Assessing Challenges and Opportunities for Home Energy Improvements in Canadian Indigenous Communities: A Case Study of the Metlakatla First Nation

by

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Declaration of Committee

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Abstract

The purpose of this report is to assist the Metlakatla in understanding challenges and motivators faced by members regarding home energy efficiency, and to provide recommendations to improve energy efficiency in the residential sector. The analysis involved a baseline housing assessment for reserve housing in Metlakatla Village, a literature review, two focus groups, and a review of Metlakatla Membership Census (MMC) data. The literature related to residential energy efficiency for Indigenous households indicates qualitative aspects remain an understudied area. Baseline housing data indicates on-reserve homes are heated predominantly by electric baseboards, which contributes to higher average annual home energy consumption compared to the average household in British Columbia. MMC and focus group data reveals many Metlakatla members are struggling to meet their home energy needs and are experiencing energy poverty. This is predominantly related to a combination of low income and poor home energy efficiency. Multiple demand-side management recommendations are provided to support Metlakatla homeowners in completing home energy retrofits and improving energy efficiency.

Keywords: Energy efficiency; Home energy improvements; Indigenous energy planning; First Nations energy planning; British Columbia

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List of Acronyms

ACH	Air Changes Per Hour
BC	British Columbia
BC MIRR	British Columbia Ministry of Indigenous Relations and Reconciliation
FNCEBF	First Nations Clean Energy Business Fund
CDD	Cooling Degree Days
CEDI	First Nation-Municipal Community Economic Development Initiative
CEEP	Community Energy and Emissions Plan
CEM	Cumulative Effects Management
CEP	Community Energy Plan
CERRC	Clean Energy for Rural and Remote Communities Program
CUSP	Canadian Urban Sustainability Practitioners
DSM	Demand-Side Management
ECAP	Energy Conservation Assistance Program
FCM	Federation of Canadian Municipalities
GHG	Greenhouse Gas Emissions
GWh	Gigawatt-hour
HDD	Heating Degree Days
ICCP	Indigenous Community Conservation Program
kWh	Kilowatt-hour
LED	Light-emitting diode
LSIM	Lower Similkameen Indian Band
MDC	Metlakatla Development Corporation
MGC	Metlakatla Governing Council
MWh	Megawatt-hour
MMC	Metlakatla Membership Census
MSS	Metlakatla Stewardship Society
MTO	Metlakatla Treaty Office
NRCAN	Natural Resources Canada
NWT	Northwest Territories
RDMW	Regional District of Mount Waddington
SFU	Simon Fraser University
tCO2e	Tonnes of carbon dioxide equivalent

Chapter 1. Introduction

Residential energy improvements can provide significant benefits including reduced greenhouse gas (GHG) emissions, self-sufficiency, reduced home energy costs, and local employment. Despite these and other sociocultural, economic, and environmental benefits to First Nation communities in British Columbia (BC) through residential energy improvements, adoption of energy efficiency and renewable energy measures has not reached the level which would correspond to such benefits (Cook et al., 2017; Krupa, 2012a). There continues to be an "energy efficiency gap" or "energy efficiency paradox", which is defined as the failure to undertake energy efficiency investments that result in clear economic and environmental advantages (Linares and Labandeira, 2010).

Through the Metlakatla First Nation's (Metlakatla) Cumulative Effects Management (CEM) Program, Metlakatla members and staff have emphasized that addressing housing deficiencies for their members is a priority. Residential energy efficiency is only one element of adequate housing, but an important one that could have many benefits for households and the broader community.

To address community and household energy issues, Metlakatla drafted a Community Energy & Emissions Plan (CEEP) in 2019. Metlakatla members were engaged early in the CEEP development to determine baseline community energy consumption. However, additional community engagement was recommended to determine community goals and values regarding energy supply and demand and to ensure CEEP strategies reflect members' priorities.

This report has been developed as part of the Metlakatla CEM Program and as a follow up to the draft CEEP. The purpose of this report is to review common challenges for residential energy improvements in the context of Indigenous communities in Canada, determine if these challenges are experienced with Metlakatla, and identify Metlakatla members' perspectives on home energy improvements. The findings will assist Metlakatla leadership and managers to develop demand-side energy management (DSM) strategies for its members.

This report summarizes key findings from a literature review, focus groups, and 2020 Metlakatla Membership Census (MMC) and is organized in four main sections:

- Section 1 provides the research context including an introduction of the Metlakatla, the CEM Program, and the CEEP.
- Section 2 provides a summary of the methodology for the analysis, including: the literature review, baseline housing assessment, focus group surveys, and 2020 MMC housing results that relate to residential energy efficiency.
- Section 3 describes key findings from the literature review, baseline housing assessment, focus groups, and MMC.
- Section 4 presents the report conclusion and recommendations.

1.1. Metlakatla First Nation

1.1.1. Location

The Territory of the Metlakatla is located on the North Coast of BC (54.20.14.37 Degrees North Latitude and 130. 26. 40.8 Degrees West Longitude), and encompasses roughly 20,000 square kilometers of land and sea in the Great Bear Rainforest, ranging from the ocean waters in the middle of Hecate Strait in the west to the lands and freshwaters where the Kitnaywakna River joins the Zymoetz River in the east (Figure 1.1) (Metlakatla Governing Council (MGC), 2015). The major urban centre in the Territory is Prince Rupert. Metlakatla Village is Metlakatla's main reserve and is a boat-accessed community located five kilometers northwest of Prince Rupert.

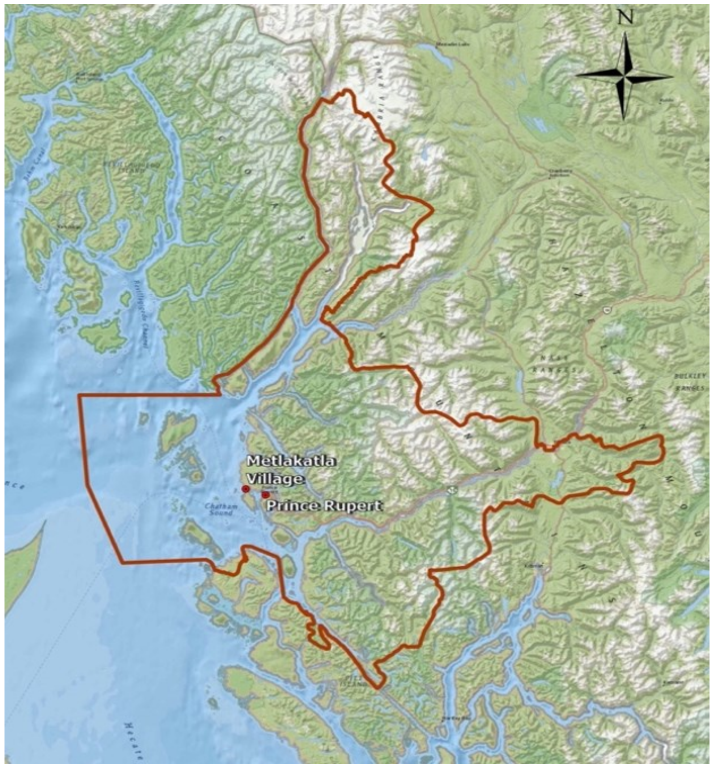

Figure 1.1: Metlakatla First Nation Territory in Northwest Region of British Columbia

(Image from: Metlakatla First Nation (n.d.))

1.1.2. Population

The Metlakatla have approximately 1,004 members and are one of seven Tsimshian communities in the North Coast region of BC (Government of Canada, 2022). Metlakatla Village is home to approximately 110 members. Over the past 20 years, total membership has grown at a rate of 2.3% per year, which is influenced by multiple factors, including economic growth and improved reserve housing (Metlakatla Stewardship Society (MSS), 2021). Based on historic rates of growth, the anticipated membership is expected to continue to increase by about 2% per year (MSS, 2019).

1.1.3. Governance

The Metlakatla have a dual governance system. Hereditary Chiefs, leaders and Elders govern affairs related to cultural practices, titles, rights, territorial lands, waters, and resources, by using traditional clan and community consultation processes (MSS, 2019). The Elected Band Council is comprised of a Chief Councillor and Councillors, and governs affairs related to the community of Metlakatla Village, which includes band administration, the delivery of social programs, and contractual arrangements with external government departments (MSS, 2019).

The Metlakatla administration has four main departments (Metlakatla Governing Council, 2010):

- *Metlakatla Governing Council* (MGC) acts as the primary governing unit responsible for delivering social services to Metlakatla members.
- *Metlakatla Development Corporation* (MDC) oversees economic development initiatives for the Metlakatla.
- *Metlakatla Stewardship Society (MSS)* works to protect the lands, waters, and resources of Metlakatla Territory.
- *Metlakatla Treaty Office* (MTO) is responsible for treaty negotiations with provincial and federal governments.

1.1.4. Environment and Climate

The Metlakatla Traditional Territory is in the very wet marine environment of coastal BC characterized by mild year-round temperatures and heavy precipitation. The climate is warm and temperate, with cool and mostly cloudy summers, and long, windy, overcast, and colder winters. According to Canadian Climate Normals (1981-2010) data from Environment Canada for the Prince Rupert A Station, the average annual temperature in the area is 7.5 °C, with temperatures commonly falling in a limited range of 0-20 °C (Environment Canada, 2022). The hottest month of the year is typically August, with an average high of 17 °C and low of 10.6 °C. The coldest month of the year in Prince Rupert is typically January, with an average low of -0.8 °C and an average high of 5.6 °C (Environment Canada, 2022).

In terms of heating and cooling loads, the temperate environment of the coastal climate zone of BC has the lowest thermal comfort energy requirements of any zone in Canada (Heerema, 2016). A common metric for defining heating load requirements is the heating degree-day (HDD). HDD for a given day represents the number of degrees Celsius that the mean temperature is below 18°C. The measurements throughout the year are added to estimate the amount of heating required. The Prince Rupert A station has an HDD index of 3824.7, among the lowest in Canada (Environment Canada, 2022). On the opposite end, cooling degree-day (CDD) is the metric for cooling load requirements, and represents the number of degrees Celsius that the mean temperature is above 18°C. The Prince Rupert A station has a CDD index of 0.7, indicating very low cooling requirements (Environment Canada, 2022).

The marine climate zone is known for frequent and heavy precipitation. Approximately 2,619 mm of precipitation falls annually in the region (Environment Canada, 2022). The month with the most wet days in Prince Rupert is October, with an average of 24.2 days with at least 0.2 mm of precipitation (Environment Canada, 2022). The month with the fewest wet days in Prince Rupert is June, with an average of 17.3 days with at least 0.2 mm of precipitation (Environment Canada, 2022). Although rain falls throughout the year, Prince Rupert experiences extreme seasonal variation in monthly rainfall. The month with the most rain in Prince Rupert is October, with an average rainfall of 373.4 mm (Environment Canada, 2022). The month with the least rain in Prince Rupert is June, with an average rainfall of 108.7 mm (Environment Canada, 2022).

In the marine climate zone, the most common weather factors that could affect building design are frequent and wind-driven precipitation, high winds, seismic activity, and forest fires during dry summers (Heerema, 2016). Consequently, mould reduction, storm water management, flood preparedness, and weatherproofing are some of the most important considerations in building design for the region (Heerema, 2016).

1.2. Metlakatla CEM Program Overview

In 2014, Metlakatla leadership was concerned about the combined impacts of some of the large development projects proposed for the North Coast region of B.C., which are located within or are in proximity outside of the Metlakatla Territory (BC Ministry of Jobs, Trade and Technology, 2019). In response to these concerns, MSS formed a team of staff members, university researchers, and external experts to combine best practices in cumulative effects management with input from the Metlakatla membership to understand and manage those effects and initiated the Metlakatla CEM Program. The Metlakatla CEM Program is a resource management system for monitoring the status of high-priority Metlakatla values including anticipating and responding to cumulative change in the Metlakatla Territory over time (MSS, 2019).

The Metlakatla CEM Program framework adopts a four-phase approach (Figure 1.2) in monitoring, management, and mitigation of the cumulative effects on the Metlakatla Territory with the initial input from the Metlakatla membership to identify priority values and indicators for each pillar in the CEM Program (MSS, 2019). The current condition of each priority value was assessed to establish a baseline and management triggers that are a series of markers that reflect increasing levels of concern about the condition of a value (MSS, 2019). Management triggers support the CEM Program by: (1) providing a direct link between assessment and monitoring information, and decision-making processes; (2) allowing decision-makers and community members to set limits on acceptable changes for a value or resource; and (3) introducing a proactive and precautionary approach to monitoring and management (MSS, 2019). The Metlakatla CEM framework adopted the tiered management triggers concept that depicts increasing levels of impact to the value over time (Figure 1.3) (MSS, 2019). Different management actions are triggered when a value's condition transition from one zone to another.

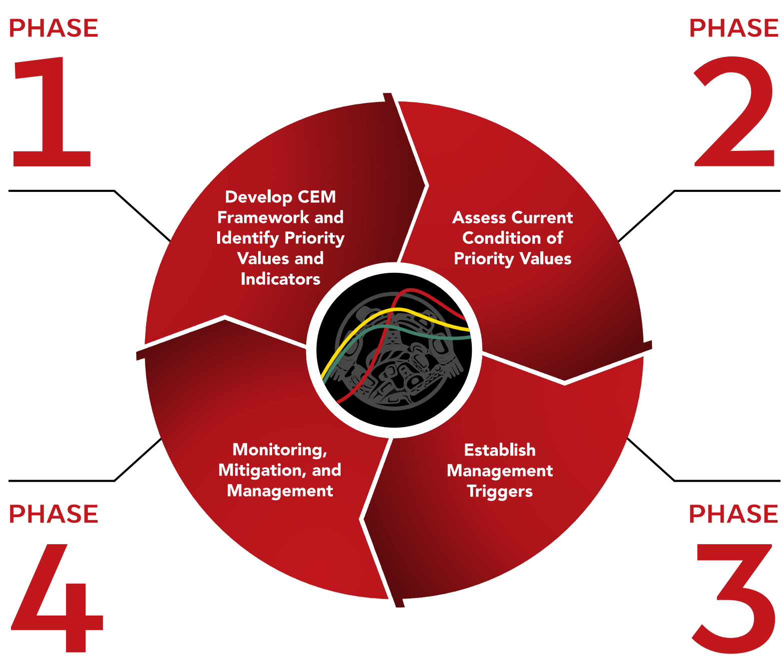

Figure 1.2: Phases in the Metlakatla Cumulative Effects Management (CEM) Program.

(Image from: Metlakatla Stewardship Society (2019))

Figure 1.3: An illustration of the concept of management zones and triggers in the Metlakatla CEM Program.

(Image from: Metlakatla Stewardship Society (2019))

The CEM Program focuses on five pillars: Environment, Economic Prosperity, Social/Health, Cultural Identity, and Governance (MSS, 2019). In 2015, Metlakatla chose four of the high-priority values for a pilot project of the CEM framework: food, social, and ceremonial activity; housing; employment; and butter clams (MSS, 2019). While residential energy efficiency is not itself a separate value of the Metlakatla CEM Program, it relates closely to the housing value.

1.2.1. Metlakatla CEM Program and Residential Energy Efficiency

The work of the CEM Program is continually evolving, and the researchers have worked with Metlakatla through workshops, interviews, and focus groups to understand what is most important for Metlakatla.

Reducing energy costs and energy consumption contributes to more affordable, healthy, and low-emission housing. This helps address the environment, economic prosperity, and social and health values in the CEM Program. The CEM Program has also been directed to explore climate change as a value, which this research also relates to because energy efficient housing or residential-scale renewable energy can lower greenhouse gas (GHG) emissions (i.e., climate mitigation), while also helping to prepare for climate impacts such as more frequent and intense storms and hotter temperatures (i.e., climate adaptation).

The connection of this research to the CEM Program is outlined in Figure 1.4.

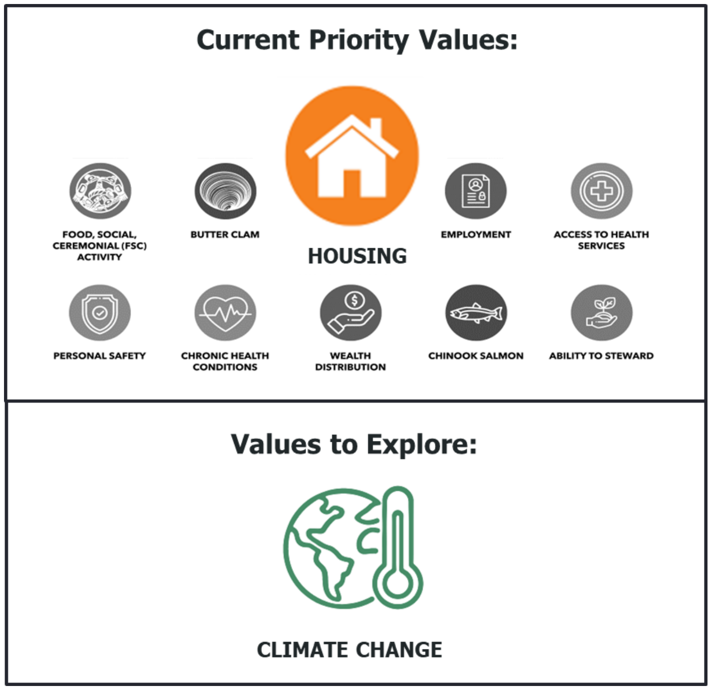

Figure 1.4: Relationship of residential energy efficiency to the CEM program

1.3. Metlakatla Community Energy & Emissions Plan

The Metlakatla Community Energy and Emissions Plan (CEEP) was first drafted in 2019, with the following objectives (MSS, 2021):

- Gather community values regarding energy.
- Determine how energy is used in the Metlakatla community.
- Identify how Metlakatla members can save electricity and utility costs.
- Identify what renewable energy projects may be feasible in the Metlakatla community or territory.

The plan identified several key recommendations on both the demand-side (i.e., ways of reducing energy consumption) and renewable energy supply side, to ensure an optimal local energy system. The top five demand side management recommendations are (MSS, 2021):

- Finish all components of Stream 1 of the BC Hydro Indigenous Community Conservation Program (ICCP) as COVID-19 permits.

- Secure funding for heat pump installations in members' homes and community buildings.

- Evaluate other energy efficiency upgrades including door/window replacement, insulation upgrades, and appliance upgrades based on ICCP data.

- Implement energy efficiency upgrades identified in Step 3 through participation in Stream 2 of BC Hydro ICCP.

