Community-Led Energy Planning and Sustainability Assessment: A Partnership with Inuit in NunatuKavut, Labrador

by

Nicholas Mercer

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Doctor of Philosophy
in
Geography

Waterloo, Ontario, Canada, 2020

Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Dr. Stephen Hill Associate Professor
Supervisor(s)	Dr. Paul Parker Professor
Internal Member	Dr. Heather Hall Assistant Professor
Internal-external Member	Dr. Ian Rowlands Professor
Other Member(s)	Dr. Daniel McCarthy Associate Professor

AUTHOR'S DECLARATION

Statement of Contributions

Nicholas Mercer was the sole author for Chapters 1, 2, 3, and 7 which were written under the supervision of Dr. Paul Parker and were not written for publication.

This thesis consists in part of three manuscripts written for publication. Exceptions to sole authorship of material are as follows:

Research Presented in Chapters 4, 5, and 6:

Dr. Paul Parker, Dr. Debbie Martin, and Ms. Amy Hudson were the co-principal investigators on the Social Sciences and Humanities Research Council grant which supported conducting this work. Each principal investigator on the grant is a co-author on any publication resulting from this work.

The research was conducted at the University of Waterloo by Nicholas Mercer under the supervisor of Dr. Paul Parker. Dr. Paul Parker, Ms. Amy Hudson, and Dr. Debbie Martin contributed to study design. Nicholas Mercer, was responsible for participant recruitment. Nicholas Mercer conducted the community-member interviews/surveys as well as the key informant interviews. Nicholas Mercer was the primary coder, contributing to the coding and analysis of all interviews. Nicholas Mercer wrote the draft manuscripts, which all co-authors contributed intellectual input on. Dr. Ian Rowlands, Dr. Heather Hall, and Dr. Dan McCarthy reviewed and provided comments on manuscript drafts.

Citations:

Mercer, N., Parker, P., Hudson, A., & Martin, D. (2020). Off-grid energy sustainability in Nunatukavut, Labrador: Centering Inuit voices on heat insecurity in diesel-powered communities. *Energy Research & Social Science*, *62*, 101382.

Mercer, N., Hudson, A., Martin, D., Parker, P.. (2020). Towards decolonized decarbonization: Integrating Indigenous perspectives on the sustainability of off-grid energy systems in NunatuKavut, Labrador. Manuscript submitted for publication.

Mercer, N., Hudson, A., Martin, D., & Parker, P. (2020). “That’s Our Traditional Way as Indigenous Peoples”: Towards a Conceptual Framework for Understanding Community Support of Sustainable Energies in NunatuKavut, Labrador. *Sustainability*, *12*(15), 6050.

As lead author of these three chapters, I was responsible for contribution to conceptualizing study design, carrying out data collection and analysis, writing, and submitting manuscripts. My coauthors provided guidance during each step of the research and provided feedback on draft manuscripts.

Abstract

Canada is a global leader in renewable energy development. However, electricity-generation differs dramatically in off-grid communities, wherein 190 of 258 communities rely almost exclusively on diesel-generation. Of these 258 off-grid communities, 170 are First Nations, Inuit, or Métis. As such, off-grid diesel-dependence in Canada must be thought of as an issue disproportionately impacting Indigenous Peoples. While a growing body of research asserts the economic, environmental, and societal impacts of diesel-generation, and several outsider stakeholders have called for a rapid transition to renewable energies in Indigenous off-grid communities, there is limited research which examines the perspectives of Indigenous Peoples themselves on the impacts of off-grid energy systems or support for sustainable energies.

As such, the Indigenous right of free, prior, and informed consent for development is often neglected in this discourse. Working in partnership with the NunatuKavut Community Council [NCC] – the governing council which represents Inuit predominantly in south and central Labrador - and nine diesel-dependent communities, this community-based participatory doctoral dissertation seeks to respond to NCC priorities and address these critical gaps in the literature. The research objectives included: (1) to determine how existing energy systems impact the sustainability of off-grid communities in NunatuKavut; and (2) to implement participatory methodologies to assess factors which influence community support for sustainable energies.

The research relies predominantly on energy deployment and local sustainability theory. A theoretical framework which emphasises substantive (i.e. measurable impacts), procedural (i.e. perceptions and acceptance), and endogenous development as critical components of sustainability. This theoretical framework has a great deal of overlap with the community renewable energy literature, which emphasises both process and outcome dimensions of sustainable energy projects. We utilize a two-eyed seeing approach, and privilege NunatuKavut Inuit participation and knowledge throughout all stages of research.

For Chapters 4 and 5, hybrid community-member interviews/surveys (n = 211) and key informant interviews (n = 11) are utilized to assess the sustainability of local energy systems. It is demonstrated that Inuit in NunatuKavut have diverse views on the sustainability of diesel-systems, including

neutrality, support, or opposition. Diesel-generation is valued for its socio-economic contributions, primarily employment, reliability, and community familiarity. Conversely, community-members remained extremely concerned about environmental implications of diesel-generation, particularly contributions to climate change and the risks of fuel spills. Key energy system concerns are related to participatory injustice, exogenous development, and heat insecurity. The research demonstrates the disproportionate impact of energy system risks on segments of the population – mainly women, seniors, low-income families, and others with mobility or health challenges. The research demonstrates the necessity of *decolonized decarbonization*, that is, energy transitions which are grounded in community autonomy and local decision-making, which recognize and protect community strengths, and which support communities in addressing self-identified priorities.

Chapter 6 of this research relied on the same research instruments, and assessed Indigenous perceptions and support for sustainable energy development in NunatuKavut. Community familiarity and understanding, association with previous projects, relationships with cultural and sustenance activities, endogeneity of resources, and security of energy – are found to be the most important factors influencing community support for sustainable energies. It is demonstrated that energy efficiency applications have substantially higher community support than supply-side generation options.

In all, the doctoral dissertation represents a novel approach to community-led energy planning. Operationalizing the Indigenous research principles of respect, reciprocity, relationships, and rights, this participatory, needs-based, consent-driven approach to planning offers a template for other scholars, activists, governments, and communities with interests in sustainably assessment and transitions research and action.

Acknowledgements

To the 211 community members and key informants in southeast Labrador who let me into their homes, shared a cup of tea with me, and participated in this research. Your knowledge is truly a gift, and I am forever grateful. Nakummek. To the funders: The Social Sciences and Humanities Research Council of Canada, the NunatuKavut Community Council, and the Waterloo Institute of Sustainable Energy, thank you for supporting this community-based approach. Your contributions were truly invaluable.

To Dr. Paul Parker, my supervisor. Thank you for your never ending positivity and advice, for giving me the academic freedom, professional space, and the trust to follow my heart and work from a distance. To Dr. Debbie Martin and Ms. Amy Hudson, your friendship is as valuable as your guidance. Thank you for believing in me, for holding me accountable when necessary, and for creating untold opportunity. To my supervisory committee: Dr. Heather Hall, Dr. Ian Rowlands, and Dr. Dan McCarthy. Thank you for the inspiring conversations, guidance, and numerous rounds of comments and feedback.

To Dr. Gabriela Sabau, Dr. Stephen Decker, the late Dr. Nick Novakowski, and the entire Grenfell Campus - thank you for setting me on this path. To the academics who have supported me along the way: Dr. Ashlee Cunsolo, Dr. Julie Bull, Dr. Maxime Liboroin, thank you for your dear advice. I have learned more from you all than from any classroom. To the anonymous peer-reviewers and external examiner, thank you for your time and thoughtful critique.

To the participating communities of Cartwright, Black Tickle, Norman Bay, Charlottetown, Pinsent's Arm, Port Hope Simpson, Mary's Harbour, Lodge Bay, and St. Lewis - thank you for everything you have done for me. To the Nevilles, the Dysons, the Keefes, the Burdens, the Slades, the Pooles, the Pyes, the Rusells, the Turnbulls, the Wards, the Curls, and certainly the many others who I am forgetting - you have helped me find myself, and I will work for eternity to return the favour. To Jim Learning and Roberta Benefiel, thank you for the tunes, tea, and love for Labrador.

To my colleagues and friends, Nicole Blinn, Siobhan Slade, and Emily Beacock. Thank you for the hundreds of games of cards - I did not think it was possible to learn so much over a hand of Skip Bo. To the entire Wabanaki Health Research Unit at Dalhousie University - Kathleen, Karina, Tara, Christie, Diane - thank you for allowing me to interrupt you with some of my biggest (and smallest) intellectual breakthroughs.

To my parents - Keith and Ann Louise, and family. You have kept me on the right path, and have bailed me out more times than I could ever count. I am incredibly grateful for your generosity and love. I would not be here without you. To my loving partner, Rebecca, and those who have supported me along the way - thank you for your patience. To my pup Rocky, I could not have done this without you kid. Thank you for always sticking by my side.

To those who always answer their phones: Meghan, Sarah, Hope, Patricia, Ian, Rachael, McLennon, and the entire crowd from Newfoundland - thank you for your kindness.

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

1.1 A Changing Climate: Profound Differences in Temperature Thresholds

According to the United Nations Environment Programme [UNEP] (2019), global greenhouse gas emissions - heat trapping gases which cause planetary climate change - reached a record high in 2018, peaking at 55.3 gigatonnes [Gt] of carbon dioxide equivalent [C02e] (including land use changes). Emissions from energy use and industry dominate global total emissions, which also reached a historic peak of 37.5 GtC02e in that same year. Recent research reports that global emissions must be reduced by 25 or 55 per cent below 2018 levels by 2030, to ensure that planetary warming does not increase beyond 2°C or 1.5°C thresholds (Intergovernmental Panel on Climate Change [IPCC], 2018). Climate data suggest that the global average temperature has already risen 1°C above pre-industrial levels, and is currently increasing at a rate of 0.2°C per decade (National Aeronautics and Space Administration [NASA], 2019). Current warming has contributed to sea level rise, ice loss at poles and mountain glaciers, increased frequency and intensity of extreme weather events (e.g. hurricanes, heatwaves, wildfires, droughts, floods, and precipitation), and changes in cloud and vegetation cover. Geographic location, socioeconomic circumstances, and reliance on wild foods, converge with climate change to create unique pressures for Indigenous, northern, remote, and coastal communities in Canada (Government of Canada, 2016). Before considering these unique communities and their challenges, the global context is reviewed.

