the needs of lights and appliances (MacLeod Farley & Associates,

2015). Although they have data on energy end-use, the data is made up of eight duplexes where occupants do not pay for their electricity directly, one housing unit powered by wood, the Cree Village Ecolodge, and the community office building. The community does not have data available about the cost across different housing units or how the behaviour of occupants contributes to this energy use by time of day and season. The questionnaire provides a better understanding of the cost of energy, occupant behaviour across different MoCreebec owned/managed units as well private units in order to explore the feasibility of energy consumption shifting and the potential of net metering for the community. The information presented below is the first time information was collected in this detail across the different housing types in the community.

These insights could be used to inform conservation and efficiency recommendations for the community and to determine how demand-side management could balance better with local supply. The breakdown of housing units surveyed is as follows: 31% from Project 93, 24% from MoCreebec Rental, 30% from ON Aboriginal and 15% from Private and Moose Cree units.

7.2 Methodology

7.2.1 Survey Sections

The questionnaire was organized into five different sections. Section One sought to determine occupancy and dwelling information. Section Two addressed the cost of energy. Section Three addressed heating and appliances/lights profile. Section Four examined occupant behaviour and awareness of conservation measures. Section Five explored preferences for demand switching and occupants preferred method of obtaining energy information tips. The questionnaire consisted of 33 questions.

7.2.2 Survey Administration

The majority of questionnaires were delivered to subjects at their dwelling and gathered at a later date. In some instances I was able to administer the survey directly, which allowed me to clarify questions participants had about the survey. However most respondents preferred to complete the survey on their own time, and then requested that I pick them up at a later date. This approach allowed for the greatest flexibility to accommodate the respondents' schedules and assured that a high number of surveys were completed. It should be noted that although this accommodated respondents' schedules I was not able to provide clarity if survey questions were unclear to respondents.

7.3 Presentation of Results

Results are presented in five sections: occupant information, cost of energy and heating equipment, lights and appliances, energy behaviour, and preferences for demand switching. These results are contrasted between the different housing types to draw preliminary comparisons between the different groups. As noted above, residents have different occupation modes (privately owned and rental units) as well as payment arrangements. The presentation of results explore more specific questions as they relate to different groups within the residential sector and allows some ability to compare between them. This adds greater depths to the understanding of the overall energy situation of the community.

It is important to remind the reader that the sample is not representative and thus should use caution when interpreting the results. This is particularly important to remember when comparing subsets of questions and across the different housing types as

the sample could be made up of as few as five respondents (i.e., the Private and Moose Cree sample).

7.4 Occupancy and Dwelling Information

The majority of respondents to the questionnaire (83.87%) were tenants. 31% of total respondents were from Project 93 units and therefore pay a flat fee for electricity depending on the number of bedrooms (\$61 per month for a three bedroom and \$66 for a four or five bedroom dwelling). The majority of occupants had been living in their dwelling under ten years, with 46.8% of total respondents living in their dwelling for under five years (see Figure 12 below). The average occupancy rate was 3.8 persons; a quarter of total responses were dedicated to two, four, and five occupants respectively (see Figure 13). Respondents indicated that the largest individual age group living in these residences were under 12 (21.11%); this was followed by the age groups of 21-30 (15.56%), and 31-40 (13.33%) (see Figure 14). This roughly corresponds to 2016 census data age brackets for the southern portion of Moose Factory that states individuals fourteen and under make up 24% of the population, while individuals fifteen to sixty-four make up 66% of the population (Statistics Canada, 2016). In total, most respondents indicated that there is an individual home on an average weekday (51% of respondents). This number varies across the different units. Project 93 units and Private and Moose Cree units reported the highest occurrence of individuals home during the day at 60% (see Figure 15).

Figure 12. Length of time (years) occupants have been living in their current dwelling by housing type

Figure 13. Number of occupants by housing type

Figure 14. Housing demographics by age and housing type

Figure 15. Dwellings occupied on an average weekday by housing type

7.5 Space Heating Energy Source, Equipment and Costs

This section presents survey data on space heating energy sources, space heating equipment and costs of energy in different households. It confirms the findings of the CEP that the majority of households (91%) rely solely on electricity to meet their space heating needs (Figure 13). The data also shows that MoCreebec Rental units and Private and Moose Cree units are more likely to have supplementary heating equipment powered by wood than Project 93 and ON Aboriginal units. This section also presents reported

seasonal costs by housing type, and although a small number of units reported high costs of electricity in the winter and spring, it does not seem to confirm the assertion in the CEP that electricity bills “\$900 or more a month...are commonplace” (MacLeod Farley & Associates, 2015). Results are presented by section below.

7.5.1 Space Heating Source and Equipment

This section presents reported space heating energy source and space heating equipment in different households. The majority of respondents (91%) depend on electricity to heat their homes (see Figure 16). These respondents indicated that they have either forced air furnaces, or electric baseboard heaters to provide more than half of their space heating needs (see Figure 17). The remaining 9% reported that they rely on wood (6%) or did not know their fuel source (3%). Electric heating equipment varies most with MoCreebec Rental units and Private and Moose Cree units. 14% of the MoCreebec Rental sample and 16% of the Private and Moose Cree sample reported that they use wood as their primary fuel source. These units represented the highest percentage of non-electric heating equipment in all surveyed households.

The use of supplementary heating systems varied between housing unit samples. When asked about supplementary heating systems, 41% of respondents replied that they do not use one (see Figure 18). When broken down by sample, 80% of ON Aboriginal units and 55% of Project 93 units responded that they do not use supplementary heating equipment, compared to only 29% for MoCreebec Rental units, and none for Private and Moose Cree units. In ON Aboriginal and Project 93 samples, respondents stated that portable space heaters were used exclusively, with the exception of one respondent who uses an electric fireplace. In contrast, the supplementary heating equipment in

MoCreebec Rental and Private and Moose Cree samples were mostly wood stoves. The sole reliance of electricity to meet space-heating needs for ON Aboriginal and Project 93 units may make these units particularly vulnerable to issues described in the CEP such as electricity power interruptions or high electricity cost, while MoCreebec Rental and Private and Moose Factory units may have more flexibility to switch fuels. These units however may have the highest incentive to supplement or switch because those that use electric baseboard heating have an inefficient heating source. For ON Aboriginal units, whose tenants pay for electricity, reliance on one source also limits their ability to shift to other heating options if electricity prices become unaffordable; this would not affect Project 93 tenants as they do not pay for electricity.

Figure 16. Primary fuel source by house type

Figure 17. Primary heating equipment by house type

Figure 18. Supplementary heating equipment by house type

7.5.2 Thermostats

Thermostat capabilities and their proper use can allow an occupant to adjust dwelling temperature to varying degrees of accuracy and save energy and costs. Some estimates cite that the proper use of thermostats could save occupants between 5-15% of annual heating and cooling costs (Peffer et al., 2012). Misunderstanding of proper use of programmable thermostat settings and lack of knowledge of residential heating and

cooling systems have been attributed to this misuse (Peffer et al., 2012). Identifying what type of thermostat the occupant is using is the first step in being able to understand its proper use and limitations.

A total 15% of respondents indicated that they did not know what type of thermostat they had in their dwelling (see Figure 19). These results were concentrated in ON Aboriginal units (29%) and Project 93 units (15%). In addition, responses from these units spanned all options, which could indicate uncertainty with their decision or lack of clarity with the question. In contrast, MoCreebec Rental and Private and Moose Cree samples had more consistent responses. The majority of MoCreebec Rental units (60%) responded that they had non-programmable thermostats while Private and Moose Cree units reported the highest number of programmable thermostats (75%). When respondents were asked if they had thermostats in every room, the majority of responses (75%) indicated that they did not (see Figure 20). The remaining 25% were all concentrated in MoCreebec Rental units probably due to electric baseboard heating.

Figure 19. Types of thermostats used presented by combined responses and by housing type

Figure 20. Percentage of responses with thermostats in each room presented by combined responses and by house type

7.5.3 Cost of Energy

The above section discussed the space heating equipment and the sources of power for the surveyed population, this next section explores the cost of energy associated with the sample's space heating needs and other energy needs. The presentation of results first begins with a brief discussion on those units that do not rely on electricity to meet the majority of their space heating needs. The CEP had the least information on these units, which makes them a good starting point to discuss the cost of energy. In the absence of access to electricity bills, respondents were asked to estimate their cost of electricity per month by season.