- Implement an ongoing community engagement and education program to keep members engaged in activities and up to date on opportunities for behavioural energy savings opportunities (e.g., Line drying clothes in summer or turning down heat when not home during winter).

Work on the CEEP is ongoing and there are plans to do community engagement to finalize the plan.

Chapter 2. Research Methodology

In 2019, SFU Researchers and representatives from the MSS determined that residential energy efficiency, although not currently a CEM priority value, was an important component of quality housing and a research topic worth exploring in more detail. With the completion of the draft CEEP in 2020, it was determined that further community engagement was needed to gain a better understanding of Metlakatla members perceptions on residential energy efficiency, including barriers and motivations for home energy improvements, and potential home energy improvements. Between 2020 and 2022, a literature review, focus groups, and the 2020 MMC were carried out to inform the research. The methods for each of these components are described below. Results and recommendations from this research will be presented to MGC in Fall or Winter 2022.

2.1. Literature Review

To provide a broader lens on energy issues in Indigenous communities, a review of both academic and grey literature was undertaken on residential energy efficiency in the context of Indigenous communities in Canada using various keyword strings in English. Five research areas informed the literature review. First, Indigenous residential energy efficiency is examined as part of broader issues related to housing conditions. Second, residential energy efficiency is situated as a driver of energy poverty. Third, research addressing motivations for community energy planning and shifting to more efficient and clean energy systems in Indigenous communities is reviewed. Fourth, literature is reviewed that focuses on active Indigenous energy efficiency and DSM projects at both the planning and implementation stage. Lastly, Indigenous energy support programs are summarized.

2.1.1. Academic Review

The Web of Science database was queried in February 2022 for multi-disciplinary academic publications including areas of natural sciences, social sciences, economics, and sustainable development using multiple keyword strings in English (Table 2.1). The database search from 2000 to 2022 found 93 published papers relating to Indigenous energy planning and development and Canada. This initial list was screened using a title and abstract review, which reduced the number of pertinent articles to 17.

The theses database “Thesis Database and Archives Canada Thesis Portal” was also searched in February 2022 using the same keyword method above. The database search from 2000 to 2022 found 50 dissertation or theses papers relating to Indigenous energy planning and development and Canada. This initial list was screened using a title and abstract review, which reduced the number of eligible/relevant articles to thirteen.

Table 2.1: Keyword strings for Web of Science database search

Keyword String
“First Nation” OR “Aboriginal” OR “Indigenous” OR “Metis” OR “Inuit”
AND
“Energy Efficiency” OR “Energy Conservation” OR “Energy Poverty” OR “Clean Energy” OR “Renewable Energy” OR “Green Energy” OR “Alternative Energy” OR “Energy Planning” OR “Community Energy”
AND
“Canada” OR “British Columbia” OR “Alberta” OR “Saskatchewan” OR “Manitoba” OR “Ontario” OR “Quebec” OR “Nova Scotia” OR “New Brunswick” OR “Prince Edward Island” OR “Newfoundland” OR “Yukon” OR “Northwest Territories” OR “Nunavut”

2.1.2. Grey Literature Review

In this review, grey literature was included to give space for Indigenous voices through channels outside of peer-reviewed journal articles, as Indigenous research is often conducted at a community/organizational level and documentation does not always appear in academic channels. Furthermore, many Indigenous community energy plans (CEPs) and energy efficiency or clean energy projects are not considered academic literature and are not published on academic databases; therefore, much of the information pertaining to these research areas could only be accessed through a more general web search. Grey literature included: 1) public policy documents from Canadian institutes, think-tanks and research groups published on the Canadian electronic library desLibris; 2) First Nations’ CEPs and energy projects available through a Google Search; and 3) Other relevant reports that were available through a Google search.

2.1.3. Review of Current Metlakatla Reserve Housing

To gain perspective on the quality of housing in Metlakatla Village that could impact residential energy performance, a review of available housing data was conducted. Information on current housing conditions was gathered by reviewing reports and findings from: the Metlakatla CEM Program, previous Metlakatla community research, the CEEP, and data available from MSS staff. The review was limited to on-reserve housing because there is no readily available housing information for off-reserve housing for Metlakatla members.

2.2. Focus Groups

Two online focus groups with Metlakatla members were conducted, the first on March 15 and the second on March 17, 2022. Participants were all homeowners over the age of 18. The first focus group had six participants, all Prince Rupert residents. The second focus group had seven participants, which included two Prince Rupert residents and five Metlakatla Village residents.

The focus groups had three main objectives:

- Gain an understanding of Metlakatla members perceptions of their home energy system (e.g., are household energy bills high? What areas of the home are inefficient?).
- Determine members' priorities and values related to their home energy system.
- Gather feedback on high level energy improvements that could be applied to member homes.

The focus group format allowed the participants to express in their own words how they perceived energy-related elements of their home, as well as their thoughts on barriers to and motivations for energy improvements, in as much detail as they wanted. This provided a more detailed and broad range of information than can typically be gathered from a quantitative survey. It is, however, worth looking at both the pros and cons of the focus group method and recognizing that the group environment can sometimes cause unwillingness to discuss topics that might be considered personal or defaming; even if it was explained that all information recorded and transcribed would be anonymized. Further, focus group responses are meant to capture participant perceptions, which may not corroborate verifiable quantitative information (e.g., home energy costs). Most importantly, though, the focus groups allowed the participants to have a voice on residential energy improvements and to explore the issues they deemed important. Participants appeared enthusiastic to share their experiences, and the group dynamic led to a deeper understanding of why Metlakatla members feel the way they do.

2.2.1. Design and Delivery

Focus group discussion format and questions were designed based on conversations with representatives from the CEM Program (including an MSS representative), the literature review, and a review of the CEEP. A thematic approach was adopted in designing the focus groups with emphasis on different aspects of residential energy efficiency and household level renewable energy systems.

Four themes were identified for the focus groups: current home energy systems, barriers to energy improvements, motivators for energy improvements, and perceptions on upgrade options (Figure 2.1). Key questions were then developed for each theme to help guide the conversation. This thematic approach allows researchers to organize the discussions in a systematic framework with the focus on key topics that are most relevant.

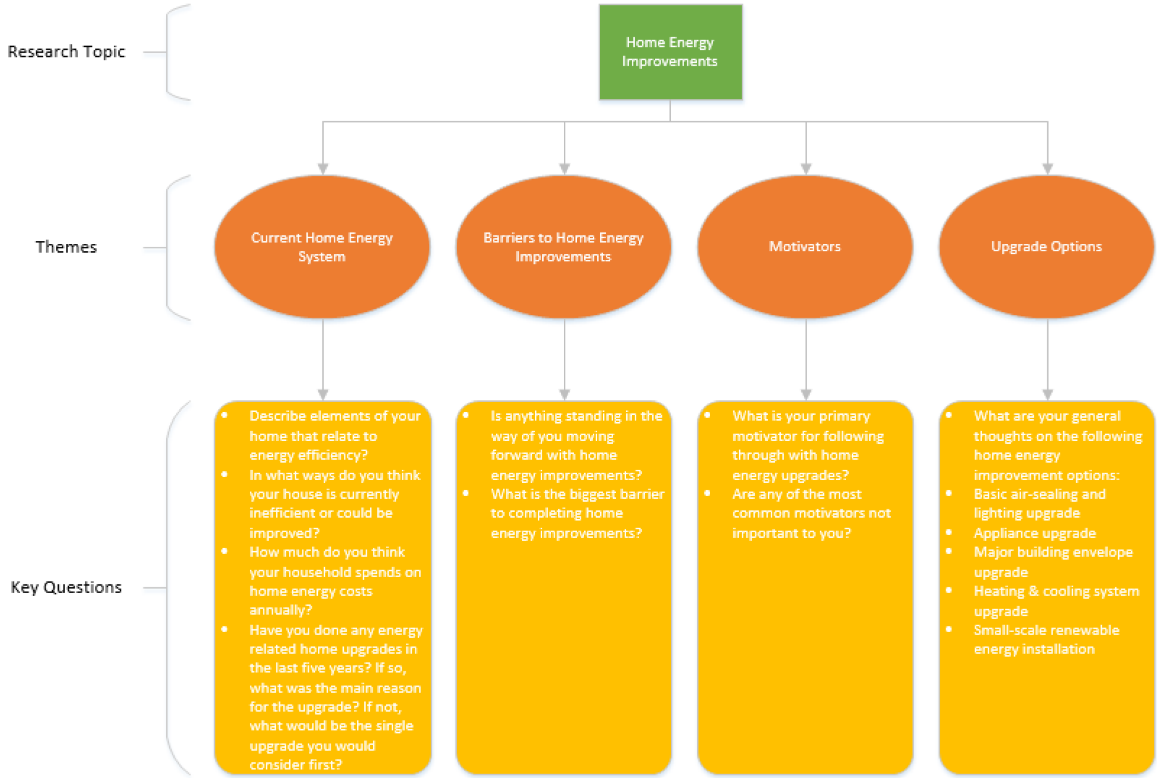

Figure 2.1: Focus group themes and key questions

Each focus group meeting was scheduled for two hours. Meetings were conducted remotely using the Zoom online conferencing software. Data was collected and recorded using Zoom's built-in audio and video recording feature. Transcripts were produced by Zoom through conversion of recorded audio into a Web Video Text Tracks (VTT) file. Any parts of the transcript that were unclear were checked using the audio and video recording.

2.2.2. Analysis

Nili et al.'s (2017) systematic and integrative framework for qualitative analysis was used to classify and analyze the data recorded in the focus group transcript. This method applies an inductive approach (a.k.a. "conventional approach") in which one identifies codes and categories inductively from raw data and without any preconceived codes or perspectives from a previous study's existing theory or findings. The inductive approach is useful where theory or prior research on a topic is limited; therefore, it can help researchers to achieve a deeper understanding of the topic and to develop new theories (Halkier, 2010; Moretti et al., 2011). The analysis framework involved seven steps used to classify and analyze the focus group data (Nili et al., 2017):

1. Determine and organize data that is relevant to the research.
2. Review the whole raw organized data to get a sense of the whole and identify content areas (i.e., parts of transcript or observation field notes that directly relate to each other).
3. Conduct a manifest analysis of content data in each content area (i.e., analyzing the readily understandable parts of the organized data in each content area).
4. Conduct a latent analysis of content data in each content area (i.e., analyzing the parts that need a high level of interpretation to understand their underlying meaning).
5. Analyze interaction data in each content area based on the interactions and discussions between participants.
6. Integrate the results obtained through previous steps for each content area.
7. Integrate the results of all content areas and report the whole results.

2.3. MMC Data Collection and Analysis

In addition to the focus groups, this research also examined the responses of Metlakatla members to housing related questions from the 2020 Metlakatla Membership Census (MMC). The MMC is one of the tools used by the CEM Program to collect input and data from the membership. Results are used to assess and monitor the status of selected indicators in the CEM Program, including housing. While not all MMC housing questions were relevant to this research, the responses to some questions provided insight into residential energy issues such as energy poverty, as a function of household income and home energy costs, and homes needing repair.

MMC questions were designed by the housing assessment project team of the CEM Program based on findings from a housing literature review and key informant interviews (Pope, 2021). The 2020 MMC included questions on impacts of the Coronavirus Pandemic on housing, awareness and use of housing services, and questions on core housing need (Appendix A) (Pope, 2021).

The 2020 MMC was administered from November 9 to December 7, 2020 (Pope, 2021). The survey was available online using SurveyMonkey and in paper hardcopies dropped off at member households (Pope, 2021). All Metlakatla members aged 15 years and older were invited to fill out the survey (Pope, 2021). The anonymized and cleaned data on the housing section of the MMC was provided to the housing assessment project team for analysis. The response rate (i.e., the percentage of Metlakatla members aged 15 years and older living in the traditional territory who completed the survey) for the 2020 MMC was 61.2% (Pope, 2021).

For the purposes of this research project, summary statistics from relevant housing related questions from the 2020 MMC were provided by the housing assessment project team (i.e., total household income, average yearly costs for electricity and heat, and responses to homes needing repair). Energy poverty rates were calculated by comparing the values reported for annual costs for electricity and heat (i.e., total home energy costs) to the values reported for total household income. The percentage of households spending more than six percent of their household income on home energy costs was determined along with the average home energy expenditure relative to income.

Chapter 3. Findings

3.1. Summary of Literature Review

It is clear from the academic literature that residential energy efficiency for Indigenous households has primarily been examined by means of quantitative and statistical methods, and that qualitative aspects of residential energy efficiency remains an understudied area. There is considerable amount of research related to Indigenous housing issues in Canada; however, there exists a gap in the academic literature to understand barriers to and perspectives on residential energy efficiency in the context of Indigenous households. The grey literature, on the other hand, contains multiple studies that examine energy poverty (with poor energy efficiency and construction quality being primary drivers) or application of energy efficient technologies in certain Indigenous communities.

There is a considerable amount of academic and grey literature related to clean or renewable energy projects in the context of Indigenous communities in Canada. These projects are typically at the community scale rather than the household scale, and are, therefore, outside the scope of this research. However, the literature on clean or renewable energy projects in the context of Indigenous communities in Canada may provide some perspective on Indigenous projects related to energy supply and could help Metlakatla advance the CEEP; therefore, a separate literature review on Indigenous clean energy projects is provided in Appendix B.

3.1.1. Indigenous Housing

Residential energy efficiency in the context of Indigenous communities and households is often embedded within government publications and grey literature that are focused on housing issues more broadly, such as construction quality, overcrowding, housing shortages, affordability, and health impacts associated with mould. Some of this literature provides insight into housing issues that can impact home energy performance. For example, Statistics Canada census data indicates that one in five Indigenous people in Canada lived in a dwelling that needed major repairs in 2016, with major repairs considered “dwellings with defective plumbing or electrical wiring, and dwellings needing structural repairs to walls, floors or ceilings” (Statistics Canada, 2017). The proportion of

First Nations people with registered or treaty Indigenous status who lived in a dwelling that needed major repairs was more than three times higher on-reserve (44.2%) than off-reserve (14.2%) (Statistics Canada, 2017). Graham and Motsi's (2008) policy brief indicates the Government of Canada spent approximately $3 billion on First Nation housing between 1997-2006, and although overcrowding was reduced by 7%, homes requiring major repairs increased by 8% to 44% during that same period. The national average for homes requiring major repairs was 7%.

While homes needing repair is not synonymous with homes with low energy efficiency, many of the deficiencies defined under major repairs can contribute to a home's energy efficiency level, and therefore solutions focused more broadly on addressing "major repair" deficiencies may address a suite of problems (e.g., mould, indoor air quality, home comfort) including low energy efficiency. This more holistic approach to housing is exemplified through the Coastal First Nation's (2017) *New Housing Guide* which provides recommendations on high performance, culturally appropriate building for Coastal First Nations (including Metlakatla). While the primary motivation for a new housing guide is improving energy efficiency and reducing dependency on fossil fuels, a high-performance home also offers additional benefits, including:

- a more comfortable, healthy interior environment with less drafts and moisture;
- a quieter building, as thicker insulation results in less outside noise entering the building; and
- higher indoor air quality because well-ventilated buildings filter air regularly (Coast First Nations, 2017).

Similarly, Heerema (2016) provided new housing design recommendations for eight common issues for Coastal First Nations communities: water leakage and pooling, mould, cold and drafty spaces, inadequate gathering space, food preparation and storage, energy efficiency and sustainability, affordability, and local capacity and materials. Many of the proposed solutions are similar across the eight issues. For example, an airtight building envelope is a potential remedy for mould, cold and drafty spaces, energy efficiency and sustainability, and affordability. Heat pump or forced air heating is a potential remedy for mould, cold and drafty spaces, and energy efficiency and sustainability. While the design guides for Coastal First Nations communities show the synergies in housing solutions that can address multiple deficiencies, these guides are catered towards new homes instead of existing homes. Addressing multiple deficiencies might be relatively easy for new construction because designs are essentially a blank slate, whereas multiple deficiencies in existing homes are comparatively more difficult to address because the process for home improvements is more iterative, with most households typically addressing only one issue or one component of the home through a renovation project.

Another Indigenous housing issue that has been researched and indirectly relates to home energy efficiency is mould. While moulds are invaluable components in the nutrient cycle, many secrete mycotoxins that are neurotoxins can be very dangerous when inhaled due to their effect on the human respiratory system (Hope & Simon, 2007) and neurological functions (Campbell et al., 2004). The crucial condition for mould to grow is moisture. In a home it can lead to higher rates of degradation of building components while having negative health impacts on the residents of the home (Porttris, 2020). Problematic moisture stems from deficiencies in housing conditions, including structural damage to the building envelope, overcrowding, and insufficient use of ventilation systems and other moisture-control and maintenance strategies (Heerema, 2016; Optis et al., 2012). Lawrence and Martin (2001) explore the challenges of First Nation communities faced with mould and suggest that substandard housing is a major contributor. Carriere et al. (2017) confirmed that hospitalizations for respiratory tract infections and asthma were more likely for Indigenous peoples in Canada compared to non-Indigenous peoples, with housing conditions and income level major factors. On-reserve homes were built using centrally designed housing plans that did not account for the vastly different climates across Canada, which has resulted in unsuitable and substandard housing designs in many cases (Standing Senate Committee, 2015).

In relation to energy efficiency, Brambilla and Sangiorgio (2020) examined the connection between mould growth and energy efficient buildings. They found that the occurrence of asthmatic symptoms is higher in new energy efficient buildings with increased airtightness and organic-based materials because these features amplify the risk of mould growth (Brambilla and Sangiorgio, 2020). However, this is largely in homes with low ventilation rates, which correlates with Heerema's (2016) research that suggests ventilation is the key factor is limiting mould growth. Therefore, in areas with high moisture, mould and energy efficiency should be considered together to obtain mutual solutions. Pursuing one solution without considering the other could result in adverse impacts on either mould growth or energy efficiency.

There exists minimal research that analyzes the quality of Indigenous housing from a technical perspective. Recognizing that most of the literature draws from statistical information or self-reporting surveys, Porttris (2020) attempted to analyze the differences between First Nation homes and non-First Nation homes in BC using housing information provided by Natural Resources Canada (NRCan). The metric used as a proxy for home quality was air changes per hour (ACH), which can be obtained from EnerGuide home energy assessment data. The information from NRCan represents 693 homes owned by First Nations between climate zones 4 and 7A and 127,295 homes owned by non-First Nations between climate zones 4 and 7B (Porttris, 2020). The aggregate data suggests First Nation homes had more favourable ACH performance and ceiling insulation levels than non-First Nation homes (Porttris, 2020). This contradicts most of the research on the quality of Indigenous housing, that would indicate quality is lower for Indigenous housing. The study results also indicate that socioeconomic factors (e.g., unemployment rates, average total income, and annual band revenues) did not significantly impact quality of homes on-reserve, but remoteness of a community had a negative relationship with quality (Porttris, 2020).