A recent report by the Intergovernmental Panel on Climate Change [IPCC] (2018) suggests severe differences in climate-change related impacts on natural systems at a global temperature increase of 2.0°C versus 1.5°C. Of particular concern is increased frequency and intensity of extreme weather events. For example, under a 1.5°C warming scenario, 14 per cent of the global population will be exposed to extreme heat waves once every five years, a figure which rises to 37 per cent with 2°C of warming. Under 2.0°C of warming, 61 million more people will be exposed to severe drought conditions compared to 1.5°C. Continued global warming is projected to have severe effects on biodiversity loss and ecosystems. The IPCC report examined 104,000 species, and determined that under 1.5°C of warming, 6 per cent of insects, 8 per cent of plants, and 4 per cent of vertebrates studied, will see their climatic geographic range diminish by over 50 per cent. Under 2.0°C of warming, these figures increase to 18, 16, and 8 per cent, respectively. With 1.5°C of warming versus 2.0°C, between

1.5 and 2.5 million square kilometres of permafrost soils will be prevented from thawing over centuries, halting the release of significant amounts of stored carbon. Under 2.0°C of global warming, 70 per cent of the world's coastlines will rise by at least 0.66 feet, leading to increased flooding, erosion, and salinization of freshwater. Under 1.5°C of warming, 10.4 million fewer people will be exposed to these risks by 2100.

Significant changes are predicted for human systems under different climate change scenarios (Buis, 2019; IPCC, 2018). For instance, ocean warming, acidification, and more intense storms will cause coral reef decline between 70 to 90 per cent at 1.5°C of warming, and will become almost non-existent at 2.0°C. This biodiversity loss will affect over half a billion people who rely on these delicate ecosystems for food, livelihoods, coastal protection, and other ecosystem services. At 1.5°C of warming versus 2.0°C, several hundred million fewer people will be susceptible to climate-related poverty risks. Furthermore, entire island nations are at risk of being inundated by sea level rise as a result of climate change - at a 1.5°C increase, 40,000 less would be exposed to this risk by 2150 compared to a 2.0°C increase. Climate change is predicted to severely impact economic activity. For example, the United States is expected to lose 2.3 percent gross domestic product [GDP] for each degree of warming. In 2017, this would equate to USD $446 billion. Climate change is projected to cost the Canadian economy between CDN $21-43 billion per year (Government of Canada, 2016).

Economic losses related to climate change are in addition to severe impacts as a result of the novel coronavirus (COVID-19) global pandemic. For instance, GDP dropped 8 and 5 percent in Canada and the United States, respectively in the first quarter of 2020 as a result of the pandemic – the worst economic decline since the 2009 financial crisis (Financial Post, 2020). More than three million Canadians lost their jobs as a result of the pandemic in March and April of 2020, described by Statistics Canada as the greatest employment decline in the country's history (CBC News, 2020a – 2020b). South of the border, the United States lost 19.6 million jobs in April alone (BNN Bloomberg, 2020). A recent study determined that global C02 emissions declined 17% during January and early April of 2020 compared to 2019 average levels, with a predicted annual decline of 4.4 – 8 per cent, driven largely by reductions in surface transportation (Quéré et al., 2020). However, given that these reductions are a result of forced changes as opposed to restructuring of global economies or energy use, it is anticipated that these decreases are temporary (Quéré et al., 2020; CNN, 2020). Illustratively, during the most recent financial crisis of 2009, global emissions declined by 1.4 per cent, and then increased by 5 per cent in 2010 as economic activity recovered (CNN, 2020).

1.2 Climate Action and Electricity-Generation in Canada

The rate of warming in Canada has been approximately double that of the global average, with temperatures increasing 1.6°C since 1948. The rate of warming has been even faster in northern regions of the country, for instance Inuvik, Northwest Territories has warmed by 4.0°C since the same year (Environment and Climate Change Canada, 2019). Canada is a significant contributor to climate change, emitting 716 megatons [Mt] C02e in 2017 - making the country the seventh largest emitter, responsible for 1.7 percent of global emissions (Carbon Brief, 2018; The Star, 2018). On a per-capita basis, Canadians emit 22t C02e, which is the highest among G20 countries - and nearly three times the G20 average of 8t C02e (The Star, 2018). The largest emitting sectors in Canada are oil and gas production (195Mt C02e), followed closely by transportation (174Mt C02e), combined accounting for approximately 52 percent of national emissions (ECCC, 2019).

Canada is a signatory to the Paris Agreement put forward by the United Nations Framework Convention on Global Climate Change [UNFCCC], which aims to limit global temperature rise to well below 2.0°C, and pursue efforts to limit the increase to 1.5°C. As previously discussed, the difference in predicted impacts on natural and human systems between these two thresholds is profound. As part of Paris Agreement commitments, Canada launched the Pan Canadian Framework on Clean Growth and Climate Change [PCF] in 2016, and established an emissions reduction target of 30 percent below 2005 levels by 2030 (Environment and Climate Change Canada, 2019). The Government of Canada itself notes that policies enacted under the PCF are inadequate for reaching the national emissions reduction target, and several others have noted an ‘emissions gap’ of approximately 109Mt between pledged actions and national targets (CBC, 2019; Carbon Brief, 2018). Other research has questioned the integrity of Canada’s targets - which are not compatible with what is required for 2.0°C of planetary warming, let alone 1.5°C (Carbon Brief, 2018).

The PCF consists of four key pillars for climate action: 1) pricing carbon pollution; 2) complementary climate actions; 3) adaptation and building resilience; and 4) accelerating clean technology, innovation, and jobs. A key area of focus underneath complementary climate actions is electricity-generation. Despite significant improvements since 1990, electricity-generation remains the fourth largest sectoral source of greenhouse gas emissions in Canada - or approximately 78Mt C02e in 2016 (ECCC, 2019; Government of Canada, 2016). Canada is generally regarded as a global leader in renewable energy development, currently producing 80 percent of its electricity from low carbon sources, which is the largest share in the G7 (Government of Canada, 2016). Canada is the second largest producer of hydroelectricity in the world, with over 81,000 MW of installed capacity - accounting for approximately 60 percent of total capacity (International Energy Agency, 2020; Carbon Brief, 2018). Non-hydro renewables such as wind, solar, and biomass account for over 8 percent. Nuclear stations in Ontario and New Brunswick account for a further 14.6 percent of electricity from low carbon sources.

1.2.1 Indigenous Off-Grid Communities: The Diesel-Dependence Challenge

In comparison to the national average, the electricity generation-mix differs dramatically in off-grid communities in Canada[1], and the PCF establishes "reducing reliance on diesel working with Indigenous Peoples and northern and remote communities" as a priority (Government of Canada, 2016, p. 11). There are 258 off-grid communities located throughout the country, and the vast majority of these communities (n = 190, or 74%) are dependent on diesel-fuel for electricity-generation (NRCAN, 2019). Combined, off-grid communities have a population of over 200,000. One-third of off-grid communities, with 100,000 residents, are in the northern territories (Yukon, Northwest Territories, Nunavut). The remaining two-thirds are located in every province except for the Maritimes. A large majority of off-grid communities (n = 170) are Indigenous, with a population of over 124,000. As such, off-grid diesel dependence in Canada must be thought of as an issue predominantly affecting Indigenous Peoples.

Newfoundland and Labrador [NL] mirrors the broader electricity generation pattern in the country, making the province an ideal region for case study research on off-grid energy sustainability. For instance, the province currently produces approximately 95 percent of its electricity from large-scale hydropower (Canada Energy Regulator, 2019). With the anticipated completion of the 824MW Lower

---

[1] The Government of Canada (2011) defines an off-grid community as: (1) any community not connected to the national or provincial electricity grid nor piped natural gas network; and (2) any permanent settlement (at least five years or longer) with at least ten dwellings.

Churchill [Muskrat Falls] Hydroelectric Project in 2021 this figure is expected to rise to 98 percent (The Telegram, 2020; CBC News, 2020c; Nalcor Energy, n.d.). However, the electricity-generation mix differs dramatically at the off-grid scale in NL. There are 27 off-grid communities throughout NL, of which 19 are almost exclusively dependent on diesel-fuel for electricity generation (NRCAN, 2019). Of the 19 diesel-dependent communities, 14 are Indigenous. These communities are represented by one of the following: Nunatsiavut Government in northern Labrador (n = 5), Innu Nation in the community of Natuashish (n = 1), or the NunatuKavut Community Council in southern Labrador (n = 8). The NunatuKavut Community Council – the governing council which represents Inuit primarily in southern and central Labrador - and the diesel-dependent communities they represent are the primary partners in this doctoral dissertation.

Diesel-generation poses substantial economic, environmental, and societal challenges for off-grid communities. From an economic perspective, diesel-generation is expensive, creates strain on governmental resources as a result of heavy subsidization, poses energy security challenges, and may restrict economic growth, social development, and poverty alleviation efforts via local load restrictions (see: Arriaga, Cañizares, & Kazerani, 2014; McDonald & Pearce, 2013; Weis & Illinca, 2010; Arriaga, Brooks, & Moore, 2017). From an environmental perspective, diesel consumption contributes to global climate change, and poses the risks of fuel spills and leaks during diesel operation and transport to communities (see: Bhattarai & Thompson, 2016; Thompson & Duggirala, 2009). From a societal perspective, diesel-generators can be loud, noisy, and disruptive - especially in quiet isolated northern environments. Crown-controlled energy systems may be perceived as an imposition on the autonomy of Indigenous communities, and diesel emissions are known to pose local health challenges (Fitzgerald & Lovekin, 2019; Rezaei & Dowloatabadi, 2016; Government of Canada, 2011). While there is a large body of techno-economic literature which demonstrates the challenges posed by off-grid diesel-dependence, there has been limited research to date in which Indigenous Peoples themselves describe their experiences with off-grid energy sustainability. There is danger in this, as a narrative for change has been created by western researchers, policymakers, and advocates - which may not necessarily be representative of the views of the communities themselves.