Most respondents reported that they relied on electricity to meet most of their space heating needs; however there is a small subset of the sample that indicated they used wood as their primary heating equipment. All responses from this subset are concentrated in the Private and Moose Cree, and MoCreebec Rental units and the number of responses is very small which makes it difficult to compare with other units. The Not Applicable (N/A) option was included in the questionnaire in an attempt to capture the

whole sample which would have provided greater context to these small subsets, however, respondents usually left questions blank that were not applicable to them. Results are reported below and they show a maximum winter cost in the \$801-\$1000 range per month for the Private and Moose Cree sample while the maximum in the MoCreebec Rental sample reaches a winter maximum in the \$501-\$800 range. Again, these results should be interpreted with great caution, but it is clear, further research is needed to compare costs between those that rely on electricity to meet their space heating needs and those who do not.

The majority of respondents (91%) of respondents reported that they rely on electricity to meet more than half of their space heating needs (Figure 16). The results of the associated costs are the subject of this discussion. Around 25% of respondents, or roughly the percentage of respondents who live in Project 93 units, have electricity included in their rent and do not pay directly for their electricity; they are not included in this analysis. These units pay a flat rate, depending on the number of bedrooms in their dwelling. Another small proportion of MoCreebec Rental units, and Private and Moose Cree units (6% of total surveyed units, Figure 16) indicated that they primarily use wood to meet their space heating needs, however the sample is too small to make comparisons with the cost of energy for the other units. The remainder of the units are responsible for paying for the full cost of electricity for space heating. This section will first present the combined overall results and then present the reported costs of the MoCreebec Rental, ON Aboriginal, and Private and Moose Cree subsets.

7.5.3.1 Cost of Energy Results Combined

Results show that nearly half of respondents perceived their electricity bills to be below \$500 per month in the summer, fall, and spring seasons. Between 44%-52% of respondents estimated that their monthly electricity bills are in the \$201-\$500 range for summer (44%), fall (52%) and spring (48%) seasons, although there are outliers below and above this range (see Figure 21). In the winter these estimates increase. Estimates for monthly winter bills are mostly in the \$501-\$800 range (30%) followed by the \$201-\$500 range (23%). However, 17% of respondents also indicated that they may pay between \$801-\$1501 per month in the winter which should raise some concerns. It is important to remind the reader that the sample is quite small, however costs this high are well beyond what is considered normal in less remote locations (Environmental Commissioner of Ontario, 2018). To better understand how these responses are spread out among the different housing types, these responses are explored in greater detail below.

Figure 21. Combined results of estimated monthly electricity expenses by season

7.5.3.2 Cost of Energy Results by Housing Sub-Sample

The results indicate that the most variation between units occurs during the winter months. Presenting results by housing sub-sample can show where there are variations, if any, between housing types. Before interpreting these results I would like to remind readers that the overall sample was only 33 units and that breaking them down into sub-samples could result in a sub-sample containing only five responses, in the case of the Private and Moose Cree sub-sample. The results below help increase the understanding of variation between units, but must be interpreted with caution.

In the summer, the sub-samples do not deviate from the combined results; most respondents estimated their bills are under the \$500 range (see Figure 22). Some respondents indicated that they pay under \$200 during these months, notably 35% of ON Aboriginal respondents selected this range, followed by fewer of the other units. There are outliers however, one can see that MoCreebec Rental (13%), and Private and Moose Cree (20%) samples were responsible for reporting ranges in the \$501-\$800 range. Responses from these units were responsible for the dramatic outliers in the other seasons as well.

Figure 22. Estimated monthly electricity bills by month in the summer, by housing sub-sample

The majority of estimated monthly bills in the fall remain under \$500. However ON Aboriginal (20%) reported bills in the \$501-\$800 range, while again MoCreebec Rental, and Private and Moose Cree units, deviate into the higher ranges (see Figure 23). 13% of MoCreebec Rental units and 20% of Private and Moose Cree units perceived that their bills were in the \$801-\$1000 range for the fall season. These outliers remain constant in the winter season results as well.

Figure 23. Estimated monthly electricity bills by month in the fall, by housing sub-sample

The winter season saw the greatest variation between sub-samples. The MoCreebec sub-sample (60%) perceived they pay within the \$501-\$800 range (see Figure 24). This is more than the other housing units where 50% of ON Aboriginal believed they were paying within the \$201-\$500 range along with 40% of the Private and Moose Cree respondents. Increase in reported costs also appear in the ON Aboriginal unit responses as well as. 10% of the ON Aboriginal units report costs in the \$801-\$1000 range and another 10% report bills in the \$1001-\$1500 range. The Private and Moose Cree sample also reported higher costs overall in the winter as well. Again, the most dramatic outliers came from the MoCreebec Rental (13%) and Private and Moose Cree (20%) samples that stated their winter bills are over \$1501 per month.

Figure 24. Estimated monthly electricity bills by month in the winter, by housing sub-sample

In the spring months, the sub-samples converge again. Most units in the spring reported paying in the \$201-\$500 range (see Figure 25). While the majority of respondents indicated bills between the abovementioned range, 25% of MoCreebec Rental and 20% of ON Aboriginal respondents reported bills within the \$501-\$800 range. The only significant variation to these results is from the Private and Moose Cree sample where 20% of respondents estimated they were paying within the \$1001-\$1500 range.

Figure 25. Estimated monthly electricity bills by month in the spring, by housing sub-sample

Breaking down the results by sub-sample helps identify variations between housing units, and helps further address Research Question #3. From the presented results, it is clear that throughout the seasons, most respondents indicate that they perceive they are paying between \$201-\$500 per month annually. This increases slightly in the winter months especially in the MoCreebec Rental sample where results show a significant shift from the \$201-\$500 range in the fall (75% of respondents), to the \$501-\$800 range in the winter (63% of respondents). It has also shown that there were consistent outliers in the MoCreebec Rental, and Private and Moose Cree samples. These outliers always remained at the same percentage of respondents across seasons. Although results indicate that most respondents estimate they are paying a consistent amount annually, some respondents estimate that they are paying much more, especially during the winter months. These results are compiled estimates, so it is difficult to confirm these responses, however it could indicate that there are households in the community that still pay absurd amounts to heat their homes. I obtained TOU data from 16 Project 93 units

for one year (2017-2018) that allows me to make some comparison to these estimates. On average, electricity costs were above \$200 from November to April, peaking in December (\$290) and January (\$309). The shoulder months of October (\$138) and May (\$153) were the next most expensive. Finally, from June to September, bills hover just above or just below \$100.

7.6 Lights and Household Appliances

According to the CEP, lights and appliances make up approximately 28% of home energy use; this represents the second most significant source of energy costs after space heating. This next section explores results from the questionnaire to better understand the lights and appliances that make up this percentage of home energy use. It also explores any measures to help reduce some of the costs of these appliances such as energy efficient lighting equipment and water saving equipment. It examines the types of lights used, as well as the number and age of household appliances used in the sample.

7.6.1 Lights

Identifying the type of lights used can determine to what extent basic energy efficiency measures are being taken into consideration and can provide insight into the uptake of recent community initiatives such as the Green Saver Program. Most respondents (68%) responded that Compact Fluorescent Lamps (CFL) and LED light bulbs were the most common in their dwellings (see Figure 26). 60% of Project 93 units indicated that LEDs were the most common type of lights in their dwelling, while 50% of ON Aboriginal and 50% of MoCreebec Rental units indicated the same (see Figure 27). The highest concentration of CFL and Incandescent lights appeared in the Private and Moose Cree units at 60% and 20% respectively.

Figure 26. Type of light bulbs being used in dwellings by housing unit

Figure 27. Most common type of light bulb in dwelling by housing unit

7.6.2 Household Appliances

Combined results of common household appliances and the estimated age of these appliances are presented below. This data adds further depth into understanding what appliances and activities could contribute to the cost of energy in a MoCreebec household. Figure 28 presents these results below. Appliances can be categorized into major appliances (fridges, freezers, dishwashers, ovens, washing machines, dryers and air

conditioners), minor appliances (dehumidifiers and portable fans) and electronics (televisions, computers, and gaming consoles). Most respondents indicated that they had one of each major appliance, however a small percentage responded that they had two or more fridges (10%), fridge-freezers (13%), deep freezers (9%), washer-dryers (6%) and ovens (3%). It was more common for respondents to have multiple electronics appliances, compared to other categories. Multiple TVs are common in households, with 31% of respondents stating that they had three TVs in their household, and some stating they had up to four. This is similar for gaming consoles, where 33% of participants indicated they had two or more of these electronic devices in their household.

Figure 28. Number of appliances used in a dwelling presented by combined results

7.7 Energy Use Behaviour: Activities and Views on Energy Conservation Behaviours

The aims of this section are twofold: first, it seeks to explore day-to-day activities to try to examine the energy demand from the residential sector, and second, it seeks to explore the awareness of energy efficiency and conservation measures. The first question asked respondents to indicate when they take part in different activities on an average weekday. The second question asked respondents how often they do a certain activity. Results help provide a more comprehensive picture of when to expect certain peaks and lows in demand based on the selected activities, as well as better understand how respondents perceive and implement certain energy efficiency and conservation behaviours.