3.1.2. Energy Poverty

Energy poverty is broadly defined as the household experience of struggling to meet one’s energy needs (Rezaei, 2017; Ecotrust Canada, 2020). There is a growing set of literature dedicated to exploring the issue of energy poverty in Canada (see Rowlands, 2015; Green et al., 2016; Rowlands and Gord, 2016; Tardy & Lee, 2019; Das et al., 2022); however, most of this research addresses the issue across all demographics, without a focus on Indigenous peoples and communities. This is understandable, considering energy poverty is a problem not only for Indigenous peoples, but is an issue that most populations experience to varying degrees. There is a small set of literature that examines the issue of energy poverty pertaining to Indigenous communities (Anderson, 2018; Ecotrust Canada, 2020; Rezaei and Dowlatabadi, 2015; Rezaei, 2017), while other studies have explored energy poverty more broadly, but looked at the relative impact to Indigenous communities (CUSP, 2019a).

Ecotrust Canada (2020) quantifies energy poverty in BC as a situation where 6% or more of household income goes towards meeting energy needs. While the median Canadian household expenditure on energy was 2.9% of income in 2011, the estimated average for on-reserve households was 9% (Anderson, 2018). According to 2016 Census Data, at a national level, Indigenous households experience higher incidence of energy poverty (26%) than non-Indigenous households (23%). In BC, energy poverty rates are lower than the national levels, but energy poverty is still marginally more prevalent amongst Indigenous households (18%) than non-Indigenous households (16%).

Ecotrust Canada (2020) suggests there are three drivers for energy poverty: household income, energy efficiency in homes, and energy price, and the experience of energy poverty could involve any mix of those three factors depending on the local and household context. Based on national census data, CUSP (2019b) found energy poverty is experienced by both owner and renter households and those with a range of incomes in Canada, and therefore the type of tenure is not necessarily a good indicator of energy poverty. On the other hand, age of home and type of home affect the likelihood of households experiencing energy poverty (CUSP, 2019b). Occupants of older homes built before 1960 are more likely to experience energy poverty than newer homes, and occupants of moveable dwellings, single-attached houses, and single-detached houses are more likely to experience energy poverty than those in multi-unit buildings (CUSP, 2019b).

In relation to Indigenous households, CUSP (2019a) research reveals those experiencing energy poverty tend to live in older homes and those that are twice as likely to need major repairs. Low-income levels combined with larger household sizes can also contribute to higher energy poverty rates for Indigenous households (CUSP, 2019a). The characteristics of rural, remote, and on-reserve Indigenous communities are also factors that impact higher energy poverty rates. Poor quality housing, lower incomes, limited access to cheaper heating fuels such as natural gas, and relatively high electricity costs can lead to a higher incidence of energy poverty for Indigenous households (Ecotrust Canada, 2020). On-reserve Indigenous communities face a comparative disadvantage for energy poverty because there is a tendency for housing to be constructed from poor quality building materials and a lack of funds for building maintenance and upgrades (Standing Senate Committee, 2015). The result is reserve housing with inadequate ventilation that leads to poor air quality and mould issues, and poorly sealed building envelopes which cause higher energy use regardless of the energy fuel source (Lawrence & Martin 2001).

3.1.3. Indigenous Motivation for Clean, Efficient Energy

The research related to experience and motivation for Indigenous transitions to a cleaner or more efficient energy system in Canada is largely focused at the community or Nation level as opposed to the individual or household level. Nonetheless, the literature suggests the transition is mostly viewed positively. Indigenous communities are adopting cleaner, more efficient energy systems voluntarily and see it as part of their sustainable future development as opposed to being motivated by government policy (Brewer, 2018; Cook et al., 2017). Common motivations include breaking free of colonial ties, achieving energy autonomy, developing a more reliable energy system, and reaping the financial benefits that clean energy can provide (Stefanelli et al., 2018).

Generally, the literature on motivations for clean energy projects in Indigenous communities is connected in some way to the notion of energy autonomy or self sufficiency (Cook et al., 2017; Fields-Lefkovic 2012; Henderson 2013; Jaffar 2015; Karanasios and Parker 2016a-e; Ozog 2012; Rezaei and Dowlatabadi, 2015; Schultz 2017). The history of energy development for Canadian Indigenous communities follows that of settler colonialism, as Europeans took lands from Indigenous Peoples and over time colonizing states eradicated many communities culturally, politically, and physically. As Indigenous communities in Canada were displaced from their traditional territories and through time forced onto smaller reserve lands, in most cases the reserve lands were either connected to the centralized electric grid or remained off-grid and were reliant on some form of fossil fuel (e.g., heating oil from diesel). For on-grid reserves in BC, reliance on BC Hydro’s electric grid, which is viewed as an extension of the Government of BC, is seen by many First Nations communities as further dependence on colonial institutions which have prolonged processes of land and cultural dispossession and oppression of Indigenous peoples (Rezaei and Dowlatabadi, 2015). For off-grid reserves, reliance on fossil fuels translates to a dependence on big oil companies, which represent an extension of Western culture and the energy intensive lifestyles which many Indigenous communities oppose (Rodman, 2013). Furthermore, Indigenous views on fossil fuel developments projects are most clearly portrayed through the blockades and protests against large resource development or transportation projects that intersect traditional territories. The “not in my backyard” mentality is shared by other BC First Nations, concerned about their right to determine what goes on or through their traditional land (Rodman, 2013).

The desire for self-sufficiency is also one of the primary motivators for engaging in community energy planning. Rachelson (2018) interviewed representatives from 12 BC First Nations who have developed a community energy plan and some interviewees believed they had experienced historical displacement due to past energy projects and activities from government. As a result, some felt they were at the mercy of provincial and federal governments and service providers and were not in charge of their own energy futures (Rachelson, 2018).

While the issue of self-sufficiency is of mixed importance to non-Indigenous communities, it is considered a high priority for many Indigenous communities in Canada and First Nations communities in BC (Cook et al., 2017; Krupa, 2012a; Krupa, 2012b; Rezaei and Dowlatabadi, 2015; Stefanelli et al., 2018). Through various interviews examining the motivations for community energy projects in remote First Nations communities in BC, Rezaei and Dowlatabadi (2015) found that self-sufficiency is the most important motivation for these First Nation communities. The interview responses indicated that there are two different dimensions to self-sufficiency: (1) energy self-sufficiency which is considered a community’s ability to materially supply their own energy; and (2) the process of decision making and having the autonomy to control their own affairs (Rezaei and Dowlatabadi, 2015). While the former is centred on providing a consistent revenue stream that helps the community in its pursuit of economic independence, provide local employment, and a degree of independence from government agencies or “big capital”, the latter focuses on political autonomy and self-determination. Rezaei and Dowlatabadi (2015) suggest that striving for autonomy is the primary motivating factor that stimulates community interest in renewable energy initiatives, and that economic prosperity and material benefits are a supplementary outcome of that decision.

Other scholars argue that financial benefits and social development are the initial and primary motivating factors for local energy improvement projects, while achieving levels of autonomy and self-governance are accompanying benefits (e.g., Henderson

2013). Therefore, tangible benefits (e.g., reduced energy bills, improved health) are necessary to achieve community buy-in. This perspective aligns with reviewed literature that focused on energy poverty in First Nations communities. For communities experiencing energy poverty, the primary motivator for evaluating their energy system is to lower energy costs; however, the supplementary benefit from a proposed solution (e.g., deep energy retrofit, renewable energy supply options) can achieve a level of sociocultural autonomy within a household or community.

Some of the literature also indicates that Indigenous motivations for clean, efficient energy are rooted in economic prosperity. By interviewing First Nations communities across BC, Cook et al. (2017) determined that grid-connected communities were particularly interested in renewable energy projects to sell power back to BC Hydro. While clean energy projects have the potential to achieve multiple social, political, and environmental objectives, typically the project is only viable if there is some form of financial assistance, and if utilities are willing to “pay for power” (Cook et al., 2017). Unfortunately, BC Hydro has scaled back its primary distributed generation programs (i.e., Call for Power, Standing Offer Program, Micro-Standing Offer Program, and Net Metering Program), and some BC First Nations see this as the biggest barrier preventing further pursuit of clean energy projects (Cook et al., 2017).

While many Indigenous communities have utilized these more generic CEP frameworks, there are various aspects of Indigenous CEPs that may be distinct. Necefer et al. (2015) note that local Indigenous community contexts include socio-cultural factors (e.g., historical, cultural, artistic, and religious or sacred beliefs) that non-Indigenous communities likely do not consider. Rakshit et al. (2018a) argue that these deep-rooted values, identity, and the stewardship of the land need consideration in modern energy system planning and development. In this context, each community’s energy plan or strategy needs to be catered to the attributes of each local community and must therefore use unique approaches, assessments, and contexts; something that is not always considered in more generic energy planning frameworks (Rakshit et al., 2018a; St. Denis & Parker, 2009).

Indigenous communities are often in remote and/or rural locations; thus, much of the Indigenous literature related to Indigenous energy planning and transitions is centered on remote, off-grid situations where communities have a high dependency on fossil fuel (e.g., diesel) power generation (Arriaga et al., 2013; Arriaga et al., 2016; Heerema & Lovekin, 2019; Karanasios & Parker, 2018; Rakshit et al., 2018a; Rakshit et al., 2018b; Rezaei & Dowlatabadi, 2015; Shantz, 2018; St. Denis & Parker, 2009). While finding alternatives to fossil fuel derived power in remote communities is important, research has demonstrated that rural community energy planning (both Indigenous and non-Indigenous) is overly centered on technical and economic concerns over social aspects (Herington et al., 2017). For example, several scholars have developed case studies on renewable energy alternatives in remote Canadian communities (e.g., Karanasios & Parker, 2016a-f; Krupa, 2012a; Rezaei & Dowlatabadi, 2015) and have offered reflections on potential opportunities and challenges in this realm (Arriaga et al., 2013; Henderson, 2014; Krupa, 2012b; Rae & Bradley, 2012). While valuable research, these studies centre on the most viable renewable energy technologies instead of analyzing the Indigenous aspects of energy planning. Though rural and remote regions are growing areas of interest with respect to CEP, Shantz (2018) suggest this specific context remains understudied compared to larger, non-Indigenous municipalities.

3.1.4. Indigenous Energy Efficiency Planning and Projects

Despite the lack of academic research that examines residential energy improvements in the context of Indigenous households, many Indigenous communities in Canada have initiated projects that address residential energy improvements, from both a planning and implementation perspective. On the planning side, CEPs are used to evaluate a community's existing energy use and GHG emissions to reduce energy consumption and emissions, improve efficiency and resilience, and increase the local renewable energy supply (CEA, 2008; QUEST, 2016). Outside of BC, Indigenous community energy planning appears to be most advanced in Ontario and the Northwest Territories (NWT). In Ontario, through the Indigenous Community Energy Plan (ICEP) Program (previously the Aboriginal Community Energy Plan Program), the Independent Electricity Systems Operator (IESO) supports First Nation and Métis communities and organizations to develop and maintain an updated CEP designed to enhance community energy security (IESO, 2018). Energy efficiency and demand-side management initiatives are supported components of the ICEP program as options to address future energy needs. So far, over 100 communities have utilized IESO funding and support (IESO, 2022). In NWT, as part of the Integrated Community Sustainability Plan (ICSP) process, all 33 communities (both Indigenous and non-Indigenous) were required to complete a CEP to access federal Gas Tax funding (Arctic Energy Alliance, 2019). Communities have access to resources and guides through the Arctic Energy Alliance, and therefore most outputs across communities have similar frameworks. Some communities have a formal CEP (e.g., Behdzi Ahda First Nation – Colville Lake, Aklavik), while others only have a Community Energy Profile and Community Energy Efficiency and Renewable Project Summary (e.g., Paulatuk, Tuktoyaktuk) (Arctic Energy Alliance, 2019). Thus, for many smaller communities, the CEP process does not necessarily require a formal written Community Energy Plan. Once communities have assessed how energy is used locally, the evaluation of potential projects and partnerships that could improve community energy management can act as the plan for action.

In BC, Rachelson (2018) compiled a list of 67 Indigenous governments with CEPs in the province by examining those communities that have received funding for this work. Of the 67 communities, Rachelson (2018) selected 12 completed CEPs for in-depth review based on those that were complete and were accessible. The 12 plans came from the following Indigenous governments and organizations: Klemtu (Kitasoo), Coastal First Nations, Haida Nation, Ktunaxa, Kwadacha, Nuxalk, Wuikinuxv, Seabird Island, Skidegate, Snuneymuxw, and Tsay Keh Dene (Rachelson, 2018). Rachelson's (2018) CEP review had four major findings:

- Existing CEP frameworks may not adequately support Indigenous communities and may need to be adjusted to support their unique characteristics (e.g., unique governance arrangements, historical and socio-economic circumstance).
- Limited client or community capacity (e.g., staff resources) is a major barrier preventing CEP implementation.
- Knowledge and skills transfer that result in local capacity-building is highly valued in CEP processes.
- CEPs can be highly visible and referenced documents; therefore, linking these plans with other foundational and strategic plans (e.g., Official Community Plan, Economic Development Plan) helps to ensure consistency and longevity.

There are other First Nations communities in BC that have developed a Community Energy Plan in addition to those reviewed by Rachelson. The first to do so was the Hupacasath First Nation, who developed their plan in 2003 with support from the Pembina Institute. The Hupacasath Community Energy Plan was initiated by Chief Judith Sayers, who helped ensure a natural gas fuelled power generation project that was slated for the Port Alberni area did not proceed (Hamilton & Heap, 2004). To go along with the protest, Chief Sayers wanted to develop energy alternatives to conventional energy production and consumption (Hamilton & Heap, 2004). As a result, the community's initial efforts led to the development of the 5.2 MW China Creek hydroelectricity project followed by a community-led energy planning process that resulted in a more desirable local energy system (Hamilton & Heap, 2004). The Hupacasath CEP is a detailed document that outlines energy objectives for their reserve lands, the planning process, a summary of existing energy demand and supply, and proposed energy demand reduction packages (Hamilton & Heap, 2004). The Plan takes a holistic approach to examining local energy needs and desires for Hupacasath's Reserve Lands by recommending energy efficiency measures, building envelope upgrades, sustainable transportation options, and renewable energy supply options.

There is minimal published academic and grey literature that summarizes residential energy efficiency or DSM projects that have been implemented in Indigenous communities. There are likely more completed projects than the research would suggest; however, because such improvement projects may not occur at the community scale (e.g., only one or several households adopt energy efficiency measures), it is possible that projects were completed but not captured in the literature.

Despite the lack of published literature pertaining to residential energy efficiency or DSM projects in Indigenous communities, three projects were completed by Ecotrust Canada:

- **Regional District of Mount Waddington (RDMW) - Regional Residential Heating & Energy Analysis (Ecotrust Canada, 2019a):** Initiated by concerns over the inequities of BC Hydro's residential inclining block rate towards local households who lacked access to affordable heating fuels, Ecotrust Canada reviewed RDMW's residential electricity consumption and conducted a region-wide survey to determine some of the problems. Key findings indicate 60% of residents use electricity as their primary heating source and average household spending on heating in the RDMW is 47% greater than the provincial average. Thirty-three percent of residents are challenged to pay their home energy bills and 18% needed to forgo other basic needs (e.g., food, clothing, transportation). Of the 49% of RDMW residents who are aware of BC Hydro's residential inclining block rate structure, 63% do not think it is fair for their household. In addition to advocating for changes to BC Hydro's tiered rate structure, the report recommends building envelope improvements and upgrades to existing heating systems, such as high efficiency heat pumps, to help address high household energy costs in the area. Further, given the lack of building maintenance and certified HVAC professionals in the region because of its remoteness, the report recommends RDMW initiate a capacity building initiative that supports cost-effective, local retrofitting and upgrading of the regions 4,850 homes.

- **Lower Similkameen Indian Band (LSIB) - Heating System Analysis (Ecotrust Canada, 2019b):** Ecotrust Canada completed a comprehensive review of residential heating to (1) identify community sentiments about household heating and efficiency; (2) estimate a true cost of heating for different heating sources; and (3) assess opportunities for new energy infrastructure and household efficiency improvements. To do so, the study involved a community survey, a review of residential electricity usage rates and costs, and modelling household heat retention and energy efficiency using NRCan energy assessment data. The following key findings were noted (Ecotrust Canada, 2019b):
    - Cost for homes only heated with electric radiators or furnaces are substantially higher ($3,629 per year) than heat pumps ($2,474 per year) and wood ($1,453 per year).
    - Eighty-nine percent of LSIB members are interested in making improvements to their household structure, while 61% are interested in installing a more efficient heating system, and 61% indicate their heating costs are unaffordable.
    - Between 2010 and 2018, average annual household electricity consumption declined 17%, but average annual household electricity spending increased 19%.
    - Insulation improvements and heat pump retrofits were identified as the most promising opportunities to reduce household heating expenses for homes across the LSIB community.
- **Heiltsuk First Nation - Report on Bella Bella Heat Pump Project (Ecotrust Canada, 2019c):** In 2017, Heiltsuk Nation and Ecotrust Canada engaged in a fuel switching pilot project that replaced diesel furnaces with ductless air-source heat pumps in 37 local homes. The purpose of the report was to assess the performance of the heat pumps and to identify opportunities to improve the project. To assess heat pump performance, a survey was issued to heat pump recipients, electricity bill data was reviewed for recipients, and heat pump aspects (e.g., installation costs, energy efficiency, and potential return on investment) for two options were modelled in RETScreen Expert. Ninety-three percent of heat pump owners reported being 'happy' or 'very happy' with their heat pump system and 75% of heat pump owners feel better knowing they are heating their home without fossil fuels. Estimated average annual cost savings per household was $1,658 and average energy consumption reduction was 17%. The report indicates installation costs for a

ductless heat pump system after rebates were $6,000 - $8,000, and $11,000 - $13,000 for a central air, ducted unit. Estimated payback period was 2.5 years and 4.3 years, respectively. Based on the results, Ecotrust Canada recommended continuing heat pump education with households to ensure effective system operation, considering central air heat pump systems for larger homes, continuing building envelope and ventilation upgrades to complement heat pump installations, completing bathroom fan upgrades where possible, getting consent from heat pump owners to provide utility bills to track energy consumption, and continuing to explore funding options to expand the program.