The disproportionate impact of diesel-dependence in Indigenous communities is only one detrimental outcome linked to historical and ongoing processes of colonization and assimilation in Canada. In general, settler policies and attitudes devastated aspects of traditional cultures, languages, spirituality, systems of governance, and other important parts of identity (Schiffer, 2016). MacDonald & Steenback (2015) state

> "Overall, colonization and government assimilation policies and procedures contributed to the marginalization of Aboriginal people from mainstream society, and had a profound and disruptive impact on the health, socio-economic welfare, access to healthcare services, and culture of Canadian Aboriginal and other Indigenous populations around the world" (p. 32).

Central amongst these policies was the Residential School System, an intergenerational colonial system whose effects endure today. Designed to 're-educate' Aboriginal children to conform to colonizer's values and ways of life, more than 100 residential schools operated across the country at their peak, attended by approximately 100,000 children (Schiffer, 2016). The Truth and Reconciliation Commission of Canada revealed that no fewer than 6,000 Aboriginal children died in residential schools (CBC News, 2015).

1.2.1.1 Whose Agenda is It? The Off-Grid Energy Transition

Given the challenges associated with diesel-dependence, many have called for a transition to renewable sources of energy in Indigenous off-grid communities (see: Arriaga et al., 2014; Bhattarai & Thompson, 2016; Thompson & Duggirala, 2009). For example, the Canadian Prime Minister has vowed to "eliminate diesel from all indigenous communities by 2030", a pledge which has been backed up by over $700 million in funding in diesel displacement initiatives (see: Nunavut News, 2019; Government of Canada, 2019). Here we stress caution, as an emerging body of research on Indigenous Peoples and the development of sustainable sources of energy urges that projects are only desirable if they respect the principles of community autonomy and local decision making (see: Walker et al., 2019; Krupa, Galbraith, & Burch, 2015). Furthermore, the 92nd Call to Action by the Truth and Reconciliation Commission of Canada (2015) encourages corporations to "Commit to meaningful consultation, building respectful relationships, and obtaining the free, prior, and informed consent of Indigenous peoples before proceeding with economic development projects" (p. 10). The PCF itself reiterates the federal government's commitment to Inuit-to-crown relationships "consistent with the Government of

Canada's support for the United Nations Declaration on the Rights of Indigenous Peoples, including free, prior, and informed consent" (Government of Canada, 2016, p. 4).

The tension here is evident: western stakeholders are calling for a rapid advancement of renewable energy development in Indigenous communities, while oftentimes failing to recognize the right of communities to free, prior, and informed consent for projects which have the ability to drastically impact their territory and way of life. In these instances, one set of issues may be addressed - i.e. emissions reductions, energy security - while another set of issues may worsen - i.e. community sovereignty and self-decision-making. This approach runs the risk of further colonization via renewable energy development. To be clear, sustainable energies may offer advantage - but only when grounded in community autonomy, local decision-making, and respect for the right of free, prior, and informed consent. In this light, research on Indigenous Peoples' perspectives on sustainable energy development in off-grid communities is lacking - as there is limited indication that energy transitions or outside support is even desired. The Pan Canadian Framework draws specific attention to partnerships with Indigenous communities, and reaffirms the federal government's support of *UNDRIP* and the right to free, prior, and informed consent. However, the PCF then states "Investing in clean energy solutions will advance the priorities of Indigenous Peoples… to transition away from diesel" without citing any evidence of community priorities or support for energy transitions (Government of Canada, 2016, p. 12).

1.3 Research Objectives: A Partnership with Inuit in NunatuKavut

In 2017, the NunatuKavut Community Council, under the leadership of current Director of Research, Education and Culture - Amy Hudson - launched their *Community Governance and Sustainability Initiative* [CGSI]. The CGSI aimed to work with three pilot NunatuKavut communities - Black Tickle, Norman Bay, and St. Lewis[2] - to "identify and build on community strengths and assets, to foster community engagement in creating a strong future, and to develop a sustainability plan for their community" (NCC 2017, p.1). The three pilot communities are off-grid and diesel-dependent, making energy a key sustainability issue. At the invitation of the NunatuKavut Community Council's Department of Research, Education and Culture, a proposal was developed to support NCC staff and

[2] Following hereafter, communities are listed geographically from north to south

community members in expanding the CGSI to consider and address energy-related challenges in the pilot communities. As such, this research responds not only to the significant knowledge gaps previously discussed, but directly to the self-determined priorities of Inuit in NunatuKavut. The key research objectives for this doctoral dissertation include:

1) To determine how off-grid energy systems [based on both diesel-fired electricity and sources of home heat] affect the integrated sustainability of diesel-powered Inuit communities in NunatuKavut

2) To implement participatory methodologies in order to identify factors which influence community support for sustainable energy development in NunatuKavut communities

1.3.1 Partner Community Background

Translated from Inuttitut, NunatuKavut means "Our Ancient Land" and it is the traditional territory of NunatuKavut Inuit. The NunatuKavut Community Council is the governing organization which represents the rights of approximately 6,000 Inuit who belong predominantly to south and central Labrador. NunatuKavut spans a vast territory, within which several communities are off-grid and diesel dependent, located along the southeast coast of Labrador. Originally, we secured a grant from the Social Sciences and Humanities Research Council of Canada to undertake energy sustainability research in partnership with the three Inuit communities involved in NCC's '*Community Governance and Sustainability Initiative'* (Black Tickle, Norman Bay, and St. Lewis). Upon dissemination of preliminary findings to the communities in January, 2018, we were invited back

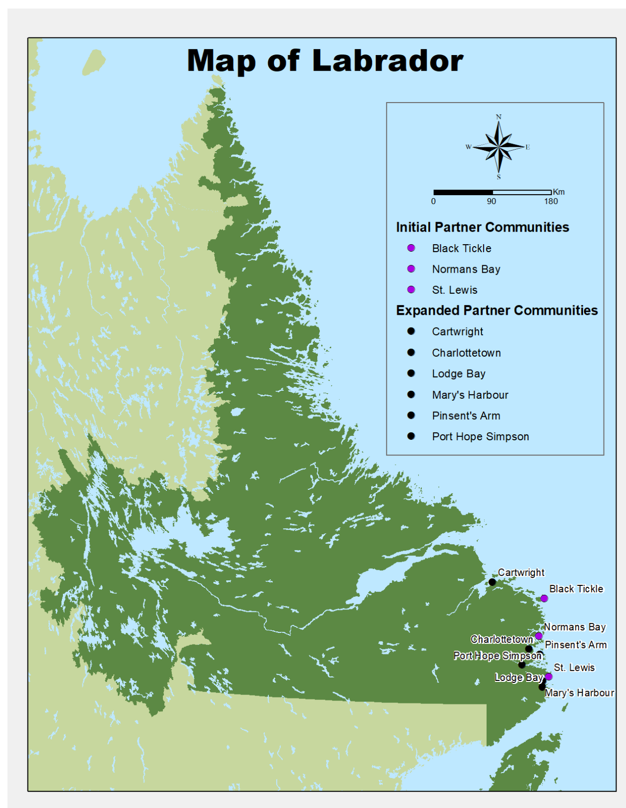

Figure 1.1 Map of Partner Communities

to the territory by NCC's Department of Research, Education, and Culture to expand the research model to six new partner Inuit communities: Cartwright, Charlottetown - Pinsent's Arm, Port Hope Simpson, and Mary's Harbour - Lodge Bay **[Figure 1.1]**. Much of this expanded phase of research was funded by NCC's own revenue, while the Canadian Institute of Health Research funded a project entitled 'A SHARED Future', through which financial and in-kind contributions were made to the research (A SHARED Future, 2019).

Inuit on the southeast coast of Labrador have maintained transhumance (seasonal migration) since time immemorial (Martin et al., 2012). In the spring, families would move to fishing locations on the coast to harvest seals and codfish. In the summer, cod fishing continued, with salmon runs and berry picking gaining importance. The arrival of fall marked bird and seal hunting, and by the end of the fall families moved into sheltered bays to prepare for winter trapping and caribou hunts. Today, families maintain multiple homes, cabins, and camps in order to accommodate each harvest. As such, the traditional way of life persists into the 21st century for Inuit in NunatuKavut, as community-members continue to travel their lands and subsist as their ancestors did in the past. Community-members from Black Tickle, Norman Bay, and St. Lewis describe their deep attachment to their lands, waters, ice, and way of life in a series of booklets published by NCC (NCC, 2017a; NCC, 2017b; NCC, 2018c). Today, the southeast coast of Labrador is home to several modern NunatuKavut communities. Cartwright being the most northerly community, and others stretching down the south coast. Settlement into modern day communities occurred in the 1950's and 60's at the urging of the religious and governmental leaders in the province, who wanted to end Indigenous Peoples' seasonal movements for the stated purpose of service delivery, especially schooling (Mercer & Hanrahan, 2017).

Across both phases of research, nine Inuit communities in NunatuKavut partnered in this project. All of the partner communities are off-grid and diesel dependent, with relatively small populations [**Table 1.1].** Accessibility and transportation to each community varies. For instance, the communities of Cartwright, Charlottetown – Pinsent's Arm, Port Hope Simpson, Mary's Harbour - Lodge Bay, and St. Lewis are connected to the Trans Labrador Highway [TLH] via gravel access roads. The TLH is the only public road serving south and central Labrador. Route 510 of the TLH, which the road connected communities in this research rely on as their primary transportation link, runs through dense boreal forest, lacks cell phone connection, and has no roadside services. It is not uncommon for large sections of the highway to be shuttered for days and weeks due to heavy winter storms (CBC News, 2019d).