7.7.1 Activities

The activities section examined components of energy demand from the residential sector; this helps better understand how energy is being used and when based on certain activities. No N/A option was provided to respondents, however some respondents chose to describe their activity, especially in relation to climate control settings. In some cases respondents chose not to fill out certain sections, this means that each activity may not be representative of the whole sample, and may contain only a percentage of the whole sample. Although the data is an estimate on usage over an average weekday, the data can provide some insights into activities that make up residential energy demand throughout a twenty-four hour period. Results are presented below based on related activities, such as laundry and climate control settings, and by subsample. As these results are presented by subsample, it is important to remind the reader that the Private and Moose Cree sample only contains five questionnaires. These

results are followed by a presentation of results based on combined activities to identify where peak times occur and what activities contribute most to the sample's demand.

Climate Control Settings

Two questions on the daily use of the air-conditioning unit and the heating system were used to better understand how and when climate control settings would impact household demand. Air-conditioning use seems to be fairly consistent across subsamples with the beginning of peak usage at 11:00am and ending at 4:00pm (see Figure 29). There are small variations between subsamples. The Private and Moose Cree sample peaks once in the morning at 5:00am, and then again at 11:00am until 3:00pm. The Project 93 sample starts to peak at 11:00am, and then finds its true peak at 6:00pm, while ON Aboriginal starts to peak at 1:00pm, is at full peak at 3:00pm-4:00pm, and finally, the MoCreebec Rental sample indicates peak air conditioning use from 12:00pm until 6:00pm. While the range of peak time varies, it is clear that of the sampled units, peak air-conditioning usage starts around lunch until the late afternoon. Some written responses help to better understand when this usage is most likely to occur. Some respondents indicated that air-conditioning might be infrequently used and only reserved for the hottest days of the year. For example, one respondent noted that they only use the air-conditioning when it is 30 degrees Celsius or hotter out.

Figure 29. Use of the air-conditioning by housing unit

The second question asked respondents to indicate when they use their heating system. Responses for to this question varied dramatically across subsamples; however there was generally spikes of activity in the morning, around noon and most subsamples displayed increased usage in the evening (see Figure 30). The Private and Moose Cree sample saw peak usage in the morning at 8:00am. The Project 93 units exhibit little activity throughout the day until 5:00pm, reaching their peak at 11:00pm. ON Aboriginal units first peak in the morning in between 7:00am-8:00am, and then starts to make its way to peaking from 4:00pm until peak at 9:00pm, and finally, MoCreebec Rental units indicated peak at multiple times including 8:00am-9:00am, 12:00pm, 5:00pm, and then 7:00pm-9:00pm. Responses varied substantially across different subsamples, therefore it is difficult to say if the question was well understood by most respondents. Nonetheless, it does provide some information on when residents may choose to adjust heating temperatures in their dwellings.

Figure 30. Use of the heating system by housing unit

Combined results of climate control heating and cooling indicate two different demand curves by season. In the hot summer months', air-conditioning is used during the day and during the cold days of the fall, spring and winter, the heating system is used throughout the day and peaks in the evening (see Figure 31). On hot days, air conditioning peaks around 12:00pm until around 4:00pm. Written comments from participants show that air-conditioning use may be reserved for only the hottest days of the year in the summer. Respondents indicated that they crank up their heating system in the morning around 8:00am-9:00am, around lunchtime (12:00pm-1:00pm), and from 7:00pm until peak at 9:00pm.

Figure 31. Combined results presented by heating and cooling times

Hot Water and Laundry

Three questions were dedicated to determining the hot water load and most frequent time of laundry activities. This was divided into: use of the shower, use of the washing machine and use of the dryer. Hot water usage, through the use of showering and the use of the washing machine, peaks two times each day (see Figure 32). Peak happens once in the morning at 7:00am for showers, and another in the evening at 7:00pm for use of the washing machine. At 8:00pm-10:00pm there is a second, although moderate, spike in use of showers. Showering usage is fairly consistent, most of the use seems to be in the morning and some activity in the evening. Use of the washing machine however, is spread out a little more throughout the day, in the morning and afternoon before moving into peak usage in the evening (see Figure 33). Dryer usage follows a similar pattern as the use of the washing machine as it peaks in the evening from 7:00pm-8:00pm but still sees some usage in the morning around 10:00am, and then steady usage 1:00pm until peak (see Figure 34). There is however, some variation across different

housing samples, notably ON Aboriginal units seem to be more active with afternoon laundry activities than the other housing units.

Figure 32. Combined hot water heating load based on the use of the washing machine and showers

Figure 33. Use of the washing machine presented by different housing units

Figure 34. Use of the dryer presented by different housing units

Television and Electronics

Results from this section present the use of televisions and gaming consoles by combined responses and by sub-sample. Combined results show that use of televisions and gaming consoles are most common at night starting at 5:00pm, peaking at 9:00pm and slowly declining into the early morning (see Figure 35). Although all units indicate the use of television during the evening, use throughout the day varies. Notably, only 20% of ON Aboriginal respondents stated that they use the television before 4:00pm. This differs from the other housing units that see more consistent usage throughout the day (see Figure 36). Similar observations can be made with the use of gaming consoles with the Project 93 units. 20-40% of Project 93 respondents said that they used the gaming console throughout the day from 5:00am until 4:00pm when usage from other units picks up as well.

Figure 35. Combined results of television and gaming console use

Figure 36. Results of television use presented by housing units

Figure 37. Results of gaming console use presented by housing units

The results provide some additional information on when activities contribute to energy demand in the residential sector. Based on the sample of activities, it is clear that peak time is in the evening from about 6:00pm to 9:00pm (see Figure 38). They show that in the morning there is a spike of hot water activity from showering, and that this hot water usage spikes again in the evening as most people do their laundry and take showers in the evening. It can also help understand heating and cooling usage. In the summer months, air conditioning is most often used in the afternoon between 11:00am to 4:00pm before it drops, while in the colder months heating use occurs more often throughout the day and culminates at night. Lastly, the survey explored television and gaming console use and found that there was activity throughout the day, but increased usage at night of both activities. This information can be useful to supplement assumptions on energy use throughout the day in the community if further research is to be done that needs to better understand the load of the community and what activities could be influenced when to shift demand.

Figure 38. Combined load curve results by activity

7.7.2 Energy Conservation Behaviours

The final section of the survey focused on conservation behaviour. Questions asked participants to rate different activities based on how often they are performed on a scale of “never” to “always”. Example activities were taken from resources that local distribution companies and conservation programs make available to customers to help decrease energy costs. Results from the survey can show what extent these recommended activities have become part of habitual action or not. The results indicate that respondents exhibit a variety of the conservation behaviours, although future research will be needed to better understand what potential barriers are in place that may be stopping these behaviours from becoming routine.

Respondents indicated that conservation measures were being taken for many energy intensive activities. Results were fairly positive for laundry activities and lighting. Over 70% of those surveyed responded that they “usually” or “always” use the washing machine and dryer at full load, and use cold water when using the washing machine.

Across the different housing units, Project 93 had the highest percentage of responses in the “always” category for all three questions (56% for using a full load when washing and drying, and using the cold water wash setting). For using the dryer at full load, 56% of Project 93 units and 30% of ON Aboriginal units indicated that they always exhibit this behaviour, while no other sub-samples provided responses in this category (see Figure 39). When asked about using the washing machine at full load, 56% of Project 93 units, 30% of ON Aboriginal and 20% of Private and Moose Cree units indicated they always do this (see Figure 40). While when asked about using the cold water setting, 56% of Project 93 units, 40% of ON Aboriginal, 25% of MoCreebec Rental and 33% of Private and Moose Cree units reported they always do this activity (see Figure 41). This is particularly interesting, as Project 93 units do not pay directly for their utility bills, yet a majority of respondents have indicated they practice this conservation behaviour on a regular basis. MoCreebec Rental and ON Aboriginal responses, whose occupants both pay for electricity, were concentrated in the “usually” category. However, it is also worth noting that although the majority of Project 93 units responded positively to the questions of using the washer and dryer at full load, 20% respondents indicated that they “never” or “rarely” exhibit these behaviours.