3.1.5. Indigenous Energy Programs

Provincial and Federal governments, and energy utilities offer various energy programs to support Indigenous community or household energy objectives. Programs typically provide funding for energy management positions, capacity-building in energy management, incentive and rebate programs for building energy improvements, and energy conservation policies for on-reserve buildings. Rachelson (2018) completed a scan of DSM programs in North America and found that there were approximately 22 relevant programs, about half of which were focused on Indigenous communities. 17 out of 22 of the programs utilized energy conservation measures (e.g., free giveaways, direct installations, rebates) and 13 out of 22 of the programs applied capacity building measures (e.g., grants and funding, technical support, how-to advice). Based on the DSM program scan, Rachelson (2018) recommended enhancing utility program structures to focus more on capacity building in addition to energy saving measures; prioritizing relationship-building, flexible financing, and social learning; streamlining funding for renovations and energy efficiency upgrades to ease the hassle costs on applicants; and maintaining a flexible approach when working with Indigenous communities (e.g., covering costs partially or fully, using face-to-face interaction, extending funding timelines, etc.).

In BC, there are multiple DSM programs available from the Federal and Provincial Government, BC Hydro, and FortisBC to support Indigenous communities, including Metlakatla. Some programs are only available for Indigenous communities and households, while others are available more broadly to the public or specific segments of the population (e.g., low-income households) for which Indigenous communities and households could be eligible. While the programs are constantly evolving, at the time of this report, the DSM programs outlined in Table 3.1 were available to BC Indigenous communities.

Table 3.1: Demand-Side Management programs available to BC Indigenous communities

Program Name	Amount	Description
Government of Canada		
Canada Greener Homes Grant (NRCan, 2022a)	Up to $600 for a pre and post retrofit EnerGuide home evaluation Up to $5,000 per household for energy efficiency retrofit measures	Provides grants for home evaluations and retrofits, such as home insulation, windows and doors, air sealing and mechanical and renewable energy systems. Applicants must undertake an EnerGuide pre- and post-retrofit evaluation to be eligible for the retrofit grant. Indigenous governments can submit a group application for homes that they own.
Canada Greener Homes Loan (NRCAN, 2022a)	Interest free financing between $5,000 and $40,000	Offers interest-free financing in addition to the Canada Greener Homes Grant to help Canadian households complete some of the more major retrofits recommended through an EnerGuide home evaluation. Indigenous governments can submit a group application for homes that they own.
Energy advisor recruitment, training, and mentorship (NRCAN, 2021)	Up to $200,000	Funding to support innovative projects to recruit and train new EnerGuide Energy Advisors, with a focus on increasing the diversity and representation of the existing workforce. Ten percent of funding is being targeted to Indigenous organizations. The funding is a component of the Canada Greener Homes Program.
Clean Energy for Rural and Remote Communities Program (CERRC) (NRCAN, 2022b)	Up to $5 million	Provides funding for renewable energy and capacity building projects and related energy efficiency measures in Indigenous, rural, and remote communities across Canada. The program aims to reduce the use of fossil fuels for heating and electricity by increasing the use of local renewable energy sources and energy efficiency.
Indigenous Off-Diesel Initiative (Impact Canada, 2022)	Up to $20,000 to get started Up to $2.1 million to develop goals and begin implementing a community-scale clean energy plan Up to an additional $9 million to support plan implementation	The Indigenous Off-diesel Initiative aims to support remote Indigenous communities in developing and implementing ambitious plans to reduce diesel use for heat and power.

Program Name	Amount	Description
Government of BC		
CleanBC Better Homes Incentives (CleanBC, 2022a)	Various depending on the measure	Incentives for insulation & heating system retrofits. Available amounts are already included in preliminary analysis above.
CleanBC Indigenous Community Heat Pump Incentive (CleanBC, 2022b)	Up to 80% of the cost of new heat pump installation(s), up to a maximum of $12,000 per residential heat pump. (Maximum up $200,000 per application) For homes switching from woodstove primary to electric heat pumps: $3,500 for a mini-split heat pump $6,500 for a central heat pump system	Provides funding for the installation of heat pumps for on—reserve Indigenous households. Indigenous communities wanting to take advantage of this incentive and related energy efficiency offers can also access free energy coaching services through the CleanBC Indigenous Community Energy Coach Program.
BC First Nations Clean Energy Business Fund (FNCEBF) (BC MIRR, 2022)	Capacity Funding: Community Energy Plans: up to $30,000 Pre-Feasibility and Feasibility Studies: up to $50,000 Training for Community Members: up to $50,000 Equity Funding: Demand Side Management / Energy Efficiency: up to $150,000 Clean Energy Generation: up to $150,000 Pre-Construction / Pre-Commercial Operational Date: up to $500,000 Investments in existing Independent Power Projects: up to $500,000	The program aims to promote increased Indigenous community participation in the clean energy sector through agreements between the BC Government and the eligible applicant to: • provide capacity funding to support Community Energy Plans (CEPs), feasibility studies, community training or business/negotiation planning for the purposes of developing clean energy initiatives and opportunities within First Nations communities (Capacity Funding); • provide equity funding to assist in the undertaking of First Nations' own community clean energy projects for supply, help acquire equity positions in clean energy projects, or implement energy efficiency/demand-side management projects (Equity Funding); and • share in the revenues from clean energy projects based on new, net, incremental revenues to government derived from water rentals, land rents and eventually wind participation rents (Revenue Sharing).

Program Name	Amount	Description
Energy Utilities (BC Hydro and FortisBC)		
Indigenous Communities Conservation Program (ICCP) (BC Hydro, 2022a)	Various depending on the measure	Supports Indigenous communities looking to improve the energy efficiency and comfort in their community's homes. Stream 1 - Bands can receive free energy saving products, salary support and installation training to conduct upgrades such as energy efficient lighting, high performance faucets and showerheads, and basic draft proofing. Stream 2 - Bands and their contractors can receive training to complete advanced energy upgrades to homes (e.g., insulation and air sealing, ventilation, heat pumps) and apply for rebates to support the cost of those upgrades.
Energy Conservation Assistance Program (ECAP) (BC Hydro, 2022b)	Various depending on the measure	Income-qualified households and provides an in-home visit with free energy-saving product installation including energy-saving LED light bulbs, high efficiency showerheads, and weather-stripping to reduce drafts.
Other		
Federation of Canadian Municipalities (FCM) - First Nation-Municipal Community Economic Development Initiative (CEDI) (FCM, 2022)	Varies	The CEDI program, implemented in partnership with Council for the Advancement of Native Development Officers (Cando), supports neighbouring First Nations and municipalities to develop capacity to and implement long-term joint planning for community economic development initiatives and land use, while building respectful and sustainable government-to-government partnerships
New Relationship Trust - Nation Building Initiative (New Relationship Trust, 2022)	$50,000	Provide funding opportunities to First Nations and Tribal Councils in BC to support their nation-building activities according to their self-determined priorities. A project or initiative meant to strengthen the institutional, governance, and community capacities in reclaiming and rebuilding resiliency, self-determination, and sovereignty, within each Nation's own context is considered an eligible project.

Program Name	Amount	Description
Fraser Basin Council – Home Energy Save (Fraser Basin Council, 2022)	Varies	The Fraser Basin Council is working with First Nations communities in BC to reduce energy use, share success stories, and build local capacity and economic development. The program involves several initiatives: Train the Trainer: Building Indigenous Capacity for Energy Efficiency - a project in partnership with the Aboriginal Housing Management Association and the BC Institute of Technology that aims to build skills and knowledge in energy-efficient building construction within Indigenous communities by training a peer group of Indigenous building experts and student trainees. Ask An Energy Specialist: A program to support First Nations communities in BC that are interested in improving housing energy efficiency while in the early stages of project planning or implementation. Each community can access free guidance (3-12 hours) from an energy consultant to help kickstart energy efficiency work.

3.2. Metlakatla Reserve Housing

An understanding of the current state of Metlakatla housing can provide insight into potential energy efficiency problems and opportunities. While formal EnerGuide home evaluations completed by a Certified Energy Advisor would be required for each house to determine household specific issues, more general housing data is useful for examining common housing construction themes that could present shared problems for occupants. This analysis could also be helpful to identify candidate houses for community-scale residential energy improvements (e.g., heat pumps).

According to data provided by MSS, Metlakatla Village has 57 buildings, 50 of which are residential. Six of the residential buildings are multi-unit buildings (e.g., duplex or triplex), while the remaining 44 are single-family dwellings. The residential buildings have the following features:

- **Size:** Units range from 74.3 m^2 to 204 m^2. The average size is 141.9 m^2.
- **Storeys:** 20 of the residential buildings are one level and 30 are two-level. There is no indication that any of the buildings have a basement.

- **Date of Construction:** Most (27) of the buildings were constructed in the 1980s. Nine buildings were constructed prior to the 1980s, eight were constructed in the 2010s, and six are unknown (Table 3.2). Although age of home is typically a good indicator of home energy efficiency as energy efficient products and construction practices have improved over time, it is possible some homes have undergone minor or major upgrades since being built that are not captured in the data.

- **Building Envelope:** Thirty-five of the homes have 38 mm x 89 mm exterior wall studs, nine have 38 mm x 140 mm wall studs, and six are not reported. Of the nine homes that have thicker studs, eight were built in the 2010s. Exterior wall stud size is not a proxy for energy efficiency level, but it can be a good indicator for thicker insulation levels which improve residential energy efficiency.

- **Heat Source:** Metlakatla Village is not connected to the natural gas grid; therefore, all homes are heated electrically. Forty-four of the homes have electric baseboards, five have an electric heat pump, and one has a combination of a woodstove and electric baseboards (Figure 3.1). All five homes that have an electric heat pump are Elders Units that were constructed in 2012.

- **Ownership Type:** Thirty-five of the residential buildings are privately owned, while 15 are owned by Metlakatla. All multi-unit residential buildings (i.e., duplexes and triplexes) are Metlakatla-owned.

Table 3.2: Date of construction of residential homes in Metlakatla Village

Date of Construction									
	Pre-1960s	1960s	1970s	1980s	1990s	2000s	2010s	Unknown	Total
Number of Units	1	4	4	27	0	0	8	6	50

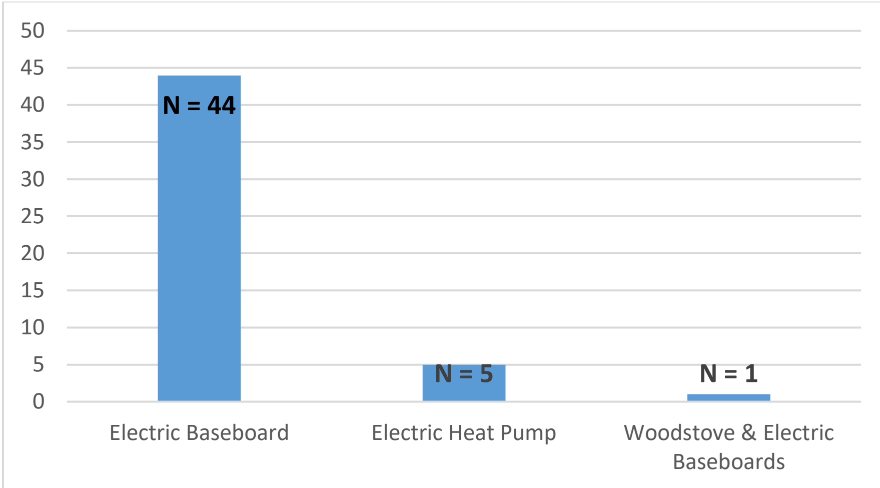

Figure 3.1: Heat source of residential homes in Metlakatla Village

Metlakatla's CEEP provides an Energy Profile for Metlakatla Village that summarizes baseline energy consumption from community buildings using monthly electricity data from BC Hydro. As Metlakatla Village is not connected to the natural gas supply network, building electricity consumption data is an accurate representation of total building energy usage. It was determined that total annual electricity consumption for the community was 1,481,851 kWh, with residential consumption accounting for 54% of total consumption and commercial buildings and operations accounting for the remaining 46% (Metlakatla, 2021). Based on individual residential consumption data provided by BC Hydro, the average electricity consumption for Metlakatla homes was 29,629 kWh/year (Metlakatla, 2021). Despite a conservative estimate of energy consumption, this is 2.7 times higher than the provincial average of 11,000 kWh/year (Metlakatla, 2021). Consumption varies substantially depending on the season. During the colder months between October and March, community electricity consumption (968 MWh) was nearly double the electricity consumption from April to September (514 MWh). This is largely attributed to heating demand, as exemplified by the number of heating degree days in Figure 3.2.

Linear regression analysis was completed to determine the base load (i.e., the load that does not change in correlation with outside temperature) and the variable load (i.e., the load that will change in correlation of outside temperature). This is beneficial in understanding how much of a home's energy consumption is impacted by features those occupants have control over. The analysis determined an annual baseload of 446,328 kWh, or 30% of the total community load. The variable load was therefore estimated at 70% or the total load, or 1,035,523 kWh (Metlakatla, 2021).

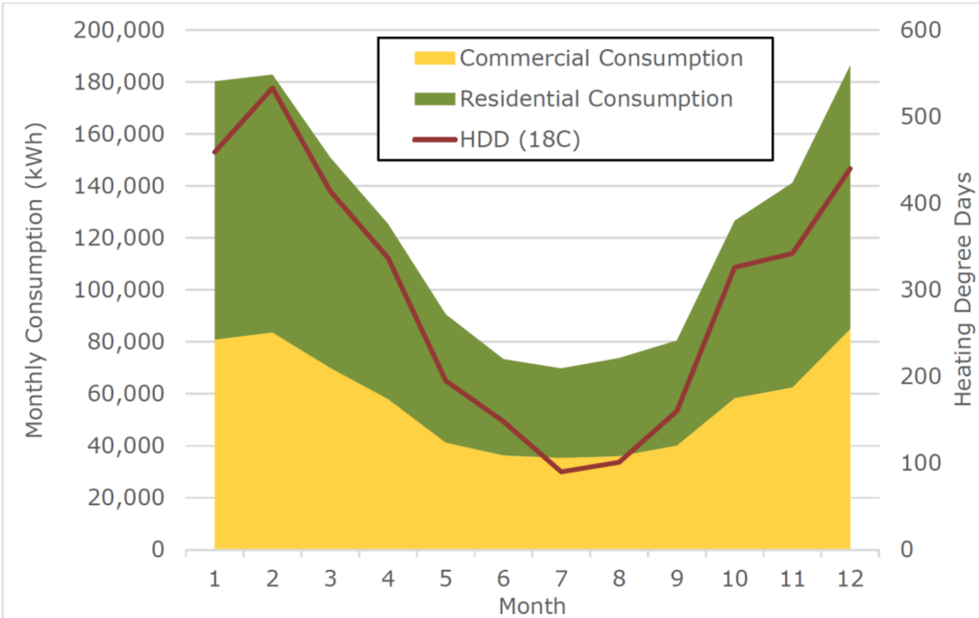

Figure 3.2: Metlakatla Village monthly building energy consumption with HDD identified

(Image from: Metlakatla (2021))

To determine climate impact of the operational energy use of buildings, the GHG emissions from Metlakatla Village's building electricity consumption were calculated based on BC's 2019 Grid Electricity GHG Emissions Intensity Factor of 29.9 tonnes of carbon dioxide equivalent (tCO2e)/GWh (Government of BC, 2022). In hydroelectric-based power systems such as BC's, electricity grid GHG emissions factors can vary significantly from year to year based on water supply conditions and reservoir levels (Government of BC, 2022). In years with low stream flow or low reservoir levels, relatively low GHG emission hydroelectric power must be supplemented with imported fossil-fuel generated electricity from neighbouring jurisdictions or through increased use of BC thermal generation facilities. Between 2010 and 2020, BC's Grid Electricity GHG Emissions Intensity Factor has ranged from a high of 41.6 tCO2e/GWh in 2011 to a low of 25.3 tCO2e/GWh in 2018 (Government of BC, 2022). The average between that period was 34.4 tCO2e/GWh (Government of BC, 2022). Based on Metlakatla's 2019 electricity consumption and forecasted growth, total 2019 and future GHG emissions from Metlakatla buildings was estimated at 44.3 and 51.9 tonnes of CO2 per year, respectively.

While BC's Grid Electricity GHG Emissions Intensity Factor may shift from year to year, it remains lower than electricity grid emissions factors for many other jurisdictions. For example, 2019 grid emissions factors for Alberta, Nova Scotia, and Saskatchewan were 683 tCO2e/GWh, 663 tCO2e/GWh, and 728 tCO2e/GWh, respectively. Further, comparing electricity to natural gas for heating, it is estimated that in BC, a natural gas furnace would produce 40 times more carbon pollution than an electric system (Heerema, 2017). Therefore, even on a year with a higher-than-average Grid Electricity GHG Emissions Intensity Factor, electricity in BC remains a relatively low-carbon residential energy source compared to other areas and heating fuels.

3.3. Summary of Focus Groups

In this section, findings from the two focus groups are presented in the following key themes: current home energy elements, perceived deficiencies, energy costs, barriers to energy improvements, and motivations for energy improvements. An in-depth summary of the focus groups is provided in Appendix C.

3.3.1. Current Home Energy Elements

Housing quality for Indigenous households is well documented through Canadian census data and indicates many Indigenous households live in homes needing major repairs (Lawrence and Martin, 2001; Standing Senate Committee, 2015; Statistics Canada, 2016). The issue of poor-quality housing is more prominent for on-reserve households than off-reserve (Lawrence and Martin, 2001; Standing Senate Committee, 2015). Most focus group participants described elements of their home that would be in line with the notion of poor-quality or inefficient housing.

The term "drafty" was frequently mentioned as a descriptor of home quality, and various elements of the building envelope contribute to draftiness. One of the most mentioned building components was windows, with multiple participants describing windows that were old and only single or double pane. These old and lower quality windows result in noticeable drafts, bringing unwanted cold air from the outside, especially during the winter months. Some participants also described their window frames, and perceived older aluminum frames to contribute to draftiness along with the number and quality of panes. Insulation was another element that participants associated with draftiness. This was either because of poor insulation or lack of insulation in the wall, basement, or attic. As stated by one participant: “Is my house properly insulated? I severely don’t think, there’s drafts everywhere.”