The partner communities of Norman Bay and Black Tickle are non-road connected and transportation to and from the communities is restricted. The seasonal governmental ferry service to Norman Bay was discontinued in 2018, and replaced by a twice weekly (weather dependent) helicopter service from the neighbouring community of Charlottetown. Travel to and from the community in the winter and spring is limited to snowmobile only. Black Tickle is an island community, accessible by a weekly ferry service in the summer and fall, and by snowmobile only in the winter and spring. Air travel to Black Tickle is dependent on seat availability on a medical flight, which is extremely costly.

Table 1.1 Basic Characteristics of Partner Communities

Community:	Population	Diesel-capacity (kW)	Accessible primarily by:
Cartwright	427	2,200	Road
Black Tickle	150	1,005	Ship
Norman Bay	25	160	Helicopter
Charlottetown - Pinsent's Arm	290 - 55	3,160	Road
Port Hope Simpson	412	1,965	Road
Mary's Harbour - Lodge Bay	341 - 65	2,635	Road
St. Lewis	194	1,020	Road

1.3.2 Dissertation Overview

While Canada is generally regarded as a global leader in renewable energy development, the same cannot be said for off-grid communities in the country – whom remain heavily dependent on diesel-fuel for electricity generation. Diesel-dependence in Canada must be thought of as an issue disproportionately affecting Indigenous Peoples. While a growing body of literature has asserted and demonstrated the economic, environmental, and societal challenges of diesel-generation – there is limited research which focuses on Indigenous understandings of off-grid energy sustainability, despite the fact that the majority of off-grid communities are Indigenous.

More concerning, a wide array of researchers, policymakers, and advocates have called for a rapid transition to renewable sources of energy in Indigenous off-grid communities, with little evidence that this transition is a priority. This approach ignores the federal government's commitment to Indigenous rights, particularly the right to free, prior, and informed consent – for projects which have the ability to drastically impact Indigenous territories and ways of life. Working with the NunatuKavut Community Council, and the nine Inuit diesel-dependent communities of Cartwright, Black Tickle, Norman Bay, Charlottetown – Pinsent's Arm, Port Hope Simpson, Mary's Harbour – Lodge Bay, and St. Lewis – this doctoral dissertation seeks to respond to these critical knowledge gaps, provide a community-led framework for assessing energy sustainability and transition pathways from the local perspective, and further NunatuKavut Inuit priorities included in NCC's *Community Governance and Sustainability Initiative.*

The dissertation proceeds as follows. The second chapter includes a literature review, examining diverse themes such as: the emerging body of research on Indigenous Peoples and sustainable energy development in Canada; sustainability implications of off-grid energy systems; and Indigenous Peoples' perspectives of renewable energies in off-grid communities. The third chapter considers the methods deployed, including guiding theoretical principles, operational methods, limitations of the research, and the researcher's positionality. The fourth, fifth, and sixth chapters are presented as manuscripts and serve as both findings and discussion chapters. The first two manuscripts focus on assessing the sustainability of off-grid energy systems in NunatuKavut, while the final manuscript presents a conceptual framework for understanding community support of sustainable energies. The dissertation ends with a brief conclusion, including recommendations for future policy and research.

Chapter 2: Literature Review

2.1 Indigenous Peoples and Sustainable Energy: Need for Community Autonomy

This doctoral dissertation is situated in the emerging body of research related to Indigenous Peoples and sustainable energy development in Canada. Several authors in this area of research have argued that due to significant natural resource potential, and in-depth understandings of their local environments, Indigenous Peoples are at the forefront of renewable energy transitions in this country (Walker et al., 2019; Jaffar, 2015; Krupa, Galbraith, & Burch, 2015; Henderson, 2013; Krupa, 2012). A national survey demonstrates that "nearly one fifth of the country's power is provided by facilities fully or partly owned or run by Indigenous communities" (CBC News, 2017a). There are over 152 clean energy projects with Indigenous involvement of at least 1 megawatt [MW] across the country, a substantial increase from only 20 such projects in 2008. There are 1,200 smaller projects (<1MW) with Indigenous involvement that generate electricity for local communities. Indigenous involvement ranges widely from impact benefits agreements, to partnerships with developers, public utilities, and financial firms, to direct ownership of projects (Castleden, 2019; Indigenous Clean Energy, n.d.). According to the social enterprise Indigenous Clean Energy (n.d.) there is at least 2,500MW of Indigenous clean energy available for development in Canada by 2024.

A key systematic review conducted by Stefanelli et al. (2018) analyzed the motivations of Indigenous communities in Canada for pursuing sustainable energy projects. The review concluded that motivations are mixed on a nation-to-nation, government-to-government, or even community-to-community basis. While some Indigenous communities pursue sustainable energy projects to achieve enhanced levels of autonomy and self-determination, others pursue projects to reduce environmental damage, energy costs, and to generate revenue to invest in community development initiatives.

Caution has also been urged in this literature, as renewable energies may negatively impact Indigenous autonomy if projects are forced on communities - or if consultation processes are not meaningful - potentially resulting in inequitable and unjust development processes (Walker et al., 2019; Rezaei & Dowlatabadi, 2016; Krupa et al., 2015). To protect and enhance the autonomy of Indigenous communities, researchers suggest that "truly sustainable renewable energy development requires a project design that reflects community values, incorporates community control, and incentivizes

Indigenous ownership" (Krupa et al., 2012, p. 61). Similarly, Walker et al. (2019) conclude that renewable energy is only valuable in terms of lower emissions and improving socio-economic well-being of communities, when energy autonomy and local decision making power are present.

This literature review seeks to critically examine evidence related to the primary objectives of this doctoral dissertation. Firstly, the available literature related to diesel-generation, renewable energy, and implications for off-grid community sustainability are discussed. Secondly, the literature related to Indigenous perceptions and support for renewable energy development is considered.

2.2 Sustainability of Off-Grid Energy Systems: A Narrative Review

2.2.1 Economic Impacts of Off-Grid Energy Systems

A significant body of research demonstrates the economic, environmental, and societal challenges of diesel-generation for off-grid communities. Due primarily to fuel transportation costs, diesel-generation is expensive in off-grid communities. Arriaga et al. (2013) suggest that the average unsubsidized cost of diesel in off-grid communities is $1.30 per kilowatt hour[3] (Arriaga et al., 2013). In communities with year round road access unsubsidized rates are as low as $0.45/kWh, for communities accessible by barge or airplane costs increase to $0.80/kWh or more, and for Arctic communities rates range from $1.5 - 2.5/kWh. Coates & Landrie-Parker (2016) note that households in northern off-grid communities devote a much higher percentage of total income on domestic energy use than the Canadian average. McDonald & Pearce (2013) suggest that the high cost of electricity in off-grid communities strains household financial resources, oftentimes forcing residents to choose between paying for food, shelter, electricity, and other necessities.

To contrast, renewable energies are frequently promoted in off-grid communities due to their relative cost competitiveness as a source of electricity (see: Byrnes et al., 2016; Jaramillo-Nieves & del Rio, 2010). For example, Rickerson et al. (2012) state "At current oil prices, diesel generation is significantly higher on a per capita basis than all renewable thermal applications and higher than almost all power

[3] All monetary figures are in terms of Canadian dollars, unless otherwise mentioned

generation technologies (depending on location and application)" (p. 23). A more recent study by Warren (2018) in three off-grid communities in Labrador (Nain, Hopedale, and Makkovik) determined that "a business case exists for including alternative energy in the generation mix for all communities considered in this research" (p. 72). The study demonstrated that renewable energies were cost effective in displacing, but not eliminating, diesel fuel. For instance, Nain achieved the lowest cost of electricity of $0.299/kWh for a hybrid wind-diesel-storage system (49 per cent renewable generation fraction) compared to $0.356/kWh for a diesel only system and cost savings of $1,145,480 annually in terms of fuel. Comparatively, 100 per cent renewable energy systems were prohibitive, with a minimum cost of electricity of $0.856/kWh for a wind-solar hybrid system with storage for Makkovik.

Despite this, off-grid renewable energy developments are significantly more expensive than grid-connected projects. For example, while a grid-connected wind project typically costs $2,000/kW installed, estimates for remote applications range from $3,800 to $13,415/kW installed (Thompson & Duggirala, 2009; Arraiaga et al., 2013). More recent research from Warren (2018) utilizes a cost range of $7,000 – 15,000/kW installed for off-grid wind energy projects in Labrador. Similarly, for solar PV applications in Canada, provincial grid-connected applications range from $2,340 to $4,310/kW installed, while off-grid applications ranged from $6,500 to $8,365/kW (McDonald & Pearce, 2013: Arriaga et al., 2013). While life-cycle costs of renewable energies are seen as competitive, the high upfront costs have been identified as a barrier to their development (Weis et al., 2008). In the case of remote, off-grid renewable energy projects – complicated transportation and logistics significantly increase installation costs (Warren, 2018; Arriaga et al., 2013). To contrast, installation costs for off-grid diesel generators are as low as $1,300 - 2,400/kW installed (Bhattarai & Thompson, 2016; Arriaga et al., 2013).

Due to the significant costs associated with diesel generation, various levels of government provide significant subsidies in order to keep rates affordable for consumers. For example, in Nunavut, where the entire population lives in 26 diesel-dependent communities, the territorial government spends approximately one-fifth of its annual budget on the energy needs of the territory (McDonald & Pearce, 2012). Touchette, Gass, & Echeverria (2017) determined that between 2012 and 2016, the Government of Nunavut spent approximately $60.5 million annually on diesel fuel subsidies, with approximately half ($36.6 million) spent on electricity subsidies. This economic pressure limits the government's ability to address other important social issues such as housing, educational programs, health services, and food security (McDonald & Pearce, 2012).