Figure 39. Results on reported frequency of using the dryer at full load by housing unit

Figure 40. Results on reported frequency of using the washing machine at full load by housing unit

Figure 41. Results on reported frequency of behaviour for using the cold-water setting when using the washing machine by housing unit

Lighting, use of appliances, and climate control behaviours received similarly promising results. For behaviour related to lighting over 80% of respondents stated that they “usually” or “always” use sunlight as much as possible before turning on their lights, and nearly 90% of respondents said they “usually” or “always” turn off lights when they are not in the room. MoCreebec rental units reported the highest percentage of responses in the “always” category at 71%, followed by Project 93 at 56%, and ON Aboriginal at 44% for utilizing daylight (see Figure 42). MoCreebec rental responses also saw the highest percentage in the “rarely” category at 14%. For turning lights off when not present in the room, MoCreebec Rental and Project 93 units reported similar results in the “always” category, just over 50%, while responses from ON Aboriginal units saw the highest of all household types in the “rarely” category at 10% (see Figure 43). Other activities show moderately positive signs as well. Over 60% of respondents said they “usually” or “always” invest in energy efficient appliances and that they “usually” or “always” turn off their appliances completely. Project 93 units led in this area in the

“always” category although the remainder of responses from these units are scattered throughout the different categories (see Figure 44 and Figure 45). These questions also saw many responses in the “N/A” and “never” categories that could be a further area to explore. With climate control settings, responses are still positive, however there is definitely room for improvement. 51% of respondents mentioned that they “usually” or “always” lower their thermostat setting at night. This behaviour was most common in MoCreebec Rental units and ON Aboriginal units (see Figure 43). It is promising to see such positive responses however there are other areas where individuals may face barriers to achieving further action.

Figure 42. Results on reported frequency of utilizing sunlight as much as possible before turning on lights by housing unit

Figure 43. Results on reported frequency of turning off the lights when occupant is not present in a room by housing unit

Figure 44. Results on reported frequency of choosing to purchase energy efficient appliances by housing unit (for example LED lights, low flow shower heads, low flow taps, Energy Star appliances)

Figure 45. Results on reported frequency of turning off appliances completely by housing unit

Figure 46. Results on reported frequency of turning down the thermostat temperature at night by housing unit

Responses show that there are areas where conservation measures could be further utilized. Beginning with heating, 20% of individuals said that they “never” or “rarely” lower their thermostat setting at night. These responses came from the Project 93, MoCreebec Rental, and Private and Moose Cree sub-samples (see Figure 46). 17% of those surveyed said that they “never” only heat rooms that are being used (see Figure 47).

These answers come from Project 93, ON Aboriginal, and MoCreebec units however, 38% of total responses also indicated that this option was not applicable to them, including 71% of Project 93 units. This response could be limited by heating controls for various households, as most respondents stated that they did not have a thermostat in each room. As heating makes up the majority of energy consumption, it would be worth identifying what barriers exist to enabling these behaviours. Other activities may be easier to establish such as using a clothesline or other relatively small habits that conserve electricity. Over 60% of respondents stated that they “never” or “rarely” use a clothesline to dry their laundry in the spring, summer and fall and this was consistent across housing units (see Figure 48). Over 20% of respondents reported that they “never” or “rarely” put on more clothes before adjusting the temperature, and 45% stated that they only do this “sometimes”, with responses from Project 93, ON Aboriginal, and MoCreebec Rental making up the majority of the negative responses (see Figure 49). These activities indicate that although the respondents exhibit a number of conservation behaviours, there could be room for improvement to ensure these conservation measures become habit.

Figure 47. Results on reported frequency of only heating rooms that are being used by housing unit

Figure 48. Results on reported frequency of using a clothesline to dry clothes in the summer, spring and fall seasons

Figure 49. Results on reported frequency of putting on more clothes before adjusting the temperature by housing unit

The results present an exploration into how recommended conservation behaviours are exhibited in the community. The responses show that energy conservation measures are being taken in the community, however there are areas that could be improved or explored further. Many of these activities do not require large upgrades, but are simply a matter of altering behaviour. Proper dissemination of information on conservation approaches and discussing its benefits could be a simple way to alter some of these behaviours. Other areas, such as behaviour related to heating, could be more costly as they may be limited to heating systems. Programmable thermostats could help by giving occupants greater control over how they can manage their household temperature. Combined results of all questions are displayed in Table 9 below.

Table 9. Combined results of energy conservation behaviours

How often do you do the following activities?						
	Never	Rarely	Sometimes	Usually	Always	N/A
Lower the thermostat setting at night	9%	9%	25%	31%	25%	0%
Open windows for fresh air during the summer	6%	6%	28%	19%	41%	0%
Open windows for fresh air during the winter	33%	27%	33%	3%	3%	0%
Only heat rooms that you are using	17%	0%	3%	31%	10%	38%
Put on more clothing before adjusting the temperature	16%	6%	45%	23%	10%	0%
Use daylight as much as possible before turning on lights	0%	3%	10%	32%	52%	0%
Close blinds in the summer to avoid direct sunlight	0%	7%	34%	10%	48%	0%
Turn lights off when not present in a room	0%	3%	6%	52%	39%	0%
Use a clothesline for drying laundry in the spring, summer and fall	56%	9%	19%	6%	6%	6%
Use the dryer at full load	3%	6%	13%	47%	31%	0%
Use the washing machine at full load	3%	3%	22%	44%	28%	0%
Use cold water when using the washing machine	0%	0%	19%	38%	38%	0%
Use the dishwasher at full load	4%	0%	0%	3%	13%	78%
Invest in energy saving devices(LED lights, low flow shower heads, low flow taps, Energy Star appliances)	0%	3%	19%	39%	26%	13%
Leave appliances on standby mode	18%	21%	21%	21%	11%	7%
Turn appliances off completely	19%	6%	10%	19%	39%	6%
Leave TV on while doing other things	13%	22%	34%	22%	9%	0%

At the end of the survey, respondents were asked how they would like to receive energy information tips. The most agreed upon and strongly agreed upon responses were through community seminars, the MoCreebec website, local TV programmes and mailbox pamphlets (see Table 10). This information could be used to complement the results above to better target community energy programs in the future.

Table 10. Compiled results of preferred method to receive energy saving tips

What would be your preferred method of obtaining information on energy saving tips based on the options below?					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Mailbox pamphlets	33%	42%	21%	0%	4%
Local TV programmes	36%	40%	12%	4%	8%
Local radio announcements	26%	48%	22%	0%	4%
MoCreebec website	37%	44%	15%	0%	4%
Local community seminars	36%	48%	12%	0%	4%

7.8 Preferences for Demand Switching

The last section of the questionnaire seeks to gauge respondent openness to shifting their use of appliances based on different scenarios. Respondents were asked about three different scenarios where they would have to switch the use of certain appliances to a different time of the day in order to sample the possibility of demand-shifting in the community. The questions asked about demand shifting based on three options. Option One asked participants if they would consider using appliances at a different time if they received a reduction on their energy bill (Figure 50). Option Two asked respondents if they would consider using appliances at a different time if they knew it would support a community owned system (Figure 51); and Option Three asked respondents if they would consider using appliances at a different time if they would receive direct monetary compensation (Figure 52). Responses were rated based on a strongly agree-strongly disagree scale.

Figure 50. Results from Option 1 by housing unit

Figure 51. Results from Option 2 by housing unit

Figure 52. Results from Option 3 by housing unit.

Results indicate that there is some openness to the idea of shifting demand. All options received fairly positive responses to the scenarios suggested even by Project 93 units who do not pay for the full cost of electricity.

Option One had the highest concentration of respondents that strongly agreed (50%). This option asked participants if they would agree to use certain appliances at a different time if they saw a direct reduction in their energy bills. Of the housing units, ON Aboriginal strongly agreed with this option (70%), followed by MoCreebec Rental (63%), Private and Moose Cree (60%) and Project 93 units (20%). Both ON Aboriginal and Project 93 units also had 20% of their responses as “neutral”. This is the highest concentration of neutral responses out of all three questions.

When asked if they would shift their use of certain appliances in support of a community owned electricity system, 34% of respondents strongly agreed. Option 2 introduced the idea of supporting a community owned electrical generation system but crucially, omitted any monetary incentives for switching demand. Again, ON Aboriginal

had the highest amount of support in the “strongly agree” category with 45%, followed by MoCreebec Rental (38%), Project 93 (22%) and Private and Moose Cree units (20%). This option saw the highest overall concentration of “agree” responses at 56%; Private and Moose Cree units (80%) led in this category, followed by Project 93 units (67%). In the neutral category, support ranges from 9% from ON Aboriginal units and 13% in MoCreebec Rental units.

Option 3 suggested that occupants would receive direct monetary compensation for switching demand. 38% of combined responses were in the “strongly agree” category. Support in this category came from MoCreebec Rental units (63%), then the ON Aboriginal units (50%), and Project 93 units (22%). Out of all questions, it sees the second most support in the “agree” category at 55%. Private and Moose Cree led support with 100%, followed by Project 93 units (56%), ON Aboriginal (40%), and MoCreebec Rental (25%).