Several participants who live off-reserve in Prince Rupert noted the basement as a component of their home that contributed to drafts and poor energy efficiency. Some houses were constructed directly on a rock foundation or with a floating foundation, and the lack of insulation in the basement envelope created noticeable temperature differentials between the lower levels and higher levels of the house, with one respondent mentioning:

> My biggest problem is probably the basement… I'm on a rock cliff and half the basement is just rock. And then the rest of the area is for walking and a storage kind of area, but that's the coldest; I feel the draft coming all the way up in the wintertime especially this past winter.

The heating and cooling system was an element of the home that many participants appeared to understand well. Participants who lived off-reserve in Prince Rupert had a mix of natural gas furnaces and electric baseboards, while participants who lived on-reserve in Metlakatla Village had electric baseboards only. The responses align with the Metlakatla CEEP and information on the local energy supply, which indicate Metlakatla Village is connected to the BC Hydro electricity grid, but not to the natural gas network. Prince Rupert is also connected to the BC Hydro electricity grid and is part of Pacific Northern Gas’ natural gas service area. Participants with electric baseboards often described them as old, indicating that they recognized this form of heating is a dated technology that is relatively inefficient, and has not been changed since occupying the home. Several participants with electric baseboards also indicated having to supplement with small electric room heaters because the baseboards were not adequate in getting the home to a comfortable temperature.

New energy efficient (e.g., Energy Star) appliances, such as refrigerators, washers, and dryers were common amongst participants. However, participants generally felt there was a trade-off between energy efficiency and quality. While older appliances may have a lower energy efficiency rating, there was a strong sentiment that they also tend to last longer than newer appliances that have a higher energy efficiency rating. In some cases, participants preferred older appliances, sacrificing higher energy efficiency for durability. This sentiment appeared to be amplified by the group dynamic of the focus group setting, as one participant stated their concern over the quality of newer, more energy efficient appliances, and others in that focus group followed suite by agreeing (e.g., "That's true, they don't make them like they used to.").

Most participants have moved to energy efficient lighting, with many stating that they have installed light emitting diode (LED) lights throughout their home as the technology has improved. Through Metlakatla's participation in the BC Indigenous Community Conservation Program, LED lights were offered free of charge to on-reserve households, and many have taken advantage of this. Off-reserve participants in Prince Rupert also have or were in the process of shifting to LEDs. While replacing incandescent or compact fluorescent lighting with LEDs will help improve lighting efficiency, participants recognized that this improvement was the low hanging fruit, and that other improvements would be required to create noticeable changes in home energy performance.

Several participants made a connection between de-humidification and energy efficiency. This aligns with the literature that indicates moisture is an important design consideration for coastal homes in BC, and many homes with inadequate ventilation could experience mould issues (Heerema, 2016; Coastal First Nation, 2017). With high moisture in the Prince Rupert area, it is common to use de-humidifiers to improve home comfort (e.g., make the home warmer and less damp), but in doing so participants also noticed a reduction in energy costs:

> To reduce the moisture that we have in our homes, I found that, for me, I went out and purchased a dehumidifier and what a difference. The amount of water that came out when you put them in different rooms, and it actually made the home warmer just because the dampness is gone. I kind of noticed a little bit of a dip in my energy costs.

While the direct impact of dehumidification on home energy costs needs to be explored further, it is important to note the recognition of moisture issues for many participants, and the desire to live in a comfortable home.

3.3.2. Perceived Problems for Energy Efficiency

When asked "in what ways do you think your house is currently inefficient or could be improved" participants predominantly mentioned components of the building envelope as the culprit. Windows, doors, and insulation were stated as the main reason for problems related to energy efficiency. Participants again pointed to draftiness and air leakage when referring to elements of the building envelope, and this tangible sensation of feeling cold outside air infiltrate through cracks around windows, doors, and parts of the exterior walls could be one reason why the building envelope was considered a major problem area for energy efficiency compared to other elements of a home energy system. As stated by one participant:

> We've got the single pane aluminum [windows] and I do buy the plastic shrink wrap and put those over the windows. It does help, but you can still see how much air comes in. And same thing with the doors: with the amount of wind, it still finds a way in.

Another participant stated:

> Around my doors and a couple of windows in the basement, I can feel a draft come through there. So that's a place where they could be tightened up a little more.

Despite recognizing insulation and windows as potential issues, participants did not mention the technical insulating value of insulation (i.e., R-value) or the windows (i.e., U-value) that would explain the inefficiency. Participants consistently used the words "I think" when stating that insulation or windows are a problem, suggesting that although they feel they are a major contributor to an energy inefficient home, they do not know the features of the homes insulation to confirm. This is especially understandable for insulation, considering it is typically hidden behind drywall or is in the attic.

Some of the literature (e.g., Ecotrust Canada, 2019c; Ecotrust Canada, 2020) points to electric baseboards as a problem for high home energy costs, particularly on-reserve Indigenous communities without access to natural gas. While many participants noted having electric baseboards, only one participant mentioned the heating and cooling system as a noteworthy energy efficiency problem for their home. The tangibility of building envelope deficiencies compared to the inefficiency of electric baseboards could be a factor in why participants mentioned the building envelope as an energy efficiency problem more frequently than the heating and cooling system. Therefore, while research suggests electric baseboards often contribute to high home energy costs, home occupants do not physically feel or experience the impact of electric baseboards in the same way as drafts through a defective building envelope.

Although most participants did not recognize the heating and cooling system as a major problem for poor home energy efficiency, many participants did see improvements to the heating and cooling system as a priority solution. When, asked “what would be the single upgrade you would consider first” several participants stated various heating technologies such as heat pumps, pellet stoves, and room heaters.

3.3.3. Home Energy Costs

Most participants stated that their home energy costs were high. This is in line with the literature that indicates Indigenous households tend to experience higher rates of energy poverty or have a high home energy cost burden (Anderson, 2018; CUSP, 2019a; Ecotrust Canada, 2020). High home energy costs were reported by households with both natural gas and electric baseboard heating, although the highest costs were reported for households with electric baseboard heating. Both on-reserve and off-reserve households reported high energy costs.

There was substantial variation in the reported values for home energy costs, with participants mentioning costs between $100 and $1,300 over a two-month period. Even with this variation, the general sentiment was that energy costs within this range were high:

> And I think in the wintertime we're paying anywhere from probably $900 to $1,300 for over two months, and then during spring and summer we're paying maybe $300.
>
> And:
>
> The costs were super high, but I guess it can be the natural gas. Obviously, in the wintertime it starts going up, but regardless even in the summertime it's still like over $100 for two months, even though you're not using the hot water tank.

The variation in what is considered “high” home energy costs indicates that each household’s situation is unique and aligns with the literature that suggests energy poverty is a function of multiple factors, including household income, home energy efficiency, and energy prices (Ecotrust Canada, 2020; CUSP, 2019). Therefore, what is deemed high by one household might not be for another household. Interestingly, some of the values that participants considered high for home energy costs were under the BC average residential cost of electricity of $126 per month in 2020, which is based on BC Hydro electricity rates of $0.126 per kWh and average monthly usage of 1,000 kWh (Urban, 2021).

Several participants expressed concern that home energy costs have been increasing over time, even without any major renovations. Participants used words such as “skyrocketing” and “constantly going up” to indicate that energy costs were previously more affordable and have since increased. This was mainly credited to increasing utility rates, but some participants did not know the cause. For example, one participant expressed concern that utility rates may be increasing at a higher rate for households on First Nations reserves in BC compared to off-reserve households; however, BC Hydro’s residential electricity rates are the same for on-reserve and off-reserve households.

One participant indicated that a way to moderate high seasonal energy costs was through an equal payment plan. These plans are common offers from utility companies and use the previous year’s energy consumption to determine the estimated consumption and costs for the upcoming year; then this total annual cost is divided by 12 to give equal monthly payments. While an equal payment plan can alleviate the risk of very high monthly bills, typically in the winter heating months, it would not change total home energy costs if consumption remained comparable. Most participants were unaware of the equal payment option but were interested in learning more.

3.3.4. Barriers to Home Energy Improvements

Participants agreed that high upfront cost was the main barrier preventing them from following through with major home energy upgrades (e.g., heating and cooling system, building envelope). This could be either due to the necessary improvements having a high cost, households not having adequate income, or a mix of both. High cost appeared to be a barrier for both off-reserve and on-reserve households. The barrier of high cost is well documented in research related to residential energy retrofits, and it continues to be one of the predominant barriers for many households, including but not exclusive to Indigenous households (e.g., Black et al., 1985; Jakob, 2007). Participants noted having a strong desire to move forward with certain energy improvements but needing to make trade-offs with other aspects of their household budget. In many cases, other costs were a priority. As stated by one participant:

> I feel like it's 100% finances. I feel like a lot of us have to make a choice to either upgrade one thing and then leave the other. I had to choose between buying a new furnace or buying a couple windows just because I'm about to be a new mom and go on maternity leave, and there is just no point on heating up the house and paying a lot for the gas bill when all the heat goes out from the draft from the old windows. It's kind of picking what's more important and sticking to your budget.

In addition to upfront cost, participants agreed that poor knowledge and awareness (i.e., failure of information) about how to effectively follow through with home energy improvements was another barrier. However, while high upfront cost was a barrier quickly identified by participants, the information barrier had to be explained to participants first, and then most agreed that it hindered home energy improvements. Participants referred to various parts of the home energy improvement journey that they did not fully understand or have knowledge of. For example, one participant stated "…I just don't know what to do", indicating a lack of understanding on what areas of the home to focus on to improve energy efficiency. Other participants noted a lack of awareness of energy efficiency programs, available contractors, financing options, and the benefits and costs of upgrade options. Regarding heat pumps, several participants indicated they did not understand the benefits of the technology in the local climate. For example, several participants conversed with heat pump owners in a neighbouring First Nation community who indicated their experience was not overly positive. They noted issues with functioning properly in colder climates. Aside from anecdotal evidence, participants did not have verifiable expert information that could accurately represent the benefits and costs of home improvement technologies, such as heat pumps, in the local climate.

To address the failure of information, participants were introduced to the concept of an EnerGuide Home Evaluation, which is a home energy audit carried out by a Certified Energy Advisor to identify areas that contribute to poor energy performance and identify retrofits to help improve energy efficiency. Most participants were unaware of this service but believed it could help overcome the information barrier. However, there were still some concerns that the knowledge gained from the assessment may not add value if households still cannot afford to follow through with the recommended upgrades. For example, one participant stated:

> If the assessment is done and identifying those issues, obviously there's a good majority of people who know about their issues but don't have the funds. We can point out all the issues but what's the point in doing it if we can’t fix anything?

Most participants felt that Metlakatla could provide support to help overcome the information barrier, especially for more complicated home energy improvements such as major building envelope upgrades. Ideas proposed by participants included providing information sessions or education resources for members, arranging EnerGuide Home Evaluations for interested member households, identifying, and accessing financing programs, and hiring a Housing Coordinator to provide ongoing and formal support for on-reserve households. While the desire for support from Metlakatla was expressed mostly by participants who lived on-reserve, some off-reserve participants also felt Metlakatla should support member households living in Prince Rupert.

A barrier mentioned by several on-reserve participants was accessibility to the community. One participant noted that Metlakatla Village is a boat-accessed community, and therefore getting contractors or housing supplies to their homes can be a challenge. The issue is even more pronounced for elderly Metlakatla Village residents who may be less inclined to handle the physical labour of either carrying supplies or doing the upgrade work (e.g., “If I had to buy a door, how do I get it over here and up to my house where I can't even lift it. That's another barrier.”).

3.3.5. Motivations for Home Energy Improvements

Similar to barriers to home energy improvements, participants agreed that finances are the primary motivator to completing home energy improvements. Participants were asked “What would be your primary motivation for following through with home energy upgrades?” and then were presented with a list of potential motivators: better for the environment, saving money, less maintenance, better indoor air quality, improved home comfort, climate resilience, and energy autonomy. Participant's chose saving money on home energy costs above other motivators and said they are most likely to invest in home energy efficiency if the selected measures result in noticeable reductions in home energy bills. Participants saw home energy costs as part of the household budget and recognized that any savings realized on utility bills could help pay for other household costs. As stated by one participant, "My biggest motivation [for completing home energy improvements] will be saving money and having a better quality of life, accessing everything I need to do it."

In the March 17, 2022, focus group, participants were asked, using the polling feature of Zoom, to choose their top three motivations for completing home energy improvements based on the list of potential motivators (i.e., better for the environment, saving money, less maintenance, better indoor air quality, improved home comfort, climate resilience, and energy autonomy).[1] Saving money was the most frequently selected motivator, followed by better indoor air quality, improved home comfort, and environmentally friendly (Figure 3.3). Less maintenance, climate resilience, and energy autonomy were the least frequently selected motivators. While saving money was the top motivator, it was common for participants to mention valuing all motivators to some degree. Participants used the words "all of the above" or "they're all good points" when describing what would motivate them to complete home energy improvements. For example, one participant stated:

> They all would be good motivators, and I think the biggest one is that we've got to save our planet for our grandchildren, and we have to do better than what we're doing. But I think on the top of the list mine would be to save money.

When asked "Which, if any, of these factors is not important to you or is least likely to motivate you to complete a home energy upgrade?", all participants agreed that none of the motivators were unimportant.

[1] The poll was not completed in the March 15, 2022, focus group because of technical issues.

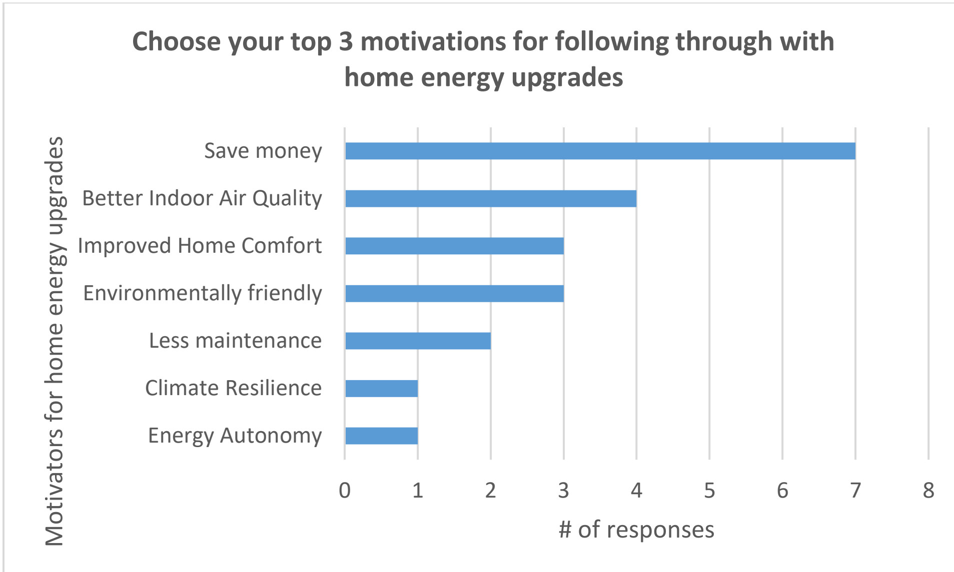

Figure 3.3: Top motivators for completing home energy improvements

The literature indicates that some Indigenous communities are motivated to complete renewable energy projects because of the desire for self-sufficiency, breaking free of colonial ties, and energy autonomy (Cook et al., 2017; Fields-Lefkovic 2012; Henderson 2013; Jaffar 2015; Karanasios and Parker 2016a-e; Ozog 2012; Rezaei and Dowlatabadi, 2015; Schultz 2017). Focus group participants were asked to consider energy autonomy as a motivator for household-scale renewable energy. While some participants mentioned the desire for energy autonomy and being less reliant on the centralized BC Hydro electricity grid, they were also skeptical of the renewable energy options available considering the local climate. For example, several participants did not feel solar was a viable option because of the lack of sunlight in the area, despite the CEEP indicating solar was the top renewable energy option to investigate further. Participants also expressed doubt that household-scale renewable energy was affordable. Therefore, even if they valued energy autonomy that could be achieved through renewable energy, the upfront capital cost was still a major barrier, and participants did not value energy autonomy enough to absorb higher costs.

3.3.6. Limitations

The focus group meetings were completed in March of 2022, when the project team was required to follow the mandatory social distancing requirements as part of COVID-19 safety measures. Under these circumstances, focus groups were conducted remotely using the Zoom online conferencing software. Online focus group methods offer some advantages such as lower costs and the flexibility provided to participants who do not need to commute and can participate in their preferred locations. However, there are limitations to gain in-depth insights from online discussions, in particular for group dynamics and collaborations of participants (Moore et al., 2015).

The scope of the focus groups was centered on Metlakatla members who own, rather than rent, their home. While renters make up a large percentage of households in Metlakatla Village and Prince Rupert, they face unique challenges related to home energy efficiency that are deserving of separate analysis. For example, one widely recognized market barrier to energy efficiency in rental units is the Principal-Agent Problem. Where tenants are responsible for paying utility bills, landlords may lack the appropriate incentive to invest in energy efficient technologies because they would not receive the benefit of lower bills. Meanwhile, tenants may be reluctant to make costly investments in energy efficient technology when future residents are expected to reap many of the long-term benefits.

3.4. Results from the 2020 Metlakatla Membership Census

This section outlines key findings from the 2020 MMC data analysis that relate to residential energy improvements. The analysis draws heavily on MMC questions related to the CEM Program's housing priority value and the analysis completed by Pope (2021) on data gaps in off-reserve housing need. Two sub-topics of the MMC housing-related questions apply to residential energy: housing condition, as a function of questions related to "home repairs", and energy poverty, as a function of questions related to household income and home energy costs.

3.4.1. Housing Conditions

Literature review findings showed that insight into residential energy efficiency in the context of Indigenous communities can be collected from research that is focused on Indigenous housing issues more broadly, and housing condition is often an indicator of home energy efficiency. A common metric for housing condition is "homes needing major repairs" which is defined by Statistics Canada and the MMC as "dwellings with defective plumbing or electrical wiring, and dwellings needing structural repairs to walls, floors or ceilings" (Statistics Canada, 2017). An energy efficient home should be thought of as a system, which includes the building envelope, heating and cooling system, appliances, and lighting; thus, home occupants' perception of their home needing major repairs could also provide an indication of the perception that elements of a home are inefficient.