Cross-subsidization is another mechanism employed throughout the country, wherein grid-connected ratepayers pay premiums on their electricity bills, which are then redirected towards off-grid consumers (Knowles, 2016, p. 35). For example, in Newfoundland and Labrador, grid-connected ratepayers contribute $80-90 million on an annual basis towards subsidizing rural operations - which accounts for approximately 10 percent of total electricity bills (Warren, 2018). It is projected that $30 million of this cross-subsidy will be applied to Labrador's isolated communities in 2021 (NL Hydro, 2018c).

Volume-based subsidies (i.e. subsidies on a limited monthly block of consumption) are often employed in off-grid communities to discourage the use of electric heat, and to incentivize electricity conservation (Knowles, 2016). For example, in the pilot communities in this research, residential rates are $0.1223 for the first block of kWh per month (termed the 'lifeline block") and $0.13660/kWh for the second block (2019 rates) **[Table 1]**. Consumption beyond initial subsidized blocks increases substantially, for example; in the pilot communities all kWh in excess of 1,000 per month are charged at a rate of $0.18523/kWh (NL Hydro, 2019). An additional direct governmental subsidy of approximately $2 million per year via the "Northern Strategic Plan" further "reduces the monthly basic customer charge and lifeline block price to those charged to customers on the Labrador Interconnected System" (Department of Natural Resources, 2017, p. 2) – or $0.0315/kW in 2020 (NL Hydro, 2020; Government of Newfoundland, 2015). Across the pilot communities involved in this doctoral dissertation, ratepayers contributed approximately 27 percent of the 'true cost' of electricity generation, with the rest covered by cross-subsidization and direct subsidies (Department of Natural Resources, 2017).

	Rates (c/kWh)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
First block	12.203	1000	1000	900	900	800	800	700	700	700	800	900	1000
Second block	13.66	0	0	100	100	200	200	300	300	300	200	100	0

Table 2.1 Residential Rates for Newfoundland and Labrador Communities in Diesel Serviced Areas, First 1,000 kWh (Sources: NL Hydro, 2019; Karanasios & Parker, 2018).

Load restrictions are an additional challenge facing off-grid communities. Load restrictions occur when a community reaches or nears 75 percent of the diesel capacity availability, at which point no new electrical connections are permitted, potentially restricting economic growth, social development, and poverty alleviation efforts. One report suggested that 25 – 50 per cent of off-grid communities in British Columbia, Ontario, and Nunavut experienced load restriction challenges in 2017 (Arriaga et al., 2017). Partially as a result of load restrictions, there are dramatic differences in electricity consumption between off-grid and grid-connected regions in Canada. Arriaga et al. (2014) note that in 2012 "countrywide electricity consumption, excluding the territories, was 8.7 – 25 MWh/year per capita, while the estimated range for N&RCs for which information was available was 2.8-18 MWh/year per capita" (p. 56). Part of these discrepancies are structural, i.e. there is less industrial electricity consumption in most off-grid communities. The unavailability of electricity prevents the connection and construction of new housing, may force families to crowd into existing housing, or may encourage reliance on less reliable or more dangerous non-electrical energy services. This trend may limit the development of social infrastructure (e.g. schools, water treatment, health services) and commercial operations in off-grid communities. For example, the community of Kasabonika Lake First Nation, Ontario, operated under load capacity restrictions for three years from 2008 - 2010. The estimated total economic cost to the community of this load impediment was $9.7 million, resulting from reduced housing stock, job losses, and inability to grow existing businesses (Advanced Energy Centre, 2015). While renewable energy projects are frequently promoted as a way to add cost-effective generation capacity, which would enable future economic and social development, there are few empirical examples of projects in the literature (see: Cherniak et al., 2015; Rickerson et al., 2012). One exception is the community of Deer Lake in northern Ontario, which installed 152kW of solar-pv, enabling the electrical connection of five newly built homes to the local grid (Advanced Energy Centre, 2015).

Weis & Illinca (2010) describe the central characteristics of energy security in an off-grid context as fuel supply and price volatility. Most off-grid communities, with the exception of a small number of communities that produce and consume their own natural gas, are required to import all of their fuel (INAC, 2015; Van Viley, 2009). This makes communities vulnerable to disruption in supply - be it from complicated logistics for delivery to isolated regions, severe weather events, or depletion of fuel sources over the long term (Weis & Illinca, 2010). Many communities must purchase annual or semi-annual supplies of fuel, subjecting them to whatever the volatile price is on the date of purchase, which can create serious challenges for community and utility budgeting. This occurred when communities purchased fuel supplies in the summer of 2008, when prices were at all time highs, and then consumed this fuel throughout 2009 when prices had crashed, falling over $0.63 cents per litre (Statistics Canada, 2019b).

Renewable technologies may enhance local energy security in two primary ways. Firstly, renewable energy projects use local energy sources - reducing the requirement for fuel imports. For example, the wind-hydrogen-diesel pilot project in Ramea, Newfoundland decreased annual fuel consumption by 25% - or approximately 250,000 litres of diesel (Rickerson et al., 2012). Secondly, renewable projects may act as a price hedge against volatile fossil fuel prices (Byrnes et al., 2016; Mohammed et al., 2014; Jarmallo-Nieves & del Rio, 2010). Following the initial upfront costs of renewables, operation and maintenance costs are limited, and there are no additional fuel costs. As such, electricity prices from renewable energy projects remain stable and predictable for the life of the project (Rickerson et al., 2012). In addition, renewable energy projects may help off-grid communities financially by reducing the use of diesel generators, and requiring fewer maintenance trips (Coates & Landrie-Parker, 2016). However, renewable energies may create some energy security challenges of their own. Most renewable sources of energy are intermittent, as such, they require back-up dispatchable fossil fuel capacity (Jaramillo-Nieves & Del Rio, 2010). Due to intermittency challenges, some off-grid communities prefer the reliability of diesel. As stated by Coates & Landrie-Parker (2016) "[in Yukon] diesel is seen as a reliable option; renewable energy is not" (p. 36).

Renewable energies are frequently promoted as a means to generate taxes and other revenue for local governments in off-grid communities (Rickerson et al., 2012; Vice, 2012). Revenue can be generated directly through electricity sales or benefit payments from firms to local government, or indirectly through economic activity. Rickerson et al. (2012) outline revenue generation measures for off-grid electricity projects (including diesel-generation) such as sales tax, property tax, import duties on equipment, and/or income taxes on energy system revenues. One example is the Lutselk'e Dene First Nation in the Northwest Territories, who have established a green reserve fund - that directs savings from the community's solar-pv project towards future green initiatives (Bullfrog Power, 2016).

Off-grid communities who develop renewable energy projects are typically compensated according to the 'avoided cost of diesel' to local utilities; i.e. utilities purchase electricity from off-grid RE projects solely on the basis of what it would cost the utility to purchase the diesel fuel to generate the electricity provided (WWF, n.d.). The Canadian average 'avoided cost' rate for remote RE projects is approximately $0.30/kWh. Many have criticized this compensation scheme, arguing that it does not account for externalities created or displaced by RE (i.e. less maintenance, wear-and-tear on equipment, emissions reductions, improved local air quality, etc.). Sherwani et al. (2010) suggest that revenue generation benefits of off-grid RE projects are minimal if a large amount of capital costs are not provided via government or charitable grants. Others have noted that off-grid renewable projects may lead to further revenue loss if projects displace conventional electricity-generation jobs, or leads to less money paid to transport and store diesel-fuel in remote communities (Karanasios & Parker, 2016b; Rickerson et al., 2012).

Rickerson et al. (2012) note that job creation from renewable energy is typically limited in off-grid communities due to the small nature of the projects. However, a small number of jobs can still be significant - due to small population sizes and high unemployment in most isolated regions. The authors provide two case study examples: the first being a renewable cooperative in the Isle of Eigg's in Scotland, which created five new jobs in a community of 96 residents; and the second being a wind-hydrogen hybrid project in the Island of Unst in the United Kingdom, which created 10 new jobs in a community of 806 residents. Again, the authors stress that renewable energy projects may actually decrease employment to the extent that they displace fossil fuels. Diesel transportation, storage, distribution, and sales in remote communities can be important sources of employment.

2.2.2 Environmental Impacts of Off-Grid Energy Systems

The burning of diesel-fuel for electricity generation contributes to global climate change. It is estimated that off-grid communities in Canada consume 215 million litres of fuel per year for electricity generation [excluding space heating and fuel transportation], which equates to approximately 770,000t C02e (Arriaga et al., 2014; Quest, 2018). While off-grid communities represent a small fraction of overall Canadian emissions, per capita emissions are much greater than in grid-connected communities. For example, on average, off-grid residents emit 4.8t C02e per year for electricity generation, over double the 2.2t C02e emitted by a grid-connected resident in Canada (Arriaga et al., 2014; Environment and Climate Change Canada, 2014). Emissions also occur when fuel is transported to the community via plane, barge, and truck. In some cases, these emissions can be substantial. For example, fuel transportation to off-grid communities in northern Ontario via plane accounts for 25 percent of electricity related emissions (Pembina Institute, 2016; HORCI, 2015).

Renewable energies are frequently promoted to help off-grid communities reduce greenhouse gas emissions (Bhatarrai & Thompson, 2016; Rahman et al., 2016; Cherniak et al., 205). For example, Weis & Illinca (2010) determined that 62 of 150 off-grid communities studied in Canada have feasible resources for wind energy development. Such projects would reduce diesel consumption by 9.6 million litres annually, or approximately 7,600t C02e. Numerous empirical examples are also available. For instance, the solar-diesel hybrid system in Xeni Gwe'tin First Nation, B.C. has reduced fuel consumption by 26,000 litres a year, and a resultant emissions reduction of 73t C02e (NRCAN, 2013).