When analyzing the data by the highest concentration of “strongly agree” responses, Option 1 receives the most support (50%). However when combining both the “strongly agree” and “agree” categories together, Option 2 receives the highest percentage of positive responses (90%), followed by Option 3 (88%). Both options also received the lowest amount of “neutral” responses as well. Project 93 respondents, who do not pay directly for their electricity, were moderately positive in their responses. Although the responses from these units never breached 22% in the “strongly agree” category, they reported the most agreement for Option 2. It is worth noting that this option had nothing to do with compensation, but focused solely on support for community electricity generation.

Although exploratory, it is interesting to observe that the most positive response overall does not deal with economic relief, but instead is focused on community ownership. This could further indicate the desire for self-sufficiency in the community that was a consistent theme in the focus groups. The overall positive results are also striking when it is considered that 30% of respondents do not pay for electricity directly yet may still respond to economic incentives as well as a possible desire to see the community be able to have their own system.

7.9 Conclusion

The above chapter has provided data about the residential sector by seeking to build on the CEP to provide a more fulsome analysis of the housing units and how energy is used within them. It has provided insights into better understanding the cost of energy by different seasons and across different MoCreebec owned/managed and private units, as well as occupant behaviour across different MoCreebec owned/managed units. The data may be used in order to explore the feasibility of energy consumption shifting and the potential of net metering for the community. The information presented above is the first time information was collected in this detail across the different housing types in the community.

Chapter 8: Discussion and Recommendations

8.1 Introduction

The community of MoCreebec has a history of self-improvement. They continue to find areas where they can improve the lives of their community members and achieve

greater control and self-sufficiency. The previous chapters have presented my findings that further explore the energy issues stated in the CEP. This chapter presents how this thesis addresses the research questions stated in Chapter 1, section 1.2, and outlines three recommendations based on the results. These recommendations strive to contribute to achieving the community's energy goals.

The chapter is organized into two main sections. The first section presents the results that address the research questions. The second section provides recommendations based on my findings. The research questions are presented below.

- 1. What are the community's preferences for different electricity generation technologies?*
- 2. What are the community's preferences for different desired qualities in an energy system?*
- 3. How does the cost of energy differ across different MoCreebec units?*
- 4. How does occupant behaviour differ across different MoCreebec housing units and can demand be shifted and brought in line with local supply?*

8.2 Research Question #1: What are the community's preferences for different electricity generation technologies?

Compiled focus group results indicate that solar and wind are the most preferred electricity generation technologies for the community. Over 50% of votes for most preferred sources of generation were attributed to one of these resources. These resources were described as having little impact on the environment (in terms of GHG emissions and local pollution) and human health. They were also described as accessible, scalable, and cheap. Small hydro was the third most preferred resource. Preference for small hydro was due to the community's proximity to water resources and like solar and wind, it was perceived as having little impact on the environment, especially in contrast to large hydro. Although these resources were preferred, some participants in Focus Group 3

indicated that they would prefer knowing which electricity generation technology would produce the most financial gains. Generally, results indicate preferences for generation sources that were perceived as having little environmental impact.

8.3 Research Question #2: What are the community's preferences for different desired qualities in an energy system?

Preferences for different qualities in an energy system varied across focus groups; however all preferences had strong connections with the predetermined themes: “Autonomy”, “Reliability”, “Affordability”, and “Sustainability”. Discussions in all focus groups highlighted that the community has unique needs that differ from the southern communities and that this needs to be reflected when addressing energy issues. This was most strongly demonstrated in Focus Group 2 and Focus Group 3. These groups identified “Autonomy” as their preferred objective. Focus Group 2 discussed the importance of local solutions due to the challenge of meeting energy demands without a holistic approach to energy production that includes thinking at both the building level and at the community level. Focus Group 3 discussed the importance of “Autonomy” as well; they linked this idea directly with ownership so that they could take control over energy decisions instead of having to accept decisions that are made somewhere else without input from the community. Expressed in this desire for autonomy was also the desire for an additional revenue stream for the community. “Reliability” appeared as the primary theme for Focus Group 1. This group highlighted the importance of a resilient system that would not leave the community without access to electricity. Finally, Focus Group 4 identified both “Affordability” and “Sustainability” as their primary preferences.

This group cited the existing cost of living in the North as their reason for identifying “Affordability” as a concern and discussed the equal importance of “Sustainability” because of Indigenous Peoples’ relationship with the land. Overall, focus group discussions added greater depth to themes expressed in the CEP and demonstrate important perspectives that need to be considered when pursuing electricity system developments.

8.4 Research Question #3: How does the cost of energy differ across different MoCreebec units?

Results from the survey indicate that across the seasons, most people estimate that they pay between \$201-\$500 per month for electricity. This fluctuates by season and there are outliers, however responses in these ranges remain from 55%-75% in the summer for all units, fall, and spring seasons and drops to 40%-50% in the winter. In the winter there is an exception to this in the MoCreebec Rental sample; the majority of respondents (63%) shift into the \$501-\$800 range during the winter. This could be due to the use of electric baseboard heating in these units.

One can observe the differences of the cost of energy between different units. Based on the results, the Private and Moose Cree sample estimated that they consistently pay larger bills than other samples throughout the seasons. Although most respondents indicated they pay between the \$201-\$500 range, across the seasons estimates go up to the \$1001-\$1500 range in the spring time which is not seen in any other sample for the same season and up to \$1501 plus in the winter which is only reported again in the MoCreebec Rental sample. ON Aboriginal has the most consistent concentration of responses in the \$201-\$500 range across the seasons, however in the winter, 20% of

respondents estimate they pay within the \$801-\$1500 range, otherwise, responses do not breach the \$800 per month mark for other seasons. For the Mocreebec Rental, most units pay within the \$200-\$500 range with the exception of the winter months when respondents report higher bills. The MoCreebec Rental sample also reports a small percentage of responses that are much higher than the majority of responses per season. Results from the survey can shed insight into the perceived cost of electricity in the community, however because the sample was small and was not a random sample, it cannot be considered representative of the larger community and the results should be interpreted with caution.

8.5 Research Question #4: How does occupant behaviour differ across different MoCreebec housing units and can demand be shifted and brought in line with local supply?

Research Question #4 sought to explore how behavior differs across MoCreebec housing units and to examine the possibility of demand shifting. I used a questionnaire to collect information on this question. Results show that behavior does change between the subsamples and that there is openness to shifting demand.

Generally, all subsamples exhibited promising conservation behaviour, however units differed in key areas. Laundry activities, such as using a full load when operating the washer and dryer, or using the cold water setting for the washer, received combined positive results in the “always” category from 28%-38%. The Project 93 subsample had the highest concentration of responses in the “always” category out of all the subsamples (over 50%), while other subsamples indicated a high concentration of “usually” responses.

Questions about turning down the thermostat setting at night and only heating rooms that are in use, sought to examine climate control behaviours. Here, MoCreebec Rental units had the highest concentration of responses in the “always” category with 50%, in response to turning down the thermostat setting, and 33% in response to only heating rooms that are in use. It is worth noting that a number of Project 93 units and ON Aboriginal units indicated that the question regarding individual room temperature control was not applicable to them. Questions about lights and appliances were also asked.

All subsamples answered positively for utilizing daylight as much as possible, however answers varied for turning off lights in vacant rooms and turning off appliances completely. Most units indicated that they use sunlight as much as possible, however for turning off lights when rooms are vacant, MoCreebec Rental (57%) and Project 93 (56%) had the highest concentration of responses of “always”. When it came to investing in energy efficient appliances and shutting off appliances completely (instead of leaving them on standby) Project 93 units indicated “always” more than other units. For behaviours that are always exhibited, MoCreebec Rental and Project 93 units display the most consistent energy conservation behaviours.

The overall results are striking, especially with the positive results for the Project 93 units. Project 93 units do not pay directly for their electricity, therefore receive no financial incentive to save, yet the subsample indicated some of the best conservation behaviour results. It is worth noting again, that the sample is not representative of the whole community, so these results should be interpreted with caution, nevertheless,

results are positive although more work could be done in to ensure these habits remain and spread to other units.

The survey also explored the willingness to shift demand based on three different scenarios. The results are promising, indicating that most respondents are open to the idea of shifting the use of certain appliances if they have something to gain (i.e., monetary incentive or a reduction on their energy bills), or if it supports a community owned energy system. All subsamples were in agreement, although some who had more to gain, like MoCreebec Rental, Private and Moose Cree, and ON Aboriginal units, were more often to respond “strongly agree” to the scenarios that presented compensation for expenses on their energy bills or energy bill reductions. Project 93 units were fairly positive, although the majority of their responses were concentrated in the “agree” response which may be because they have less to gain from reductions in prices.