MMC data showed that 30% of all respondent households indicated their home needed major repairs, 30% needing minor repairs (i.e., missing or loose floor tiles, bricks or shingles; defective steps, railing or siding, etc.), 32% needing regular maintenance (i.e., painting, furnace cleaning, etc.), and 8% did not know. For respondents living in Prince Rupert, the results were similar, with 25% needing major repairs, 31% needing minor repairs, 36% needing regular maintenance, and 9% did not know. For Metlakatla Village, the results were substantially different, with 58% of homes needing major repairs, 25% needing minor repairs, 13% needing regular maintenance, and 4% did not know. Figure 3.4 summarizes the results of the question related to home repairs.

According to the 2016 Canadian Census, one in five Indigenous people in Canada lived in a dwelling that needed major repairs (Statistics Canada, 2017). The proportion of First Nations people with registered or treaty Indigenous status who lived in a dwelling that needed major repairs was more than three times higher on-reserve (44.2%) than off-reserve (14.2%) (Statistics Canada, 2017). The MMC data comparing home repair responses for on-reserve versus off-reserve Indigenous households correlates with national census data that indicates the percentage of homes needing major repairs is substantially higher for on-reserve Indigenous homes. This is consistent with some of the literature that suggests reserve housing is commonly constructed from poor quality building materials, resulting in housing with inadequate ventilation, poor air quality, and poorly sealed building envelopes which cause higher energy use (e.g., Standing Senate Committee, 2015; Lawrence & Martin, 2001).

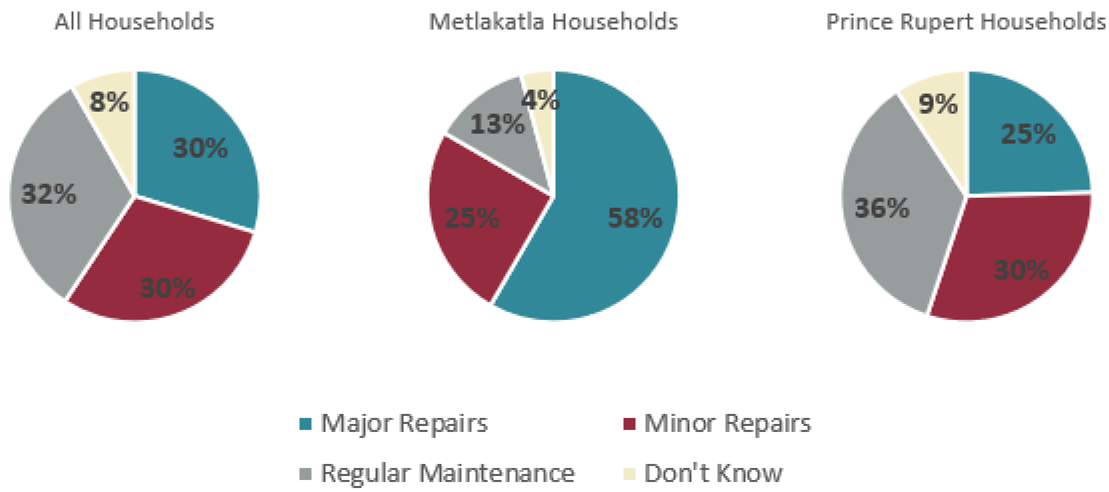

Figure 3.4: MMC responses showing percentage of homes needing major repairs, minor repairs, or regular maitenance

3.4.2. Energy Poverty

The literature review indicates that energy poverty (i.e., the household experience of struggling to meet one's energy needs) is more prominent amongst Indigenous communities and households. As described from the literature in Section 3.1, a high home energy cost burden in BC is quantified as spending 6% or more of household income on home energy costs (Ecotrust Canada, 2020, CUSP, 2019a). Therefore, as a function of household income and household energy expenditures, energy poverty could be calculated from MMC data on annual housing electricity and natural gas costs, and household income.

MMC data showed that 27% of 93 respondent households have a high home energy cost burden. The percentage (23%) is slightly lower when only considering the 73 Metlakatla member households in Prince Rupert who responded, and substantially higher (53%) when only considering the 19 Metlakatla Village households who responded. Metlakatla's off-reserve rate of energy poverty is similar to those seen in Canada for both Indigenous (26%) and Non-Indigenous (23%) households; however, it is higher than the rates for Indigenous (18%) and Non-Indigenous (16%) households in BC (CUSP, 2019a). Metlakatla's on-reserve rate of energy poverty (53%) is substantially higher than the rates for Indigenous and Non-Indigenous households in BC and Canada, as well as Metlakatla's off-reserve households (Figure 3.5).

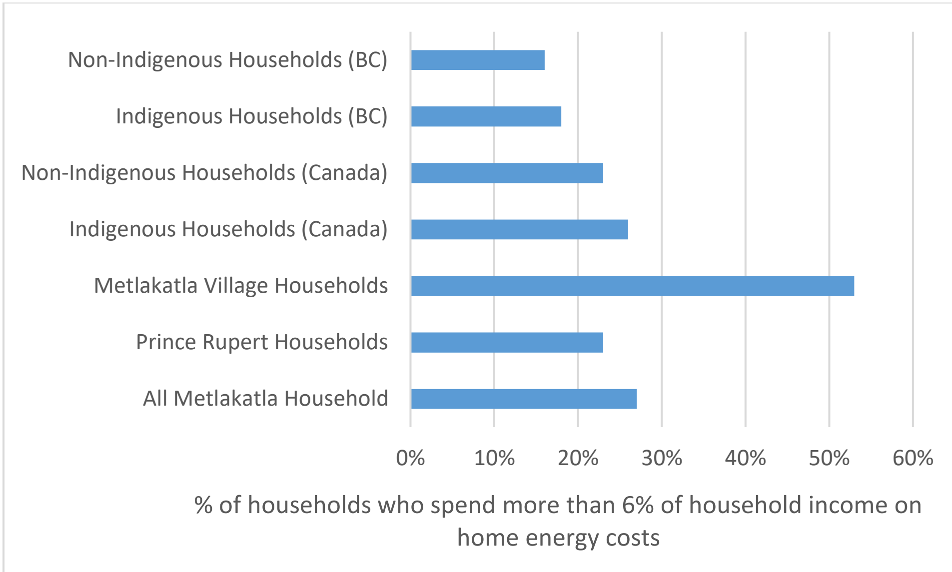

Figure 3.5: Rates of energy poverty from MMC data and other Census Populations from the 2016 Canadian Census

(BC and Canada rates from CUSP (2019a))

In terms of the level of home energy cost burden, MMC data showed that Metlakatla members spend an average of 7% of their income on home energy costs, which is just above the 6% high home energy cost burden threshold. The number is slightly lower for Metlakatla member households in Prince Rupert (5%) and substantially higher for Metlakatla Village households (15%). The average home energy expenditure relative to income for Metlakatla Village households is at the extreme home energy cost burden threshold (15%+) defined by CUSP (2019a). Figure 3.6 shows the percentage of home energy expenditures relative to income from MMC data and BC Indigenous and Non-Indigenous Households.

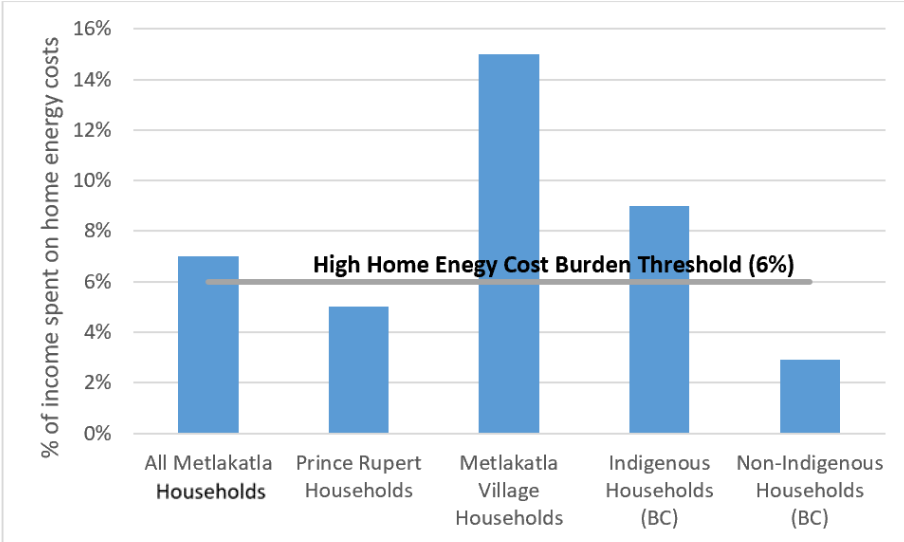

Figure 3.6: Percentage of home energy expenditures relative to income from MMC data and BC Indigenous and Non-Indigenous Households

(BC data from Ecotrust Canada (2020))

Considering the three main drivers for energy poverty put forward by Ecotrust Canada (2020) - household income, energy efficiency in homes, and energy price - the experience of energy poverty for a particular household could involve any mix of those three factors depending on the local and household context. In the context of Metlakatla, it is assumed energy prices remain constant for everyone living in the area, and therefore should not factor into energy poverty rates for MMC respondents. MMC data showed that the average household income was between $50,000 - $59,000 for all Metlakatla member respondents, $60,000-$79,999 for Prince Rupert respondents, and $30,000-$39,999 for Metlakatla Village respondents. For yearly housing costs, combined annual average electricity and natural gas costs was $3,436.60 for all Metlakatla member respondents, $3,327.86 for Prince Rupert respondents, and $3,849.32 for Metlakatla Village respondents. Thus, on-reserve households with higher rates of energy poverty had both lower average income levels and higher average home energy costs.

3.4.3. Limitations

To determine income level, the MMC asked respondents to report their before-tax income (i.e., gross income). CUSP (2019a, 2019b) and Ecotrust Canada (2020) use after-tax income (i.e., net income) in the calculation of energy poverty or energy cost burden. While this may result in a discrepancy between energy poverty calculations from MMC data and other calculation for energy poverty, it is important to note that the MMC methodology results in a more conservative estimate of energy poverty rates. Therefore, if after-tax income was used instead of before-tax income, energy poverty rates and the magnitude of home energy cost burden for Metlakatla members from the 2020 MMC would be slightly higher.

Data on energy costs is self-reported. Consequently, there may be inaccuracies because respondents are being asked to remember annual energy costs, which may or may not be taken directly from actual home energy bills.

Chapter 4. Conclusions and Recommendations

Through a literature review, a baseline housing assessment for reserve housing in Metlakatla Village, two focus groups, and a review of MMC data, this report aimed to understand common challenges for residential energy improvements in the context of Indigenous communities in Canada, determine if these challenges are experienced with Metlakatla, and to identify Metlakatla members' perspectives on home energy improvements.

The literature related to residential energy efficiency for Indigenous households in Canada indicates research to-date has primarily been examined by means of quantitative and statistical methods, and qualitative aspects remain an understudied area. Indigenous home energy efficiency research is often imbedded in broader housing research that indicates many Indigenous households report living in homes needing major repairs and having mould issues. A key factor in this, specifically for on-reserve homes, is substandard housing resulting from centrally designed housing plans that did not account for the vastly different climates across Canada. While substandard housing is not a direct representation of poor energy efficiency, it can be a major factor. Census data indicates Indigenous households in BC and across Canada experience higher incidence of energy poverty (i.e., spending more than 6% of household income on home energy costs) than non-Indigenous households.

In the context of Metlakatla, the baseline housing assessment revealed that most on-reserve homes in Metlakatla Village were built in the 1980s and have electric baseboard heating, which has resulted in household energy consumption that is almost three times higher than the provincial average in BC. From a climate mitigation perspective, most homes in Metlakatla Village have relatively low operational emissions because BC's Grid Electricity GHG Emissions Intensity Factor remains lower than electricity grid emissions factors for many other jurisdictions.

Focus group data suggests many Metlakatla members are struggling to meet their home energy needs and have high home energy costs. Participants are primarily motivated to invest in home energy improvements by saving money; however, they are also motivated, albeit to a lesser extent, by other aspects of home energy improvements such as better indoor air quality, improved home comfort, lower environmental footprint, less maintenance, and climate resilience. While participants are interested in the potential for energy autonomy from a household level renewable energy system, they are skeptical about the feasibility of renewable energy options in their area (e.g., solar) and most would not pay more to “get-off-the-grid.” Despite interest in home energy improvements, high upfront cost is the major barrier preventing more investment in home energy efficiency measures. Aside from cost, participants agreed that poor knowledge and awareness (i.e., failure of information) about how to effectively follow through with home energy improvements was another barrier. Participants noted a lack of awareness of energy efficiency programs, available contractors, financing options, and the benefits and costs of upgrade options.

2020 MMC data indicates that many Metlakatla members live in homes that need major repairs and many are experiencing energy poverty. The MMC data comparing home repair responses for on-reserve versus off-reserve Indigenous households correlates with national census data that indicates the percentage of homes needing major repairs is higher for on-reserve Indigenous homes. In terms of energy poverty, MMC data showed that nearly a third of respondent households have a high home energy cost burden. The percentage is slightly lower for Metlakatla members living off-reserve and substantially higher for households living on-reserve. In terms of the level of home energy cost burden, Metlakatla members spend an average of 7% of their income on home energy costs. The value is much higher (15%) for on-reserve households. The higher rate and magnitude of energy poverty for on-reserve households is predominantly related to a combination of low income and poor home energy efficiency, although the level of influence of each of these factors will vary by household.

Based on the findings from the literature review, baseline housing assessment, focus groups, and MMC, a series of recommendations are provided below to help advance home energy improvements for Metlakatla households. These recommendations will be presented to Metlakatla Chief and Governing Council for consideration.

4.1. Support Homeowners Through the Complicated Retrofit Process

In the focus group discussions, participants expressed a lack of knowledge and awareness of inefficient areas of their home, available resources, and home energy improvement options. While high upfront cost was expressed as the major barrier for completing home energy improvements, various grant and incentive programs are already available from the provincial and federal government and BC Hydro to address this barrier. However, many homeowners are unaware of these programs or do not know how to access them. Without adequate knowledge and capacity to navigate the complicated retrofit journey, even if cost was not a barrier, many homeowners still would not know where to begin. A recent market research report by Open Technologies and VanCity (2022) indicates the current homeowner retrofit journey is fragmented and overwhelming, particularly for small but complex jobs where a general contractor is not required. As a result, homeowners are left to navigate a complex system and assemble the puzzle pieces on their own, which often leads to less home energy improvements being completed (Open Technologies & VanCity, 2022).

To overcome the failure of information barrier, Metlakatla is well-positioned to offer or arrange a “retrofit concierge” service for its members that can assist in navigating the complex home energy improvement journey. The concierge would be a human resource that could be accessed by Metlakatla homeowners living both on-reserve and off-reserve who are at various stages of the retrofit journey. Services offered by the concierge should include the following:

- **Identifying retrofit opportunities:** Determine which households may be best suited for an energy retrofit. This can be accomplished through an analysis of available housing and utility data and by engaging with potential households through word-of-mouth, various communication channels, and referrals. This step can help ensure the right homes are being targeted and pursued.
- **Engaging with candidate households:** Once candidate households have been identified, the concierge needs to communicate with representatives from these households to explain the program and potential benefits. Engagement can occur through Metlakatla communication channels, cold calls and door knocks, structured workshops or awareness seminars, and by building industry partnerships. The concierge will gauge interest to determine if there is any interest in moving forward with home energy improvements.

- **Support prior to an EnerGuide Home Evaluation:** If homeowners have an initial interest in completing home energy improvements, the concierge will gather initial information to determine next steps. The concierge could work through a homeowner questionnaire to establish challenges and opportunities, complete an initial site visit, and complete a scan of available incentives for eligible upgrade measures. The concierge would also gauge homeowner interest in having an EnerGuide Home Evaluation be completed by a Certified Energy Advisor.

- **Support following an EnerGuide Home Evaluation:** While some Energy Advisors will help homeowners navigate the Renovation Upgrade Report that summarizes key findings from the evaluation and recommended energy efficiency improvements, it is not typically within their scope of work to provide support services after the evaluation is complete. Therefore, the concierge could fill this void by reviewing the Renovation Upgrade Report with homeowners to ensure there is a clear understanding. The concierge could also support homeowners by completing an incentive analysis for recommended upgrades, develop a Project Energy Strategy to sequence priority upgrades, and answer any homeowner questions.

- **Support during project development and construction:** If the homeowner wishes to proceed with one or several home energy improvements, the concierge can help identify contractors to complete the work, and in some cases fill the void of a general contractor/project manager if the project is relatively small. The concierge could also help homeowners complete applications for incentive programs (e.g., Federal Greener Homes Program, Better Homes BC rebates, etc.).

The concierge could either be a third-party human resource contracted by Metlakatla or a Metlakatla staff member. Several focus group participants expressed a desire for a Housing Coordinator that would manage housing issues mainly for reserve homes. The retrofit concierge could also be a responsibility of that position if it were in place. The retrofit or home energy improvement concierge process map is provided in Figure 4.1.