Diesel transportation, storage, and operation also poses the risks of fuel spills and leaks - a serious concern in many Indigenous communities, who highly value and depend on the health of the land and environment. There are over 2,000 contaminated sites at or near Indigenous communities in Canada. The vast majority of these sites, approximately 70 percent, are contaminated by diesel fuel. In addition, diesel contamination is proven to cause cancer with prolonged exposure (Advanced Energy Centre, 2015). This represents a minimum number of sites as additional spills may not have been reported. Such accidents contribute to land and water degradation, which is a serious concern for many Indigenous off-grid communities, whom highly respect, value, and depend on the health of the environment (McDonald & Pearce, 2012).

The risks of fuel spills and leaks are magnified in off-grid communities due to the cumbersome logistics required for clean-up in isolated regions (Rickerson et al., 2012). Remediation costs for diesel spills are expensive, for example, following a diesel-spill in Sayisi Dene First Nation, Manitoba - the cost of remediation was in excess of $3.6 million. These are costs which may be untenable for a small community. It is often unclear who is responsible for initiating or paying for remediation efforts; Arriaga et al. (2017, 2016) note that 250 sites at or near Indigenous communities are waiting for petroleum hydrocarbon spills to be remediated. Thus, the federal government faces millions of dollars in potential liability regarding the need to remediate sites contaminated by hydrocarbon fuels in off-grid communities. Renewable energies are frequently promoted to reduce the risks of fuel spills and leaks in off-grid communities, the general principle being that as less fuel is required for electricity generation, there is less potential for accidents during transportation and storage (Boute, 2016; Arriage et al., 2013). While this benefit is often stated generically in the literature, there is limited empirical evidence to quantify this outcome.

2.2.3 Social Impacts of Off-Grid Energy Systems

Many diesel generators are old and aging, which can pose reliability challenges for off-grid communities. For example, in Pikangikum First Nation in northern Ontario (prior to being connected to the provincial electricity grid), the local school board lost 20 percent of its educational time annually due to black outs at the local diesel generator (Arriaga et al., 2017). Due in part to these blackouts, it took high school students upwards of an extra year to finish their education (CBC News, 2018). In addition, diesel generators can be loud, noisy, and disruptive - especially in quiet, isolated, northern environments (Government of Canada, 2011).

Some research has argued that crown-utility controlled diesel-generation may be viewed as an imposition on self-determination of Indigenous communities. For example, electricity service delivery is frequently the responsibility of crown power corporations in Indigenous off-grid communities (Rickerson et al., 2012; Fitzgerald & Lovekin, 2018; Heerema & Lovekin, 2019). This can create challenges for Indigenous decision making with regards to electricity supply, distribution, and other operational decisions (Rezaei & Dowlatabadi, 2016). Fitzgerald & Lovekin (2018) have suggested that distrust of utilities is widespread across the North, driven by historical and present-day inequities that arise from colonization. The authors summarized Indigenous control of remote community energy system in Canada as follows:

> "Opportunities for Indigenous inclusion are currently rooted in the colonial market-based reality of energy development in the North, where power imbalances between utilities and Indigenous power proponents (where utilities currently have the authoritative advantage) and the lack of transparent information sharing" (p 9).

Conversely, Karanasios & Parker (2018) find in their recent analysis of 71 off-grid renewable energy projects in Indigenous communities between 1980 and 2016, that transformation of remote community electrical systems is shifting from a "utility driven" phase (focusing on utility-owned hydroelectricity and small wind projects, 1980 - 2000) to a more "community driven" phase (focusing on local government owned small solar projects, 2000 - 2016). All Indigenous off-grid communities in Newfoundland and Labrador remain diesel dependent; however, the provincial utility (NL Hydro) recently launched an *'Expression of Interest for Renewable Energy Solutions in Isolated Diesel Communities'.* Heerema & Lovekin (2018) conclude that NL Hydro's EOI does not appear to emphasize community-led projects and instead favours an industry led-approach. This suggests that the "colonial, market-based reality of energy development and utility authority in the North" (p. 9) is set to continue in the future.

Rezaei & Dowlatbadi (2016) argue that renewable energy technologies may help Indigenous communities enhance self-sufficiency and achieve greater levels of autonomy in three primary ways. Firstly, by materially supplying their own locally-sourced power generation, communities are less dependent on fuel imports from far geographic distances. Secondly, by leading renewable energy projects, communities develop and enhance processes of self-decision making. Thirdly, selling electricity generated from Indigenous owned renewable energy projects may generate revenue for communities to invest in self-determined priorities. Rezeai & Dowlatabadi (2016) urge caution however, as energy projects may erode self-determination in some instances. Firstly, if owned or controlled by outside interests, projects may lead to further entrenchment of western models of resource governance in Indigenous communities. Secondly, development may create significant administrative burdens for communities who are already operating at capacity with regards to service provision. Thirdly, energy projects may unfairly expose community members to the risks associated with novel or untested technologies. As one respondent stated in explaining their opposition to small modular nuclear reactors "why would Inuvik be the guinea pig?" (Coates & Landrie-Parker, 2016, p. 41).

Renewable energy projects are promoted to create educational and training opportunities in off-grid communities (Cherniak et al., 2015; Rickerson et al., 2012). These benefits typically accrue either from specific training resulting from projects, or community educational benefits via investments from project proponents (Del Rio & Burgillo, 2009; Del Rio & Burgillo, 2008). One relevant example is in Ramea, NL, wherein the project proponent provided first responder training to the local fire department to respond to issues at the wind-hydrogen-diesel pilot project (Rickerson et al., 2012). In Lutsel'ke Dene First Nation, NWT, four community-members completed a solar PV basics training course, and two community-members received hands-on experience during the installation of a community project

(Cherniak et al., 2015). A key tension here is that while renewable energy projects are frequently promoted to improve education and training, many projects have failed as locals haven't been provided the necessary training or skills to maintain projects (Coates & Landrie-Parker, 2016). The authors describe several failed wind energy projects in Nunavut in the early 1990's. These projects failed, as nobody in the communities were able to service the equipment, which performed poorly in harsh weather conditions. By contrast, locals were comfortable fixing diesel-generators which they have several decades of familiarity and experience working on. As a result of this training deficit, Coates & Landrie-Parker (2016) conclude "the North is always a perfect pilot for new energy options, but it is also the place where these projects are most likely to fail" (p. 32).

As discussed, virtually all the evidence on the economic, environmental, and societal impacts of off-grid diesel-generation comes in the form of quantitative reporting on a limited number of measures by outside or external stakeholders. There is limited (or any) qualitative evidence which examines the experiences or perspectives of off-grid residents themselves on off-grid energy sustainability. Likewise, there is almost no literature which integrates Indigenous Knowledge or perspectives on off-grid energy systems, despite the fact that a large majority of off-grid communities Identify as First Nations, Inuit, or Métis. Karanasios & Parker (2018) have explicitly called for further research that integrates Indigenous perspectives of remote community energy systems.

2.3 Lack of Indigenous Perspectives in Renewable Energy Social Acceptance Research

It is recognized that there is a substantial body of literature in the North American context on the social acceptance of renewable energies, especially wind energy projects, as evidenced by over 152 studies published since 1980 in a recent systematic review (Rand & Hoen, 2017). Of all the sources considered in this review, one title gives explicit reference to the experiences of Indigenous communities (Huesca-Pérez et al., 2016). Wustenhagen et al. (2013) suggest that wind energy social acceptance studies are divided into three subcategories. The first category is "socio-political" research, these studies generally involve opinion polls which gauge the acceptance of renewable energies by policymakers and the general public. The second category is "market" research which includes willingness-to-pay models, and investigations of new technologies across households and corporate organizations. The third category is “community” research, which focuses on local responses to the siting of wind or solar farms and other infrastructure.

2.3.1 Turning to Indigenous Understandings of Sustainability

Given the relative lack of research on Indigenous acceptance of sustainable energies, focus is shifted to relevant lessons in tangential literature, in order to inform a discussion of Indigenous perceptions and support of sustainable energies. There is a larger body of research in a North American context on Indigenous perceptions of diverse aspects of sustainability, such as: sustainable development (Clarkson, Morrissette, & Régallet, 1992), industrial resource extraction (Booth & Skelton, 2011; Lertzman & Vredenburg, 2005), food security (Skinner, Hanning, Desjardins, & Tusji, 2013; Elliot, Jayatilaka, Brown, Varley, & Corbett, 2012), water security (Awume, Patrick, & Baijius, 2020), climate change adaptation (Turner & Clifton, 2009), ecological education (Beckford, Jacobs, Williams, & Nahdee, 2010), environmental contamination (Castleden, Bennett, Pictou Landing Native Women Group, Lewis, & Martin, 2017), forestry management (Lewis & Sheppard, 2005), amongst others.

This doctoral dissertation is not the first to claim a lack of consideration of Indigenous perspectives in research, a finding often repeated in diverse environmental domains (see: Beckford et al., 2010; Turner & Clifton, 2009; Lertzman & Vredenburg, 2005). As stated emphatically by Booth & Skelton (2011) “After our substantive review of both environmental justice and environmental assessment literature, we came to the conclusion that the First Nations are often not allowed to speak on their own behalf in research” (p. 690) Elliott et al. (2012) state “the need for Aboriginal voice in public policy making was highlighted, with participants firmly stating, ‘We are not being heard!’” (p. 6). Awume et al. (2020) argue “with a few notable exceptions, the literature is largely silent on the meaning of water security from an Indigenous perspective” (p. 809). Prior to our discussion of Indigenous perceptions of sustainable energies, we discuss some common themes on Indigenous understandings of sustainability found in this related literature.

A key point synthesized across these studies is that Indigenous Peoples stress the interconnectedness, interdependency, and sacredness of all life forms. Turner & Clifton (2009) explain

> "First Peoples in North America commonly regard other species and even physical features like mountains and rivers – as having spirts of their own, as being beings in their own right, having their own societies and relationships, and their own powers that can aid us, or cause problems for us according to how well we respect and treat them" (p. 186).