8.6 Recommendations

The previous section has highlighted how findings from my research have addressed the research questions. The current section applies my research findings to the situation of MoCreebec in order to help inform future community energy planning. The recommendations seek to address goals established in the CEP. The recommendations concern developing renewable energy options by utilizing net metering, applying conservation and energy efficiency measures through demand side management to address the high cost of electricity, and a review of the electricity subsidy for social housing units. The recommendations will focus on addressing the following three (out of five) goals set out in the CEP:

- Goal #2: Assist MoCreebec members to reduce energy costs for their existing homes
- Goal #4: Make future homes and community buildings energy efficient
- Goal #5: Pursue renewable energy development where possible in order to increase MoCreebec's energy security and financial self-sustainability

8.6.1 Community Electricity Generation: Net Metering

Recommendation #1: Consider electricity generation technology that can apply to Hydro One's Net Metering program

The community has indicated, through Goal #5 in the CEP and through focus group research, their desire for energy security and financial self-sustainability. If the community is considering generating its own electricity, it should pursue renewable energy development so that it can benefit from Hydro One's Net Metering program. This option could allow the community to meet Goal #5.

Net metering is one initiative offered by the Ontario Government to encourage the promotion of renewable energy technologies. The initiative is only applicable for those generating electricity primary for ones' own consumption and it must be through renewable energy sources that are specified as wind, water, solar radiation or agricultural biomass (according to Hydro One's program). The initiative allows the consumer to generate electricity for their own use while any electricity generated in excess of their demand is sent to the distribution system for a credit toward the consumer's energy cost. It is measured through an electricity meter that can measure both the electricity the generator is consuming and the electricity they are generating. Consumers apply through their local distribution company (LDC), in this case Hydro One, and once connected, the LDC subtracts the value of electricity supplied to the grid from the value of what is taken from the grid. A value on the consumer's electricity bill is the "net" difference between the two amounts (Ontario Energy Board, 2018). In essence, if the amount supplied is

more than what was used from the grid over the billing cycle, the consumer receives a credit toward future energy bills. This would allow buildings in the community to generate electricity to meet or offset its own needs and sell any surplus power to the Ontario electricity grid for a credit. This recommendation aligns with the direction from the CEP as well as my research findings.

Data from the focus groups can further demonstrate why the community may want to pursue a net metering approach and how. Focus group discussions identified “Autonomy” as a primary theme in two groups, and the theme was present throughout all focus group discussions. Participants connected this concept with ideas of ownership, self-sufficiency, financial self-sufficiency, and capacity building. The discussions also demonstrated that there have been historic issues of trust with how energy decisions have been made in the past and that there has been a lack of consideration for community input. The focus groups also provide information on preferred energy sources that could help narrow the options for generation sources.

Solar and wind were identified as preferred generation sources according to focus group discussions. These two resources appeared as the top resources in all focus groups, with small hydro as a distant third. Participants associated these resources with having low-environmental impact, and being easily accessible, cheap, and scalable. These preferences align well with the required generation sources under Ontario’s net-metering policy. Another resource that was not as popular but still viewed favourably, such as tidal, is also eligible under the net-metering policy and could be a potential option. This data can be of use to Keelia LaFreniere’s research when making recommendations on electricity generation options. The community’s preferences are well aligned with

eligible generation sources, however there are important questions that need to be considered before pursuing this option.

An in depth understanding of the costs and benefits of each resource is necessary before making a decision. Members in Focus Group 2 and Focus Group 3 pointed out that they had little knowledge of the costs and benefits of each resource when they were indicating their preferences. An understanding of the feasibility of each technology is a crucial component of making an informed decision related to future energy planning. A discussion on the feasibility and cost of developing the preferred resources is beyond the scope of this thesis, however a future feasibility study would also have to keep in mind other preferences described in Focus Group 1 and Focus Group 2. “Reliability” was stressed in Focus Group 1, while Focus Group 4 identified “Affordability” as their primary preference. These discussions indicated the importance of accessibility to energy for consumers, both in terms of reliable supply and affordability. Understanding how potential resources operate in their area will help MoCreebec make the most suitable decision and determine if net metering is an option worth pursuing. If a resource is considered feasible, scale should then be considered.

The scale of the net-metered area is a decision that will affect how to best take advantage of the benefits of net metering. As net metering may only be feasible at the individual building or residence level, it will be important to decide what buildings should be considered. For example, the community could install (if technically and economically feasible) solar PV on the MoCreebec office and commercial buildings, as well as on housing units where MoCreebec pays for the electricity. In this way, they could potentially offset the electricity costs of these buildings and save money. This

would support Goal #5, as it would help offset electricity costs for the participating buildings. By choosing residential buildings where MoCreebec pays for the electricity, net metering could offset some of the costs of these buildings while still relieving vulnerable community members from the full cost of electricity. Alternatively, the community could decide to pursue net metering for all residential units that they own or manage. This would require more investment, but could relieve some of the costs of electricity for all residential units to further support Goal #2. These scenarios need future analysis to better understand the costs and benefits, especially the cost of the technology and cost of installation, if local capacity does not exist. If the net benefits of the cost of purchasing and installing the applicable technology in the community outweigh the costs, net metering could be an option for the community. Depending on the expertise needed to install and maintain the generation source, net metering could also provide an opportunity to build technical capacity in the community. To fully take advantage of electricity generation, the community could also explore demand-side management strategies.

All groups at some point discussed the cost of electricity, however only Focus Group 2 and Focus Group 3 explored how residents themselves and their homes could be part of the solution. Focus Group 2 developed a vision of an energy system that could take advantage of generation both at the community and individual residence level while Focus Group 3 highlighted the role of increasing energy awareness of residents through conservation measures to save on electricity costs. Net metering could complement these desires. For example, the community could scale solar PV to offset some of the load for individual houses. Some hours of the day a home may generate more than it uses and have surplus power to sell to the grid, while at other hours it may need to take power

from the grid. This option could potentially offset some of the electricity costs of the unit. Conservation measures can be explored and activities could potentially be shifted as indicated in the survey responses. By reducing demand and shifting activities to further take advantage of the hours when electricity is being produced, community members could take full advantage of net metering. As net metering applies at the meter level, this may be the most effective way to take advantage of the program.

This approach would align with their desire for greater control and self-sufficiency overall, however they would need to have a thorough understanding of the community's demand and perhaps influence it to align with available local supply. The community would also need a thorough understanding of the cost of the technology and the capacity it takes to install and maintain it in order to make an informed decision.

Community preferences for electricity generation sources align well with the eligible sources under Ontario's net metering policy. Net metering as an option for the community would also align well with themes of "Autonomy" that were discussed in the focus groups, as the community could own a system and have greater control over energy decisions. However, there are some important factors to take into consideration such as the feasibility and cost to develop the resource and the scale of generation, which will ultimately affect the generation source that is chosen and how net metering may best be utilized.

8.6.2 Demand-side Management Strategies

Recommendation #2: Explore demand-side management approaches with accurate feedback tools to help increase user understanding of energy use.

The cost of electricity for consumers remains a concern for MoCreebec community members. This problem is exacerbated because electricity is the source of

energy for space heating and hot water needs. The majority of surveyed MoCreebec community members stated that they rely on electricity as their sole fuel to meet their space heating needs and that even the majority of supplementary heating systems rely on electricity. Changes to behaviour through conservation and energy efficiency measures as well as shifting certain activities to benefit from TOU pricing could lead to modest cost savings. Educating the community on energy use and adjusting occupant behaviour now will increase the overall energy literacy of the community. Focus groups also highlighted the desire for more information about energy usage. This increased understanding could be beneficial to reduce energy costs for community members, and if the community develops their own system and needs to adjust demand to benefit from local supply.

Occupant behaviour should not be discounted when pursuing energy cost savings in homes. Occupant behaviour has been shown to have a reasonable impact on the use of lights and appliances, hot water and space heating, indicating that changes in certain behaviours may decrease energy use (McLoughlin, Duffy, & Conlon, 2012; Sun & Hong, 2017; Swan et al., 2011). Although housing retrofits will be an important part of an overall conservation and energy strategy, occupant behaviour could supplement energy conservation. My research has identified opportunities available for the community to benefit from conservation and demand shifting that could impact energy bills and prepare the community for future energy planning.