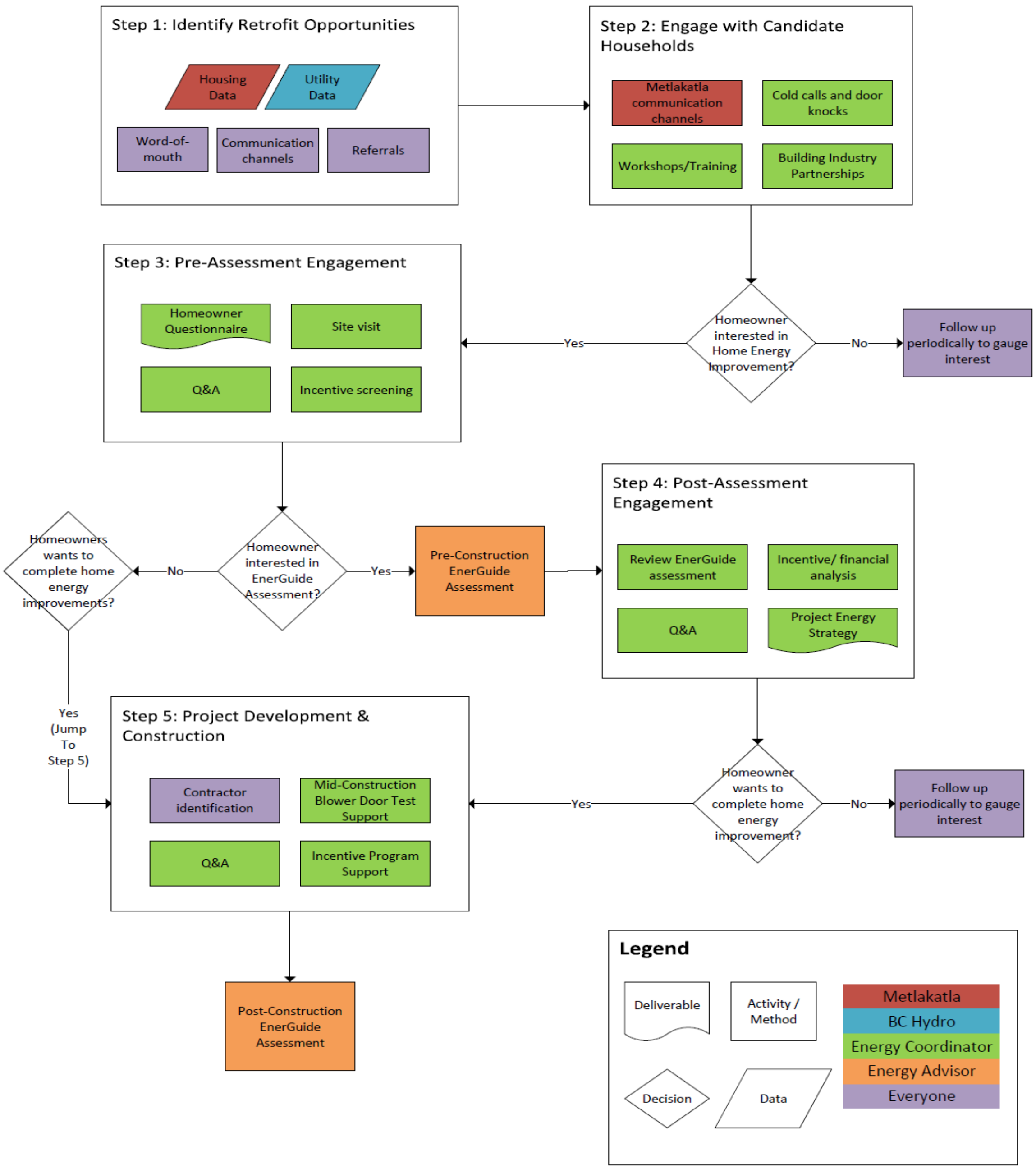

Figure 4.1: Home energy retrofit concierge process map

4.2. Organize EnerGuide Home Evaluations

Based on focus group responses and baseline housing data, many Metlakatla homeowners have a general idea of the inefficient areas of their home and the potential upgrades that could address the inefficiencies. However, each home is unique and should be assessed by a Certified Energy Advisor to accurately determine energy performance and the actions needed to improve energy efficiency. This is typically accomplished through an EnerGuide home evaluation where a Certified Energy Advisor will assess the entire home through an energy efficiency lens. By means of an initial pre-upgrade assessment, a home energy rating will be generated, and a Renovation Upgrade Report will map out priority upgrades to improve the rating. A post-upgrade assessment could confirm if installed upgrades improved the home energy rating.

Focus group participants were mostly receptive to the idea of completing EnerGuide home evaluations; however, many participants were unaware that this service was available and felt that support should be offered from Metlakatla to organize and help pay for the assessments. While the cost of an EnerGuide home evaluation can mostly be covered through the Federal Greener Homes Grant (up to $600 for a pre- and post-upgrade assessment), because the incentive is structured as a rebate as opposed to a discount, the upfront cost of the assessment can still hinder participation for many households, particularly those with low-income. Understanding that lack of awareness and upfront cost are barriers preventing higher uptake of EnerGuide home evaluations, Metlakatla could support members by (1) creating awareness of the costs and benefits of the assessments (e.g., workshops, Metlakatla communication channels, targeted outreach); (2) providing or arranging financial support to help cover the upfront cost of the assessments.

As outlined in Section 3.1, through the Greener Homes Grant Indigenous governments can submit a group application for homes that they own. Metlakatla could, therefore, use the Greener Homes Grant to cover the costs of EnerGuide home evaluations for the 15 Metlakatla-owned residential buildings in Metlakatla Village. Funding sources for assessments for privately-owned member homes would need to be determined.

4.3. Use Replacement Cycles to Address Energy and Non-Energy Related Improvements

For existing homes, energy improvements are often replacing existing technology that is reaching end of life or is failing, rather than being new technology. In many cases, a given upgrade that is labelled as an “energy efficiency” improvement could also be addressing other deficiencies related to building code compliance. For example, thicker or higher quality insulation and better wall assemblies can create a more airtight envelope and improve home energy efficiency but could also address moisture issues if done correctly with proper ventilation in mind. A natural gas furnace may be reaching its end of life from a functional perspective, so replacing it with an electric heat pump can ensure code compliance, better functionality, and improved energy efficiency. The key point is that energy efficiency improvements should be thought of as part of a larger system and there are key intervention points that homeowners need to take advantage of to ensure mutual benefits can be achieved. With most home technologies having a 10-to-20-year lifespan, missing one of those intervention points or replacement cycles to incorporate energy efficiency measures could mean missing out on the benefits for an extended period.

Energy efficiency investments can be costly, especially when doing major building envelope upgrades or installing a new heating and cooling system. As expressed through the focus groups, high upfront cost is a major barrier for many households to complete home energy improvements. Searching for synergies between energy efficiency upgrades and other upgrades with non-energy benefits, can help justify the investment. For example, it is easier for homeowners to rationalize a heat pump investment if the cost is only considered the incremental cost beyond what was already required (e.g., replacement natural gas furnace or electric baseboards) to be installed rather than the full cost of the technology.

Metlakatla completed building inspections for 45 occupied homes in Metlakatla Village in 2022. The results of these inspections were not available until after research and analysis for this report was complete; thus, the inspections were not used to inform the baseline housing assessment for Metlakatla Village home. The inspections assessed the condition of the roof, structure, foundation, electrical, plumbing, heating, ventilation, entries, and windows. Many of these elements will have an impact on energy efficiency, so Metlakatla should ensure that any repairs that are recommended are considered with improvements in energy performance in mind as well. If EnerGuide home evaluations are carried out for these 45 reserve homes as recommended in Section 4.2, then the proposed repairs from the building inspections should be compared to the proposed upgrades from the EnerGuide home evaluation to identify synergies. A replacement cycle or replacement need because of condition failure of a particular measure could be the trigger to cost effectively initiate the upgrade process.

4.4. Replace Electric Baseboards with Electric Heat Pumps

Baseline housing data for Metlakatla Village homes, MMC data, and focus group input indicate electric baseboards are an inefficient heating source that contribute to high home energy costs. The literature (e.g., Ecotrust Canada, 2020) supports this and confirms that other Coastal First Nations communities such as the Heiltsuk (Bella Bella) and Gitga'at (Hartley Bay) have successfully installed electric air-source heat pumps for residences to replace less efficient heating sources. Through the Metlakatla CEEP, a heat pump impact analysis was completed that modelled the potential energy savings from heat pump installations in a standard home in Metlakatla Village. The analysis indicated that replacing electric baseboards with electric air-source heat pumps in residential dwellings would have a rate of return of 17.7% and a net present value of $9,137 per home, and homes could save up to 11,031 kWh or $1,538 annually on electricity costs (Metlakatla, 2021). Based on the literature and the CEEP, it would be prudent for Metlakatla to target replacing electric baseboards with electric air-source heat pumps for eligible member homes, even in the absence of an EnerGuide home evaluation.

Despite the proven benefits of heat pumps relative to electric baseboards, some focus group participants expressed concern over the suitability of heat pumps in the local climate. Some participants heard anecdotally from neighbouring communities that heat pumps were not operating effectively and they continued to witness high home energy costs. The negative perception about heat pumps for some members points to the need for proper equipment selection and installation from a contractor. Further, it suggests that heat pump installations need to be accompanied by homeowner education on how to correctly operate the equipment, and regular feedback should be gathered by homeowners to assess their experience with the technology and to confirm home energy consumption and costs have decreased.

Metlakatla could support electric baseboard to electric air-source heat pump conversion through the energy concierge service (see Section 4.1). This could include, but is not limited to, identifying candidate homes, identifying and managing incentive programs, identifying and managing contractors, and answering any questions homeowners have. The Federal Greener Homes Grant could be utilized to help cover the costs. Through this program, homeowners could get up to $5,000 towards the cost of an electric air-source heat pump, assuming an EnerGuide home evaluation has been completed and the heat pump is one of the recommended upgrades.

The CleanBC Indigenous Community Heat Pump Incentive provides funding for the installation of heat pumps for on-reserve Indigenous households. The program provides up to 80% of the cost of new heat pump installation(s), up to a maximum of $12,000 per residential heat pump (maximum up $200,000 per community application). Unfortunately, at the time of this report, the program was only eligible for the following projects:

- Fuel-switching projects (e.g., switching from oil, natural gas, or propane to electric heat pumps) in communities served by renewable electricity (either grid or remote).
- Efficiency projects (e.g., baseboard or electric furnace to electric heat pump) projects in remote communities served by diesel-generated electricity.
- Woodstove primary heated homes switching to electric heat pumps in communities served by renewable electricity (either grid or remote).

It is recommended that Metlakatla continue to monitor the CleanBC Indigenous Community Heat Pump Incentive program to determine if electric baseboard to electric heat pump conversion becomes eligible.

One of the major constraints for heat pump installations is industry capacity to complete the work, especially as demand for the technology and their services increases. The problem can be worse for rural or remote communities, where there are often few qualified contractors. To help overcome this constraint, it is recommended Metlakatla consider building local capacity amongst member for heat pump installations and possibly other energy efficiency improvements. Building expertise amongst Metlakatla members could provide local employment while also minimizing reliance on external contractors. Metlakatla could support local capacity by developing or arranging a heat pump training program or supporting a program such as the Fraser Basin Council’s Train-the-Trainer Program, which aims to build skills and knowledge in energy-efficient building construction within Indigenous communities by training a peer group of Indigenous building experts and student trainees.

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Appendix A. Housing MMC Questions

Participant Information

What is your age? _________________

What is your gender?

- ○ Male
- ○ Female
- ○ Other: _________________

Is your primary place of residence in the Metlakatla Village? ○ Yes ○ No

What is your address? *If you live in Metlakatla, please write your mailing address (PO BOX).*

Street Address: _________________
City: _________________
Postal Code: _________________

Which of the following best describes your marital status?

- ○ Single
- ○ Married
- ○ Living with partner (Common-law)
- ○ Widowed

Section 4: Housing

The next few questions will ask about **<u>your household</u>**. For this census, a 'household' is a group of people (often a 'family') who live in the same dwelling and share meals and living space together.

Do not fill out this section if you are a youth (18 years old and younger).

1. For the previous year (2019), please think of your **<u>total household (combined) income</u>** from all sources before tax. What income range does it fall under?
   By household income, we are asking for the total sum of money you and the other earners in the household made in the past year. Examples of income include personal wages and salaries, commissions, investment income, bonuses, tips, research grants, royalties, CPP, EI, rental assistance, social assistance, CERB, etc. in the past year before any tax deductions.

No income	$30,000 - $39,999
Under $5,000	$40,000 - $49,999
$5,000 - $9,999	$50,000 - $59,999
$10,000 - $14,999	$60,000 - $79,999
$15,000 - $19,999	$80,000 - $99,999
$20,000 - $24,999	$100,000 - $124,999
$25,000 - $29,999	$125,000 and over

2. How has your housing situation changed this year due to the COVID-19 (Coronavirus) pandemic? **Please select <u>one.</u>**

Worsened A Lot **(1)**	Worsened Slightly **(2)**	Stayed Same **(3)**	Improved Slightly **(4)**	Improved A Lot **(5)**

3. Please record how many people, **INCLUDING YOU,** live in your house **now <u>at least half the time</u>**, using the age categories below. *If none, mark '0'.* Please fill in the entire table below.

	How many Metlakatla FEMALES?	**How many non-Metlakatla FEMALES?**	**How many Metlakatla MALES?**	**How many non-Metlakatla MALES?**
Children 0 – 4 years old				
Children 5 – 17 years old				
Adults 18 – 64 years old				
Elders 65+ years old				

4. How many couples live in your home now (i.e., share a bedroom)? _________________

5. How many bedrooms does your home have? _________________

6. Does your home need repairs? Note that:
   - ***Major repairs include****: defective plumbing or electrical wiring, structural repairs to walls, floors, ceiling, roof, etc.*
   - ***Minor repairs include****: missing or loose floor tiles, bricks, shingles, defective steps, railings, siding, etc.*

   ○ Yes, major repairs
   ○ Yes, minor repairs
   ○ No, only regular maintenance is required (e.g., painting)
   ○ Don't know

7. Do you own or rent your home? ○ Own ○ Rent

8. Do you receive rental assistance or live in subsidized housing? **Please <u>select all</u> that apply.**
   - ***Subsidized housing (i.e., social housing)*** *is a long-term housing arrangement where rent is based on income or reduced through private, public, or non-profit funding.*
   - ***Rental assistance*** *is cash assistance to help households with their monthly rent payments (does not include income assistance).*

   ○ No
   ○ Yes, I live in subsidized housing

○ Yes, I receive rental assistance

9. Please fill out the following table with the **average yearly** costs of living.
   If a field does not apply to you, please write N/A.

Cost of Living	**Average Yearly Cost ($/year)**
Water and municipal services	
Electricity	
Heat (natural gas, separate from electricity)	
Property tax	

10. Please fill out the following table with the **average monthly** costs of living.
    If a field does not apply to you, please write N/A.

Cost of Living	**Average Monthly Cost ($/month)**
Rent or mortgage payment	
Condo fees	
Transportation between Metlakatla Village and Prince Rupert	

The following questions focus on identifying which services Metlakatla members rely on to access good housing and which gaps exist in housing-related services. The findings will help Metlakatla identify areas for housing actions that could be included in an overall housing strategy.

11. Please indicate which of the following housing programs or services you are aware of and/or have used to help you maintain safe and affordable housing. ***Please do not fill out if you are NOT in need of any housing assistance.***
    Please answer 'Yes (Y)' or 'No (N)' beside the program or services that you are aware of and/or have used before. Please answer 'Yes (Y)' or 'No (N)' to rate your satisfaction with the service in helping you meet your housing needs.

Service Name	**Are you aware of this service? (Y/N)**	**Have you used this service? (Y/N)**	**Were you satisfied with this service? (Y/N)**
Housing Assistance			
North Coast Transition House			
Salvation Army Emergency Shelter			
M'akola Housing Society Units			
BC Housing Units (Mariposa Gardens, Pineridge Terrace, Harbour View Gardens, Sunset Villas, Kootenay Place)			

Service Name	Are you aware of this service? (Y/N)	Have you used this service? (Y/N)	Were you satisfied with this service? (Y/N)
Cedar Village			
Kaien Senior Citizens Housing			
Northern Health Authority Assisted Living or Long-Term Care (e.g., Acropolis)			
Thompson Community Services Residential Housing (Home Sharing or Independent Living)			
Monetary Assistance			
Rental Assistance Program (RAP)			
Shelter Aid for Elderly Renters (SAFER)			
BC Income Assistance			
Other Assistance			
Jennifer Rice's (MLA) Office			

Is there anything else you would like to share regarding your housing needs? Including other housing programs or services in Prince Rupert that we have not listed above or other housing services that you would recommend.

Appendix B. Canadian Indigenous Clean Energy Projects

The literature suggests that many Indigenous communities in Canada and BC are actively pursuing renewable energy projects, but the selected strategy or technology is community specific, indicating there is no "one-size-fits-all" approach. As with any project, communities consider different criteria for selecting their approach, and this will depend on factors such as geography (e.g., solar potential, wind speed), motivation (e.g., self-sufficiency, reducing GHG emissions), local economic conditions (e.g., a booming forestry industry for woody biomass), and community demographics (e.g., small vs. large population).

The classifications or themes were based on the most relevant and viable technology for energy supply options for Metlakatla, and include biomass, solar, and wind. Given the lack of academic research analyzing clean energy in the context of Indigenous communities in Canada, this literature review draws more heavily from grey literature (e.g., web articles, First Nation's webpages) that summarizes existing or planned clean energy projects.

<u>Solar</u>

Stefanelli et al. (2018) completed a systematic review of the literature related to the role of autonomy and reconciliation as factors in renewable energy initiatives involving Indigenous communities and found that solar energy was the second most common renewable energy technology that appeared throughout the review (wind was the first). Grey literature indicates that many Indigenous communities in Canada are increasingly pursuing renewable energy projects that involve solar technologies (both photovoltaic and solar thermal), especially as the installation costs come down. Kavlak et al. (2018) determined that the cost of solar photovoltaics (PV) declined 99% between 1980 and 2012, which can largely be attributed to improvements in conversion efficiency in solar cell technology and more research and development catalyzed by increase in demand and government policy.

While no research has been conducted that summarizes the solar energy projects in Canada, a survey report by Cook et al. (2017) indicates solar PV is one of the main renewable technologies considered by First Nations in BC. Of 105 respondents, there were 78 operational renewable energy projects and 17% of those were solar PV (hydroelectricity was the most with 62%). Of the 48 projects in development, 25% were solar PV, and of the 250 renewable projects under consideration, 26% were solar PV.

Karanasios and Parker (2018) summarized the development of renewable energy technology in remote Canadian Indigenous communities between 1980 and 2016 based on multiple past studies (2016a, 2016b, 2016c, 2016d, 2016e, and 2016f).[2] Their study indicates that solar PV projects accelerated between 2001-2016 compared to 1980-2000, and that most solar PV projects for remote Indigenous communities have occurred in NWT and Ontario (Karanasios & Parker, 2018). Prior to 2000, there was only one solar project in remote Indigenous communities in Canada, a project greater than 10 kW in Nunavut. Between 2001 and 2016, there was 47 solar PV projects, which included 29 in NWT, 12 in Ontario, four in the Yukon, one in Nunavut, and one in BC. Karanasios and Parker (2018) describe the period between 2011 and 2016 as the "fast" development phase of solar in remote Indigenous communities, which can be credited to the low performance of wind projects, limited wind resources in some areas, decreasing prices of solar panels, higher solar resource predictability, low maintenance and ease of siting PV projects.