Clarkson et al. (1992) stress Indigenous Peoples view of all aspects of creation as containing a spirit essence no less than one's own. Referring to a specific group of tribes on the west coast of Vancouver Island, Lertzman & Vredenburg (2005) describe the Nuu-Chah-Nulth traditional principle of *hishuk ish ts'awalk* – or 'everything is one'.

Turner & Clifton (2009) explain that this belief system, regarding other species as relatives, places them in a different light, attributing a higher value and respect to them. Clarkson et al. (1992) explain how by taking a life from the plant or animal world, a relationship is entered with great respect, as a life is being taken so others may live. The authors refer to the Hau de no sau nee address, which states "The original instructions direct that we who walk the earth are to express a great respect, affliction, and gratitude toward all the spirits which create and support life (p. 21). Clarkson et al. (1992) contrast the Indigenous worldview of respect for all sacred beings with western ways of knowing, where the relationship towards the earth is secularized, the Earth and it's being are perceived as under control and possession of humans. Instead of viewing all forms of life as gifts of creation, the planet is seen as resources for human use.

While respect towards all beings is pivotal to Indigenous Peoples, Lewis & Sheppard (2005) suggest that this does not translate to a romanticized notion of resource preservation – but a necessity of respectful land use and emphasis on balance. For example, in the study, Cheam participants preferred partial forestry harvesting methods over clear-cutting or preservation. Partial cutting was seen as more consistent with community traditions of dependence on forests and a need to accommodate a balance of uses – the management method leaves something behind for other life forms, retained visual screening for spiritual activities, and accommodated revenues and resource production. Clarkson et al. (1992) also stress the importance of balance in sustainable development, referring specifically to the medicine wheel, an important symbol in many Indigenous cultures. The medicine wheel helps to conceptualize all aspects of Indigenous Peoples ways of being – with the four coulors (yellow, black, red and white) representing all colors of human beings; self, family, community, and nation; fire, water, earth; and air; mind, body, spirt, and balance. The authors state

> "as human beings, the challenge is to keep these things in balance… we are given the responsibility of ensuring that no one aspect of our existence takes precedence over another…. The circular pattern of thinking is a constant reminder that we are all intimately connected to Creation" (p. 23).

Again, Clarkson et al. (1992) contrast Indigenous focus on balance with western ways of being – particularly the perception of human development as linear growth aimed at satisfying particular wants and needs.

The interconnectedness of all life forms informs a holistic perception of sustainability. For example, Booth & Skelton (2011) suggest that while the loss of plant and animal species is a grave ecological concern, it is also a serious social concern – as the loss of plants and wildlife has serious consequences for the ability to eat country foods. Likewise, harvesting periods constitute cultural events which increase social and community cohesiveness (Skinner et al., 2013). Lewis & Sheppard (2005) discuss Cheam relationship to land, which is a source of physical and spiritual sustenance, as a catalyst for social relationships, and as a source of cultural identity. This is also documented in health research, where Indigenous health is understood as holistic – and includes emotional, mental, and spiritual health – leading to overall well-being (Elliott et al., 2012).

Others have referred to the Indigenous principle of preservation of resources for future generations in sustainability studies (Turner & Clifton, 2009; Beckford et al., 2010; Clarkson et al., 1992). For instance, the concept of looking back and forward for seven generations in planning and decision-making is widely accepted in Mohawk Traditional Ecological Knowledge (Turner & Clifton, 2009). Lewis & Sheppard (2006) suggest that the respect for all life forms principle, can mean sufficient resources are left behind to ensure the continuing survival of other living communities. Beckford et al. (2009) demonstrate how Elders in Wapole Island First Nation recognize the rights of future generations when their people interact with the environment. Clarkson et al. (1992) contrast this worldview with western ways of being, which often focus on satisfying immediate and growing wants and needs, a defining characteristic of consumer oriented societies. Similarly, Turner & Clifton (2009) refer to short-term decision making in western societies, often based on the duration of a political term in office, and inspired by a need for immediate profit for successes of western businesses.

2.3.2 Indigenous Support for Renewable Energies

To contrast, there has been limited research on Indigenous perspectives on energy, especially in off-grid contexts. A key study by McDonald & Pearce (2013) examined Inuit perspectives of off-grid energy in Nunavut, and demonstrated a "reluctant acceptance of diesel by communities" (p. 101), which they attribute to the necessity of electricity for survival in harsh northern climates. The results of McDowell (2012) tended slightly more negatively, where they found that '62' per cent of residents are 'dissatisfied' with the use of diesel for electricity and home heat in Kluane Lake Region, Yukon. The author provides no explanation or rationale for respondent dissatisfaction. In general, there is a significant knowledge gap of Indigenous perspectives on existing energy systems in off-grid communities.

Existing research suggests that Indigenous perspectives on renewable energy are guided heavily by knowledge of local natural resources (Bryn, 2018; McDonald & Pearce, 2013; McDowell, 2012). These authors generally agree that community-members support generation sources based on their knowledge and experience with local natural resources. Resources understood as abundant and local are generally supported, while resources that are perceived as scarce or inconsistent are generally resisted. This finding overlaps with the emerging literature on food security in Indigenous communities, which demonstrates how local food sources are not only a source of sustenance – but a source of self-sufficiency, which decreases reliance on imported foods from southern communities (Skinner et al., 2013). Clarkson et al. (1992) remind us that Indigenous communities were traditionally egalitarian, self-sufficient, and intimately connected to land and its resources. While most studies refer to local knowledge of natural resources as key to guiding community support, several have pointed to knowledge of human resources as well (Coates & Landrie-Parker, 2016; McDonald & Pearce, 2013; McDowell, 2012). Community-members question whether or not there is adequate local capacity to support sustainable energy installation and maintenance, creating reluctance towards development.

Several studies suggest that support for sustainable energy development in Indigenous off-grid communities is often shaped by previous experiences with development. For example, several failed wind energy projects in Nunavut have created negative public images and erode support for new developments (Hobson, 2019; Bryn, 2018; Coates & Landrie-Parker, 2016; Cherniak et al., 2015; McDonald & Pearce, 2013). McDonald & Pearce discuss how large-scale hydroelectric development in northern Ontario and Quebec has exacerbated community-member fears around the potential for methylmercury contamination in Nunavut. Conversely, some research indicates that successful renewable energy developments have encouraged community support. McDowell (2012) discussed a test geothermal well drilled adjacent to the Kluane Lake Region, wherein nearby residents expressed a sense of awareness and pride regarding the development. Relatedly, some research suggests that unfamiliarity and lack of knowledge regarding the risks and benefits of sustainable energy technologies erodes support for development (Bryn, 2018; Coates & Landrie-Parker, 2016; McDonald & Pearce, 2013).

Potential threats to wildlife and aquatic life, which are integral to sustenance and way of life in many Indigenous off-grid communities, often erode support for sustainable energy development (McDonald & Pearce, 2013; McDowell, 2012). Commonly cited examples include the impacts of hydroelectric dams on migratory fish species or the impact of wind turbines on migratory birds (McDonald & Pearce, 2013; McDowell, 2012). This is not a surprising finding, given the rich body of literature which demonstrates the importance of traditional harvesting activities such as hunting, fishing, and gathering from the land in many Indigenous communities in North America (Skinner et al., 2013; Elliott et al., 2012).

2.3.3 Tensions of Sustainable Energies – A Need for Indigenous Voices

There is a large and growing body of literature which establishes the economic, environmental, and societal challenges of diesel-generation in off-grid communities in Canada. From an economic perspective, diesel-generation is expensive, requires substantial governmental subsidies, poses energy security challenges, and may restrict social and economic development via local load restrictions. From an environmental perspective, diesel-generation is a contributor to global climate change, and poses the risk of fuel spills or leaks during fuel transportation or plant operation. From a societal perspective, crown-utility controlled energy systems may create tension for self-determination of communities, pose reliability and health challenges, or be disruptive via noise pollution. While this narrative review documents the quantitative reporting of many of these challenges, there are limited (if any) studies which seek to understand the perspectives of off-grid community-members themselves. Furthermore, there are few examples of research which focus on Indigenous perceptions of off-grid energy sustainability, despite the fact a large majority of off-grid communities in Canada (n= 170, or 66%) are Indigenous.

While renewable energies are frequently promoted in the literature to improve the sustainability of Indigenous off-grid communities, the narrative review demonstrates several tensions which may emerge as a result of projects. For example, while renewable energy projects are frequently promoted to improve the affordability of off-grid energy systems, their upfront costs are oftentimes prohibitive for communities. Some research indicates that off-grid renewable energy projects are unfeasible without substantial governmental or charitable funding. While renewables are promoted to improve local energy security, they may create reliability challenges of their own via intermittency, causing community-members to prefer the consistency of diesel-generation. Likewise, while renewables are promoted to improve the self-sufficiency of communities via materially supplying their own sources of energy, facilitating the processes of self-decision-making, and generating revenue to invest in self-directed priorities, the inverse may also be true. For example, external ownership may lead to further intrusion of western models of resource governance, projects may create massive administrative burdens for communities, and development may unfairly expose community-members to risks associated with novel technologies. Given the potential for both positive and negative impacts outlined, assessing impacts of off-grid energy systems from Indigenous and local perspectives will enable a baseline understanding of the sustainability implications of future energy transitions.

While there is a substantial body of international literature which focuses on the social acceptance of renewable energy projects, particularly wind energy, there are few examples which focus on Indigenous perceptions or support of sustainable energies. As such, a wider body of tangential literature on Indigenous understandings of other aspects of sustainability is explored. These studies confirm several overarching themes – such as respect for all sacred beings which occupy the Earth, a balance of use and holistic understanding of sustainability, and the importance of preserving resources for future generations. In the literature related specifically to Indigenous perceptions of energy sustainability, a small number of common themes exist. Firstly, knowledge of local natural resources is key to guiding support of renewable energies in Indigenous territories. That is, strong and consistent resources are generally supported, while scare or limited resources are opposed. As Indigenous scholars point out, Indigenous communities were historically self-sufficient and had a tremendous respect for the land and its resources. Human resources are also of importance, and lack of qualified personnel locally in many off-grid communities creates hesitance for the development of renewable energies. Secondly, previous associations (either positive or negative) guide current support for renewable energies. For instance, several failed wind energy projects in Nunavut have created negative public images of the generation source, and some research suggests positive associations and familiarity generate community support. Thirdly, community-members typically oppose generation sources which pose threats to traditional food sources – such as large-scale hydroelectric dams and their impacts on migratory fish species. The methods chapter which follows explains the approach of this doctoral dissertation to address these gaps in the existing literature.