Data from the questionnaire and focus groups contribute some insight into the community's consumption behaviour, the potential variations in load, their willingness to shift activities to different times, and issues understanding energy pricing. Responses to the questionnaire could suggest that peak time is in the evening from about 6:00pm to

9:00pm. Data also suggests that there are two peaks during the day for hot water, once in the morning and once in the evening for showering and laundry and that there is television and gaming console use throughout the day. The questionnaire demonstrated that the community exhibits certain behaviour that could be easily altered. More strategic use of thermostats could be improved as 20% of respondents indicated that they “never” or “rarely” lower their thermostat setting at night. Over 60% of respondents stated that they do not use a clothesline to dry clothes. Although other activities are fairly positive, such as 70% of respondents stated that they “usually” and “always” use cold water during the wash and use the washer and dryer at full load, these habits could be further enforced. Finally, the questionnaire identified that they would consider shifting certain activities.

While focus group discussions explored community perceptions and desires. Data from the focus groups have shown that there is a desire for greater autonomy and self-sufficiency. Part of this could be reducing costs for community members by providing them with more information so that they can make informed decisions on how they use energy. Demand-side management could provide an opportunity to address some of these issues and save community members costs.

Demand-side management approaches that build off of these observations and keep the unique situation of the target audience in mind will be the most effective. The community has already taken steps towards demand-side management through the Green Saver program offered by Hydro One, and through their own energy audits. I propose an approach that builds on this momentum of what has been started by combining three different mechanisms that together could create a coordinated demand-side management approach.

- 1) Develop and distribute general information and education materials on energy use through community seminars, the MoCreebec website, mailbox pamphlets and local TV programmes based on most preferred outreach options in the survey;
- 2) Increase the accuracy of feedback instruments in the community by providing energy display monitors and in-home displays to residential units; and,
- 3) Implement community-wide voluntary programs and commitments for example, voluntary pledges or targets to reduce energy bills.

General information and education instruments should be the base of a demand-side management strategy in the community. These resources could be provided to households and match potential energy-related problems with potential solutions. Resources could also provide information on different technologies that could assist with energy conservation and information on how to interpret electricity bills, particularly TOU pricing. Survey respondents indicated that community members exhibit certain activities that, depending on their frequency, may contribute to higher electricity costs. This could indicate a misunderstanding of the costs and benefits of conservation activities. This recommendation could provide community members with basic information they need to start making more informed energy decisions and clarify some of the confusion around electricity bills as expressed in Focus Group 3 and Focus Group 4. Information materials could be built off of existing resources from the Ontario Energy Board and Hydro One and be catered to the local context.

Increasing the accuracy of energy feedback and more accurate temperature controls in the community residential units will provide households with useful information that can be used to make informed energy decisions and tools to make some of the adjustments possible. Survey respondents indicated that they would be open to switching the use of their appliances for certain benefits. This recommendation could

help provide information to respondents to help them know which activities to switch as well as a tool to more accurately control temperature. Through their smart meters, Hydro One's TOU data is accessible online, this could be a good place to start for feedback on energy usage. However, a portion of the community (Project 93 units) does not pay for their energy bills directly, furthermore, there is some evidence that web-based applications, although are cheap to implement for utilities, do not have very high consumer usage rates (Darby, 2006). Energy display monitors or in-home displays (IHDs) can provide direct energy consumption information for the whole house and can potentially yield energy savings from 5%-15% (Darby, 2006) to 9%-12% (Ehrhardt-martinez et al., 2010). These devices could provide households with the information they need to understand their usage and help make decisions about their consumption. Supplying programmable thermostats with default settings could further help provide households with the tool they need to accurately control heat settings. This recommendation introduces new technology to the community. It could provide great potential, however, it is imperative that the occupant understands the technology and its benefits.

Catering technology implementation to the community's unique needs will be crucial to its success. Trust is an important factor when introducing technology. Technology should be installed and explained by a trusted, local community member and workshops could be held to explain the purpose of the installations. Furthermore, to introduce the technology, the community could select community champions to pilot the technology first, in order to gain community interest and understanding before full-scale

implementation. If accepted, the technologies could provide households with powerful tools to have greater control over their household energy consumption.

Community-wide voluntary commitments to reduce energy consumption could be introduced to assist applying the new information and technologies. A voluntary commitment is a pledge or promise to oneself or publicly to conserve energy. Individually, a voluntary commitment may compare the present situation to a desired future state, and publicly, it can create expectation by others leading to social pressures. Incentives to follow through with commitments could be used to encourage participation. This recommendation would encourage a community-wide conversation about energy conservation. The initiative would complement the other two recommendations in this section to apply material and technology. Commitments could be made for a period of a year and be conducted annually in order to encourage long-term behaviour changes.

The community does not have to look far for examples of how demand-side management and conservation approaches are being used in similar communities on the West coast of James Bay. Conservation on the Coast (COTC) is the result of the collaborative efforts of the Cree communities of Attawapiskat, Fort Albany, and Kashechewan's respective power corporations. The communities have come together to deliver conservation programs focused on education and awareness of energy conservation, as well as energy efficiency. The communities have similar energy issues related to using electricity for space heating and hot water needs and have taken steps to educate their communities on their unique energy situation through promotional contests, demonstrations of energy efficient technologies and conservation measures, as well as an

annual energy fair. (Conservation on the Coast, 2018c). MoCreebec could look to adapt this model for any initiative they want to implement in their community.

The community questionnaire can offer some guidance on how these recommendations could influence occupant behaviour. Community respondents to the questionnaire have demonstrated their willingness to shift the time of certain activities based on compensation or for community development. The questionnaire results indicate that the majority of respondents would consider using appliances at a different time in exchange for compensation in the form of bill reductions. This could provide insights to inform the design of future conservation strategies or methods for demand shifting. If the behaviour is adopted, it can also be applied to new community buildings. Interestingly, the respondents also indicated that they would consider shifting certain activities if it was to support a community project, even without compensation. Based on occupant behaviour responses, it seems that there is also an opportunity to improve some energy conservation measures. In the interim, communication strategies on conservation measures could be a good start to increase the community's familiarity with energy issues, help produce moderate cost savings through conservation and prepare the community for a transition to a net metered system. This recommendation could support Energy Goals #2, #4 and assist in achieving Energy Goal #5.

8.6.3 Consider Revisiting Electricity Subsidy Arrangement for Social Housing Units

Recommendation #3: Conduct a review of existing electricity subsidy arrangements for social housing units to identify opportunities for restructuring.

Addressing the split incentives present in subsidized housing units may relieve some financial pressure for the community. There are 20 units that are managed by the

MoCreebec Eeyoud Housing Department where electricity charges are included in rent at a flat rate. These units pay a flat rate of \$61 per month for a three-bedroom unit and \$66 per month for a four to five bedroom unit. Nor do these residents see their actual electricity bill, meaning they are largely unaware how much energy they are using or when. It may be worth considering a review of these existing arrangements.

Studies have demonstrated that occupants who pay for their utilities directly exhibit different behaviours than those who have their utilities included in rent. Residential units that have utilities included in their rent have exhibited higher temperature settings than those who do. In multi-family dwellings this can range from 1-4°C more than units who have to pay for their electricity (Maruejols & Young, 2011). One study observed that when residents who previously had utilities included in their rent were required to pay for utilities, energy usage decreased by 25% (Elinder et al., 2017). MoCreebec manages 81 residential units and has arranged so that 20 of these units have the cost of utilities included in their rent in order to support low-income residents (the Project 93 units).²² MoCreebec covers the electricity costs for these residential units and the flat fee residents' pay for their utilities has not changed in at least 14 years according to the MoCreebec Housing Department.²³ This arrangement creates a misalignment of incentives for these units where occupants may not be as conscious of their energy use.

The residential sector makes up a significant portion of MoCreebec's energy cost, modification of current housing policies combined with other education and conservation

²² MoCreebec may take on responsibility of paying hydro for other units under extreme circumstances, i.e., when an occupant is at risk of being disconnected for not being able to meet their payments (J. Russell, personal communication with MoCreebec Housing Department, Oct. 30, 2018).

²³ Through conversations with the MoCreebec Housing Department, it is the researcher's understanding that these rates for electricity based on the number of bedrooms, have been in place for 14 years, or as long as the current Housing Manager has been in their position (J. Russell, personal communication with MoCreebec Housing Department, Oct. 30, 2018).

strategies recommended above could potentially mitigate some of these costs. Survey results show that the majority of respondents who pay for their electricity bills pay between \$201-\$500 per month. The \$61 or \$66 flat rate that the Project 93 units pay is well below what other community members' pay even without taking into consideration the cost of rent. One option the community might consider is a reduction in rent for these units, but no longer subsidizing electricity costs or the adoption of green leases. The CEP estimates that the residential sector makes up 78% of the community's energy cost or approximately \$627,000 annually. As the community is not responsible for the cost of electricity for the majority of the buildings they own or manage, it may be a reasonable assumption that these costs come from the Project 93 units. Without price incentives to encourage conservation or demand shifting and without access to their energy consumption information, occupants in these units have no tools to understand their energy usage.