A web search found three operational solar PV projects in BC Indigenous communities. Additionally, Karanasios and Parker (2018) cite one 28 kW solar project in Nemiah Valley. Cook et al.'s (2017) survey report suggests there are more; however, their research does not summarize the details of each renewable energy project. Therefore, it is likely other First Nations communities in BC have active solar PV installations, but the installation is a small capacity (e.g., <10 kW) so there is no documentation or media coverage. The four operational solar PV projects in BC Indigenous communities are summarized in the table below. The Upper Nicola Band near Quilchena in BC's interior has also submitted an intent to develop BC's largest

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[2] According to AANDC and NRCan (2011) remote or off-grid communities are permanent or long-term (five years or more) settlements with at least ten dwellings that are not connected to the North American electricity grid or the piped natural gas network.

solar PV installation, which would be a 15 MW solar farm on their reserve land (Norwell, 2018, Mar 19).

Operational Solar Photovoltaic (PV) Installations in British Columbia's Indigenous Communities

First Nation	Location of Installation	Project Size	Date of Installation
Kitasoo Xai Xais	Klemtu – Kitasoo IR #1	23 kW	2015
Tsilhqot'in	Chilcotin Region - Yunesit'in Reserve (solar farm)	1.25 MW	2019
T'Sou-ke	Sooke – T'Sou-ke IR #1	75 kW	2007
Xeni Gwet'in	Nemiah Valley - Lohbiee IR #3	28 kW	2007

Wind

In its most basic form, wind power is the conversion of wind energy via the use of turbines into electricity (Poumadere et al., 2011). Essentially, wind turbines act as obstacles to wind; the blades block wind and capture its kinetic energy. As wind forces the blades to move, the wind's kinetic energy is transferred to the rotational kinetic energy of the rotor blades and connecting shaft. The rotating shaft then turns a generator shaft, converting the rotational kinetic energy into electrical energy (Rodman, 2013). A wind speed of 7 meters per second (m/s) or greater is considered the threshold for economically viable wind energy; thus, there is significant geographical differences in potential for wind projects (Campbell, 2011).

Stefanelli et al.'s (2018) systematic review of the literature related to the role of autonomy and reconciliation as factors in renewable energy initiatives involving Indigenous communities found that wind energy was the most common renewable energy technology that appeared throughout the review. Poumadere et al. (2011) found that wind represented the fastest growing energy resources in the world at the time their research was conducted. The Canadian Wind Energy Association (n.d.) indicates approximately 288 wind turbines with a combined capacity of 698 MW were installed between 2009 and 2018. However, Cook et al. (2017) survey report and research by Karanasios and Parker (2018) suggest the momentum of wind energy may not be translating to Indigenous communities as other renewable energy alternatives become viable options in Canadian Indigenous communities (e.g., solar PV). While specific to remote off-grid Indigenous communities in Canada, Karanasios and Parker (2018c) found that there were 11 wind energy projects between 1980 and 2000, and only one between 2001 and 2016. Similarly, Cook et al. (2017) found that only 9% of the operational renewable energy projects, 17% of planned projects, and 12% of projects under consideration in BC Indigenous communities were wind projects.

There literature reviewed indicates there are several reasons why wind energy development has been stalled in remote Canadian Indigenous communities and has not taken off in First Nations communities in BC. Between 1980 and 2000, there were more supportive governance processes for wind projects that consisted of federal capital support and tax write offs that supported utility owned projects (Karanasios & Parker, 2018). However, low financial performance due to high and operation and maintenance costs, and mechanical failures eventually ended early experimentation with small wind turbines in remote electrical systems (Karanasios & Parker, 2018). Rodman (2013) examined the perception of wind turbine development in Gitxaala Nation near Prince Rupert, BC and found through a series of interviews that wind projects were not viewed differently than other non-renewable energy infrastructure projects. Thus, because the Gitxaala people had been subjected to years of industrial scale resource extraction and projects such as the Northern Gateway pipeline, community members did not see wind projects as offering economic, environment, and social benefits for the community (Rodman, 2013).

Even if wind energy development has been stalled in remote Canadian Indigenous communities and has not taken off in First Nations communities in BC, there are numerous examples of successful projects in Canadian Indigenous communities. In Ontario, the Henvey Inlet First Nation developed Ontario's largest wind project and the largest First Nation wind partnership in Canada. The wind farm consists of 87 wind turbines with 300 MW generation capacity. Other wind projects in Ontario include the M'Chigeeng First Nation (4 MW), Batchewana First Nation (58.32 MW), Bkejwanong and Aamjiwnaang First Nations 50/50 partnership (100 MW), and United Chiefs and Councils of Mnidoo Mnising (UCCMM) First Nations 50/50 partnership (60 MW). In New Brunswick, the Tobique First Nation started the development a of a 20 MW wind farm in

2019 near Kings County, and Pabineau First Nation. In Alberta, the Kainai First Nation are planning the development of 202 MW wind farm scheduled to start in 2020.

Biomass

Several studies indicate that biomass is being used in multiple remote Indigenous communities in Alaska, BC, and Ontario (Stephen et al., 2016; Brewer II et al., 2018; Zurba & Bullock, 2018). Biomass is solar energy captured in plant material through the process of photosynthesis (BIOCAP Canada, 2008). It comes in various forms and applications such as woody biomass to electricity and/or heat, anaerobic digestion and waste incineration producing biomethane, and biofuels (e.g., corn ethanol, lignocellulosic ethanol, yellow grease to biodiesel) (BIOCAP Canada, 2008).

The reviewed literature indicates that the Indigenous communities that have pursued biomass as an energy source have used woody biomass for electricity and/or heat because of the availability of feedstock from the forestry sector (Stephen et al., 2016; Brewer II et al., 2018; Zurba & Bullock, 2018). Two studies examined biomass as an alternative energy source for remote Indigenous communities in BC and Alaska. Stephen et al. (2016) used a two-option case study approach to determine the techno-economic feasibility of biomass utilization for space and hot water heating using either a district energy system (DES) connected to a centralized heat generation energy centre fueled by wood chips or a decentralized heating option with wood pellet boilers in each individual residence and commercial building. Using the Bella Coola community of the Nuxalk First Nation as a case study, it was determined that biomass has the potential to reduce heat costs, reduce the cost of electricity subsidization for electrical utilities, reduce GHG emissions, and increase energy independence of remote communities (Stephen et al., 2016). While either option was determined to be possible from a techno-economic perspective, the preferred option was combined heat and power (CHP) or decentralized boilers (Stephen et al., 2016).

Brewer et al. (2018) examined the motivations for Gwichyaa Zhee Corporation, an Indigenous Alaskan company, to pursue woody biomass as an alternative to diesel for the village of Fort Yukon in Alaska. Through interviews and open coding of archival materials, four themes emerged: (1) access of resources to offset high diesel fuel costs; (2) creation and development of local economic opportunities; (3) a shift away from fossil fuel systems and a movement towards energy sovereignty; and (4) cultural significance and connection to burning wood (Brewer et al., 2018). However, Rakshit et al. (2018a) suggest that biomass may not be a viable energy supply option for some Indigenous communities because of a view that biomass would require felling trees, which is counter to Indigenous values.

Henderson & Sanders (2017) determined there have been twelve Indigenous biomass energy projects in Canada, 10 of which are in BC, and one each in Ontario and Québec. The OujeBougoumou Cree Nation (OBCN) have the earliest biomass project, a 36 MW District Energy System (FVB Energy Inc, n.d.). The largest bioenergy project involving Indigenous people in Canada is the Celgar Green Energy Project (100 MW), which is part of the Celgar Mill located in Castlegar, BC (Mercer Inc., n.d.). Two other large biomass energy projects involving Indigenous communities in BC are the Gold River Power Project (90 MW) and Canfor Northwood Pulp Mill–PGP Bioenergy (55.4 MW) (Zurba & Bullock, 2018). For the Gold River Power Project, A First Nations Clean Energy Business Fund Revenue Sharing Agreement exists between Green Island Energy and the Mowachaht/Muchalaht First Nation, which involves exporting energy to the BC Hydro grid (British Columbia Government, n.d.). Although the West Moberly First Nation are not directly involved in the Canfor Northwood Pulp Mill, the project engages the Nation in the PGP Bioenergy project through involvement in new business relations that create education and employment opportunities (Canfor, 2016). In Ontario, White River Forest Products uses 7.5 MW of biomass energy to operate its mill. In 2016, Pic River First Nation launched a forestry company, Mkwa Timber, that supplies timber to the White River Forest Products mill (Krupa, 2012; Pic River First Nation, 2016).

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Appendix C. Metlakatla Focus Group Summary Report

MEETINGS ON MARCH 15 & 17, 2022

Focus Group Overview

Two online focus groups were conducted on March 15 and 17, 2022 respectively with 13 Metlakatla members. The first focus group had six participants, all Prince Rupert residents. The second focus group had seven participants, which included two Prince Rupert residents and five Metlakatla Village residents. Both focus group meetings were scheduled for two hours. Meetings were conducted remotely using the Zoom online conferencing software with built-in audio and video recording.

The focus groups had three main objectives:

1. Gain an understanding of Metlakatla members perceptions of their home energy system (e.g., are household energy bills high? What areas of the home are inefficient?).
2. Determine members' priorities and values related to their home energy system.
3. Gather feedback on high level energy improvements that could be applied to member homes.

Focus Group Methodology

Participant Recruitment

Focus group participants were recruited based on a set of criteria, including being a Metlakatla member 18-64 years old, living in Prince Rupert or Metlakatla Village, and willingness to volunteer about 2 hours of their time. Participation in the focus groups was advertised through the Metlakatla Facebook Group and community newsletter. The first focus group had six participants, all Prince Rupert residents. The second focus group had seven participants, which included two Prince Rupert residents and five Metlakatla Village residents. Participants at each focus group represented a cross-section of gender, age, and location (i.e., Prince Rupert or Metlakatla Village). Both focus groups were conducted remotely using the Zoom online conferencing software with both audio and video recording in lieu of in-person meetings due to the COVID-19 social distancing restrictions. As compensation for taking part in the focus group, each participant was provided a $50 gift card to Save-on-Foods or Petro-Canada.

Pre-engagement with Participants

Two information emails were sent to each focus group participant prior to the focus groups to provide necessary background information. Focus group reference materials including the letter of consent and focus group handout were included in the emails to all participants. Participants were given the option to contact the SFU project team if more information was required.

Focus Group Meeting Agenda

The focus group meetings were conducted according to the scheduled agenda that includes the following items:

- **Welcome and Introductions**
    - Facilitation Team Introduction: members of the project team, including SFU researchers and relevant Metlakatla staff.
    - Participant Introductions: Participants were asked to briefly introduce themselves and share their motivation for taking part in the focus group. They were asked to share what questions they had about home energy upgrades.
    - Verbal Consent: Each participant was requested to answer the questions listed on the Letter of Consent at the start of the meeting to confirm their consent to participate in the focus group.
- **Presentation of Background Information**
    - Summary of Cumulative Effects Management (CEM) Program and the connection of the research project to the CEM Program
    - Summary of Community Energy and Emissions Plan (CEEP)
    - Summary of the Research Project
    - Background Information: Elements of a home energy system
    - Background Information: Metlakatla energy sources

- **Discussion Part 1 – Current Home Energy System and Challenges**
    - Elements of participants current home energy system
    - Current energy challenges and barriers to home energy improvements
- **Discussion Part 2 – Home Energy Priorities and Upgrade Options**
    - Motivators and values for home energy improvements
    - Perception of multiple retrofit options

Data Analysis

Nili et al.'s (2017) systematic and integrative framework for qualitative analysis was used to classify and analyze the data recorded in the focus group transcript. This method applies an inductive approach (a.k.a. "conventional approach") in which one identifies codes and categories inductively from raw data and without any preconceived codes or perspectives from a previous study's existing theory or findings. The inductive approach is useful where theory or prior research on a topic is limited; therefore, it can help researchers achieve a deeper understanding of the topic and to develop new theories (Halkier, 2010; Moretti et al., 2011). The analysis framework involves seven steps to classify and analyze the focus group data (Nili et al., 2017):

1. Determine and organize the theoretical sensitive types of data.
2. Review the whole raw organized data to get a sense of the whole and identify content areas (i.e., parts of transcript or observation field notes that directly relate to each other).
3. Conduct a manifest analysis of content data in each content area (i.e., analyzing the readily understandable parts of the organized data in each content area).
4. Conduct a latent analysis of content data in each content area (i.e., analyzing the parts that need a high level of interpretation to understand their underlying meaning).
5. Analyze interaction data in each content area based on the interactions and discussions between participants.
6. Integrate the results obtained through previous steps for each content area.

7. Integrate the results of all content areas and reporting the whole results.

Key Findings

Theme 1: Participants indicated there are a variety of elements of their current home that contribute to energy efficiency or lack thereof.

- Six participants described having old, inefficient windows that are either single or double paned. In some cases, the low-window quality has resulted in notable drafts. Three participants also indicated having old-aluminum window frames, which also contribute to draftiness in addition to the window quality.

- Most participants described their home as "drafty" and credited this to either poor insulation (e.g., wall, basement, attic) or lack of insulation. Three participants credited the draftiness to gaps around their doors, indicating the area was not properly air sealed.

- Four participants stated having natural gas furnaces, ranging from low to high efficiency. All these participants live in Prince Rupert. Nine participants stated having electric baseboard heaters. This includes all the participants who live in Metlakatla Village and several who live in Prince Rupert.

- Six participants have relatively new energy efficient (e.g., Energy Star) appliances, such as refrigerators, washers, and dryers. However, participants generally felt there was a trade-off between energy efficiency and quality. While older appliances may have lower energy efficiency, there was a strong sentiment that they also tend to last longer than newer appliances that have a higher energy efficiency. In some cases, participants preferred older appliances, sacrificing higher energy efficiency for durability.

- Three participants made a connection between de-humidification and energy efficiency. With high moisture in the Prince Rupert area, they use de-humidifiers to improve home comfort (e.g., make the home warmer and less damp), but in doing so also noticed a reduction in energy costs.

Theme 2: Elements of the building envelope (e.g., exterior walls, roof, windows, doors) are the major culprits related to energy inefficiency.

- Four participants stated that the biggest problem area related to home energy efficiency was poor insulation. Despite recognizing insulation as a potential issue, participants did not mention the technical elements of insulation (e.g., R-value) that would explain the inefficiency. Participants consistently used the words "I think" when stating that insulation is a problem, suggesting that although they feel it is a major contributor, they do not know the features of the homes insulation to confirm. This is understandable, considering that insulation is typically hidden behind drywall or is in the attic.

- Three participants stated that windows and/or doors not being properly air-sealed was the biggest problem area related to home energy efficiency. This is experienced physically as participants could see the cracks/gaps or feel the cold outdoor air entering through the cracks/gaps.

- Three participants stated that window quality was the biggest problem area related to home energy efficiency. These participants have older homes with single or double paned windows. Similar to insulation, participants did not mention the technical elements of the windows (e.g., u-value) that would explain the inefficiency, but rather credited a lower number of panes to the inefficiency.

Theme 3: Perception that home energy bills were relatively high and increasing over time.

- Seven participants stated that their home energy costs were high, with reported costs as high as $1,300 over two months. High home energy costs were reported by households with both natural gas and electric baseboard heating, but the highest costs were reported for households with electric baseboard heating. Both on-reserve and off-reserve households reported high energy costs.

- Three participants expressed concern that home energy costs have been increasing over time, even without any major renovations. This was mainly credited to increasing utility rates, but some participants did not know the cause. One participant expressed concern that utility rates were increasing at a higher rate for households on First Nations reserves compared to off-reserve households.

Theme 4: Lack of financial capital is the main barrier to completing major home energy improvements, but a lack of knowledge and support were secondary barriers.

- There was as consensus amongst participants that the lack of financial resources was the main barrier preventing them from following through with the major home energy upgrades (e.g., heating and cooling system, building envelope). This is either due to the necessary improvements having a high cost, households not having adequate income, or both.

- Three participants noted that the lack of knowledge related to home energy efficiency was a barrier to following through with home energy improvements. Participants felt they “didn’t know what to do” indicating that they did not possess the personal knowledge on the topic to make a confident decision, and they did not know where to look for resources that could help them. Three participants believed a home energy assessment (i.e., EnerGuide Assessment) could help overcome this barrier; however, there were still some concerns that the knowledge gained from the assessment may not add value if households still cannot afford to follow through with the recommended upgrades (“we can point out all the issues but what's the point in doing it if we can’t fix anything.”).

Theme 5: Saving money is the top motivator for completing home energy improvements, but other motivators are also important.

- Most participants believed finances is the primary motivator to completing home energy improvements. Participants were asked "What would be your primary motivation for following through with home energy upgrades?" and then were presented with a list of potential motivators: better for the environment, saving money, less maintenance, better indoor air quality, improved home comfort, climate resilience, and energy autonomy. Participant's value saving money on home energy costs above other motivators and are most likely to invest in home energy efficiency if the selected measures result in noticeable reductions in home energy bills.

- While saving money was the top motivator, five participants mentioned valuing all motivators to some degree. Participants used the words "all of the above" or "they're all good points" when describing what would motivate them to complete home energy improvements. When asked "Which, if any, of these factors is not important to you or is least likely to motivate you to complete a home energy upgrade?", all participants agreed that none of the motivators were unimportant.

- Two participants noted that, although they desired energy autonomy from household-scale renewable energy (e.g., being less reliant on the centralized BC Hydro electricity grid), they were also skeptical of the renewable energy options available considering the local climate. In particular, they did not feel solar was a viable option because of the lack of sunlight in the area. Participants also expressed doubt that household-scale renewable energy was affordable, and the upfront capital cost was still a major barrier.

Focus Group Limitations

The focus group meetings were scheduled for mid-March 2022, during a period when we were required to follow the mandatory social distancing as part of COVID-19 safety measures. Metlakatla leadership and the project team decided to conduct the focus groups remotely using the Zoom online conferencing software. Online focus group methods offer some advantages such as lower costs and the flexibility provided to participants who do not need to commute and can participate in their preferred locations. However, there are limitations to gain in-depth insights from online discussions for group dynamics and collaborations of participants (Moore et al., 2015).

- Limited emotional and non-verbal cues: While we were using video-based online discussion sessions which allowed focus group facilitators to interact with participants remotely, it cannot compensate for the loss of non-verbal cues and interactions found in conventional in-person qualitative research. During our focus group meetings, some participants elected to turn off the video throughout the meeting.

- Limited group dynamics and spontaneous feedback: One of the advantages of a focus group is to hear what participants have to say as well as to observe the group dynamics in terms of their reaction to questions and their interaction with other respondents. While an online focus group allows for this, it does not do it as well as an in-person focus group. We only observed a few spontaneous feedback provided by some participants to other group members' comments. Most of the discussion was two-directional, from a participant to the focus group lead and back to the participant. Most of the discussion was directed towards the facilitation team rather than to other participants.