It is recommended that occupants of these units are provided with their energy bill for the unit for information purposes and that the electricity subsidy be reviewed to identify if there are any opportunities for restructuring. This would have two consequences, it would provide occupants with information necessary to make informed decisions on their energy use without having to pay for the full cost, and it would provide the community an opportunity to revisit and assess an old policy that may no longer be best suited for the community's current energy situation. Considering that much of the community is now on TOU pricing and respondents from the questionnaire indicate awareness of energy conservation practices, providing residents with further information on their energy use could empower residents to take on further conservation strategies.

This recommendation may help align future consumption with Goal #5 to support the community's financial self-sustainability.

9. Conclusion

This thesis has explored the unique energy situation of the MoCreebec Eeyoud. The northern Ontario community experiences different energy issues that result from their remote location and lack of access to the natural gas network. This has resulted in higher than average electricity bills because electricity is used to meet their space heating needs. The residential sector makes up the most of the community's energy costs (78%) and has been subject of considerable focus throughout the thesis. This thesis has further analyzed the community's unique energy situation by focusing on community preferences for different electricity generation technologies, preferences for an energy system and a questionnaire that focused on better understanding the cost of electricity in the residential sector as well as the behaviour of occupants.

My research has contextualized MoCreebec's energy situation by exploring the historical development of the community. It has drawn from existing academic work and the community itself to describe their unique political situation within Canadian history and how this has affected the community's development of essential infrastructure and access to energy. It has summarized the work the community is doing to improve their energy situation and presented the CEP, an early study and foundational community-planning document that outlines MoCreebec's vision for future energy planning. I build off of this early work by focusing on community preferences for potential energy options and by further exploring the cost of electricity and the role of occupant behaviour in residential sector.

Focus groups were used to explore community preferences for different potential generation sources as well as desired qualities in an energy system. The focus groups were conducted with different segments of the population in order to draw similarities and comparisons between different groups. The data indicates that there is a strong preference for renewable electricity generation technologies such as wind and solar. These technologies were perceived as being clean, abundant, scalable and accessible. However, participants raised concerns that more information was needed in order to make informed decisions on their preferences and some participants were concerned with the potential to generate revenue from the technologies. The discussions also explored the preferences for desired qualities in a future energy system. The desire for autonomy was consistently brought up throughout discussions and was related to mistrust of how energy decisions have been made without community input. My research approach also explored the cost of electricity and occupant behaviour in the residential sector to better understand energy use in the community.

A questionnaire delivered to the residential sector collected detailed information across different housing units to explore occupant behaviour and its connection to energy use for the first time in the community. A questionnaire was administered to build on the CEP to provide a more fulsome analysis of the housing units and how energy is used within them. The questionnaire targeted both MoCreebec owned/managed units as well as private households and compared results between them. The data shows that most respondents indicate they pay between \$201-\$500 per month across seasons, although estimates go up in the Private and Moose Cree sample to \$1001-\$1500 in the spring-time and up to \$1501 plus in the MoCreebec Rental sample in the winter. In terms of occupant

behaviour, generally all subsamples exhibited positive conservation behaviour, even Project 93 respondents, who do not pay for electricity directly. The questionnaire also explored the willingness to shift demand and found that results were mostly positive with subsamples that pay for electricity being more responsive to monetary rebates or reduction on their energy bills. The Project 93 subsample responses were mostly concentrated in the “agree” category. The questionnaire provided more information on energy use in the residential sector. By focusing on cost, behaviours and willingness to shift demand, results can be used to inform recommendations on how conservation measures through information and feedback may best be implemented in the community. This information could also be used to help shift demand in order to take advantage of net metering.

Finally, this thesis has provided recommendations based on the findings that can be implemented in the community to help achieve their energy goals outlined in the CEP. Building on the research findings I have recommended three options that may assist MoCreebec in reaching goals outlined in the CEP. The first recommendation focuses on net metering as a way to increase energy security, financial self-sustainability and reduce energy costs for existing homes. The second recommendation targets occupant behaviour by recommending the provisioning of tools such as information material and tailored energy use information to assist community members to make informed choices when using energy. The third suggests revisiting the electricity subsidy for the Project 93 units to see if the policy still aligns with the community’s goals.

This research has sought to build on the existing literature about the unique energy situation of Indigenous communities. With a strong focus on occupant behaviour,

this thesis has hoped to add to the existing literature and further explore another aspect of the energy challenges and opportunities in Indigenous communities in the Canadian context.

Appendix

Appendix A. Time of Use Prices

Table 11. Ontario Time of Use Pricing Rates as of May 1, 2018

Price Effective May 1, 2018	
Off-Peak	6.5¢/kWh
Mid-Peak	9.4¢/kWh
On-Peak	13.2¢/kWh

Table 12. Summer Time of Use Prices

Summer (May 1 – October 31 weekdays)	
7:00am-11:00am	Mid-Peak
11:00am-5:00pm	On-Peak
5:00pm-7:00pm	Mid-Peak
7:00pm-7:00am	Off-Peak

Table 13. Winter Time of Use Prices

Winter (November 1 – April 30 weekdays)	
7:00am-11:00am	On-Peak
11:00am-5:00pm	Mid-Peak
5:00pm-7:00pm	On-Peak
7:00pm-7:00am	Off-Peak

Table 14. Weekends and Statutory Holiday Time of Use Prices

Weekends and Statutory Holidays	Off-Peak
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Appendix B. Hydro One Residential Electricity Rates by Service Type

Table 15. Residential Delivery Charges

Residential Delivery Charges			
	Urban High Density	Medium Density	Low Density
Distribution Flat Charge	\$24.78	\$33.77+	\$19.83+*
Smart Metering Entity Charge	\$0.57**	\$0.57**	\$0.57**
Distribution Volume Charge (¢ / kWh – metered)	0.94¢	2.30¢+	3.74¢+
Transmission Connection Charge (¢ / kWh – adjusted)	0.47¢	0.47¢	0.44¢
Transmission Network charge (¢ / kWh – adjusted)	0.67¢	0.64¢	0.62¢
Adjustment Factor	1.057	1.076	1.105

Table 16. Residential Regulatory Charges

Residential Regulatory Charges			
	Urban High Density	Medium Density	Low Density
Standard Supply Admin Charge (\$0.25 / month)	\$0.25	\$0.25	\$0.25
Rural Rate Protection Charge (¢ / kWh – adjusted)	0.05¢	0.05¢	0.05¢
IESO Wholesale Market Service Rate (¢ / kWh – adjusted)	0.30¢	0.30¢	0.30¢
Ontario Electricity Support Program Charge (\$ / kWh – adjusted)	\$0.00	\$0.00	\$0.00

*A \$60.50 credit for rural or remote rate protection has been applied to the distribution flat charge.

+As part of the Fair Hydro Plan, residential medium density and low-density customers have a cap of \$36.86 on the distribution flat charge and distribution volume charge.

**The OEB has updated the Smart Metering Entity Charge to \$0.57 per month (from \$0.79 per month), with an implementation date of April 1, 2018. This charge is collected from Residential and General Service energy billed customers on behalf of the IESO and is effective until December 31, 2022 (Hydro One, 2019a).

MOCREEBEC HOUSING 93

Your account number is:

This statement is issued on:

May 9, 2018

Your Electricity Statement

For the period of: April 5, 2018 - May 3, 2018

What do I owe?

\$270.⁵⁶See reverse for a
summary of your charges

How much did I use?

You used

2,144 kWh
of electricity this period

When is it due?

**May 28,
2018**

What does my electricity usage look like?

Your usage has
increased by 1%
compared to the
same period last year.Find out more
by logging into
myAccount at
www.HydroOne.com

What do I need to know?

Since July 2017, your bills have been reduced by a total of \$1,667.30.

Ontario's Fair Hydro Plan saved you \$165.00 on your bill. This amount includes the 8% Provincial Rebate.

SEL 718/

P003168/C007720-1/2-VIP-A003168

For billing, quick answers
and much more, visit
www.HydroOne.com For emergencies or
reporting outages
1-800-434-1235 (24 hrs) For service inquiries
and payment
1-888-664-9376
Mon to Fri 7:30 a.m. - 8 p.m. Hydro One Networks Inc.
PO Box 5700
Markham, ON L3R 1C8

Figure 53. Sample Electricity Bill for April 2018, Side 1.

Figure 54. Sample Electricity Bill for April 2018, Side 2.

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