Chapter 3: Methods

3.1 Dissertation Development: Need for Community-Based Approaches

There is a harmful legacy of non-Indigenous researchers conducting research on Indigenous Peoples (Tuhiwai-Smith, 2013; Kovach, 2010). The Government of Canada (2018) summarizes these past (and ongoing) injustices in TCPS-2:

> "In the case of Indigenous peoples, abuses stemming from research have included: misappropriation of sacred songs, stories and artefacts; devaluation of Indigenous peoples' knowledge as primitive or superstitious; violation of community norms regarding the use of human tissue and remains; failure to share data and resulting benefits; and dissemination of information that has misrepresented or stigmatized entire communities" (p. 111).

Both partnership research and community-based approaches have been promoted as being more compatible with the ethical and community dynamics of research with Indigenous Peoples (Tuhiwai-Smith, 2013; Kovach, 2010). At its core, community-based participatory research [CBPR] involves integrating community values and autonomy through all stages of the research process, and emphasizes co-ownership of data, shared decision-making power, co-learning, and methods of knowledge dissemination which are beneficial for both parties (Castleden et al., 2012; Boser, 2007). CBPR literature argues that in ideal scenarios, research should be initiated by the community, allowing for research which begins with a topic of importance to the community and not driven by the researcher's agenda (Castleden et al., 2012; Louis, 2007). Respecting the community initiation principle of CBPR, the development of this doctoral dissertation is described below.

This CBPR doctoral dissertation the result of a long standing relationship between the doctoral student and the NunatuKavut Community Council - the Inuit governing council which represents Inuit predominantly in south and central Labrador. The relationship between NCC and the doctoral student began in the fall of 2014, when NCC and existing university partners sought to hire a graduate student to assist with research tasks related to an ongoing project. The author of this dissertation (the doctoral student) was then hired. As trust developed in the relationship between NCC and the doctoral student, the doctoral student was asked (in the spring of 2015) by NCC to help apply for funding and to collaboratively implement a research project to address the community priority of water insecurity (Mercer & Hanrahan, 2017). Upon completion of that project, and three years of collaboration and partnering on NCC priorities, the doctoral student was again asked to support an emerging research priority: the sustainability of local energy systems.

This priority was driven by NCC's *Community Governance and Sustainability Initiative* [CGSI], led by Amy Hudson, current Director of Research, Education and Culture with NCC. Working with three pilot communities (Black Tickle, Norman Bay, St. Lewis), the CGSI aims "to identify and build on existing community strengths and assets, to foster community engagement in creating a strong future and to develop a sustainability plan for their community" (NCC, 2017a, p. 1). Given that the three pilot communities are all remote, off-grid, and dependent on diesel fuel for electricity-generation, questions related to the sustainability of energy systems emerged as a priority in the CGSI.

Following NCC's request for support from the doctoral student on CGSI initiatives, the doctoral student brought the Social Science and Humanities Research Council [SSHRC] Engage funding opportunity to the attention of NCC staff in the fall of 2017. At this point, a committee was formed between NCC staff, collaborators, the doctoral student, and the doctoral student's supervisor, with the goal of identifying knowledge gaps, and designing research questions which were compatible with NCC's priorities for advancing community sustainability. The ultimate goal of this committee was to complete a grant application for the SSHRC Engage funding opportunity. The grant application was successfully awarded in December of 2017.

The successful grant application outlined project goals and objectives, the originality and significance of the research, a brief literature review, as well as the operational methods to be deployed. The agreement also descried the 'Nature of the Partnership' between NCC and the University of Waterloo research team (i.e. the doctoral student and the doctoral student's supervisor). It was agreed generally that "research team members will share responsibility and decision-making power with regards to research design, project implementation including data collection and analysis, and dissemination of research results". The roles and responsibilities of the principal investigators were established, and it was determined that the doctoral student would be hired to complete data collection and analysis. While it is common practice to come to formal terms or a memorandum of understanding governing research practices and data sharing in research with Indigenous communities, the relationship between the doctoral student and NCC allowed for a level of trust to respect the spirt of partnership outlined in the grant application. I elaborate on the trust in this relationship in Section 3.5 below (Researcher Relationality and Positionality).

The SSHRC Engage grant funded the initial fieldwork phase of this project in Black Tickle, Norman Bay, and St. Lewis. As mentioned previously, NCC used their own revenue to expand the research procedures to six additional partner communities upon completion of the initial fieldwork period. While the procedures agreed upon in the SSHRC Engage grant application continued to guide the expanded phase of research, an additional contract was reached between NCC and the doctoral student. This document formalized many of the agreed upon principles in the SSHRC grant, clearly defined the roles and responsibilities of the doctoral student, defined outcomes of the second fieldwork phase (i.e. a preliminary report based on fieldwork results), and addressed ownership of the data. It was determined that "all reports, studies, information, data, statistics, forms, designs, plans, procedures, systems, and other materials produced by the Consultant *[i.e. the doctoral researcher*] under this Agreement shall be the sole and exclusive property of NunatuKavut". However, full access to data was granted to the doctoral student for the purpose of completing their doctoral research.

3.2 Operationalizing the 4R's of Indigenous Research

Throughout regular committee meetings to complete the SSHRC Engage grant application, NCC staff and collaborators suggested that the doctoral student pay careful attention to the 'Four R's' principle in preparing their comprehensive examination and conducting research in NunatuKavut. The 'Four R's' principle suggests that research with and for Indigenous communities must be grounded in the principles of respectful representation, relational accountability, reciprocal appropriation, and rights and regulations (see: Smith, 2013; Kovach, 2010; Castleden et al., 2012; Kimmerer, 2011; Louis, 2007; Steinhauer, 2002). First, these principles are elaborated (Section 3.2.1 – 3.2.4), followed by their implementation in practice (Section 3.2 – 3.4).

3.2.1 Respectful Representation

Respectful representation embodies the notion that researchers must be cognizant of how they are representing themselves, as well as the people, events, and phenomena that they are studying (Abolson & Willett, 2004). To accomplish this, researchers must know and incorporate the cultural protocols, values, and beliefs of the communities with which they are doing research (Steinhauer, 2002; Lavallee, 2009). Steinhauer (2002) extends this, suggesting that strong Indigenous research must be grounded in Indigenous epistemology and supported by Elders in the community that live out this epistemology. A compelling example in energy research is Shultz's (2017) investigation of renewable energies implications for self-determination in Alderville First Nation (Ontario). The research adopts the Mississauga Anishinabeg core values of wisdom, love, respect, bravery, humility, and truth as a guiding theoretical framework. Louis (2007) suggests that respectful representation encompasses "displaying characteristics of humility, generosity, and patience with the process and accepting decisions of the Indigenous people in regard to the treatment of any knowledge shared" (p. 103). This means respecting and accepting community-decisions regarding how knowledge will be collected, shared, and used (Khoster et al., 2012)

3.2.2 Relational Accountability

Relational accountability suggests that Indigenous Knowledge is based on relationships with all life forms, and therefore respect must be given for what each can provide (Kovach, 2010). Wilson (2001) suggests that, due to relationality, when doing Indigenous research, that researchers must be held accountable to 'all of our relations'. Likewise, Lavallee (2009) argues that due to the interconnectedness of everything on Earth, research cannot be completely objective. Wilson (2007) agrees, suggesting that researchers cannot be separated from their work - relationships with family, friends, environment, cosmos, etc. shape who the researcher is, and how they conduct research. To Wilson (2007), good research begins by describing and building on these relationships. Khoster et al. (2012) argue that because all parts of research are considered interconnected, that authentic investments must be made to develop lasting relationships with the community - going well beyond financial investments, and striving for emotional and supportive relationships as well.

3.2.3 Reciprocal Appropriation

Reciprocal appropriation is an important Indigenous worldview (Rice, 2005; Clarkson et al., 1992). This is rooted in the fundamental Indigenous worldview that all is related, therefore “all research is appropriation” (Rundstrom & Deur, 1999, p. 239). Therefore, several authors have argued that Indigenous research must be reciprocal, i.e. knowledge is given to researchers as a gift and in return the research must bring benefits to the Indigenous community (see: Lavallee, 2009; Steinhauer, 2002). Lavallee (2009) has suggested some benefits for Indigenous community-members for participating in research, such as giving a voice to participants, and advancing Indigenous ways of knowing.

Several Indigenous authors have argued that “knowledge for knowledge's sake [is] a waste of time” (Louis, 2007; Crazy Bull, 1997); as such research has to have meaning for the community under study. Tuhiwai-Smith (2013) states “Indigenous peoples are deeply cynical about the capacity, motives or methodologies of Western research to deliver any benefits to indigenous people whom science has long regarded, indeed has classified, as being ‘not human’” (p. 122). Likewise, Weber-Pillwax (2001) argues that if Indigenous research does not lead to action “it is useless” (p. 169). As such, Tuiwai-Smith (2013) argues that “there are expectations by Indigenous communities that researchers actually ‘spell out’ in detail the likely benefits of the research” (p. 122).

3.2.4 Rights and Regulations

Rights and regulations refer to research that adheres to formal Indigenous protocols (i.e. ethical approval, permitting, etc.) and they include community defined-goals, and evaluate potential impacts of proposed research (Smith, 1999). These processes are utilized to ensure that research is not simply extractive (i.e. solely for the benefit of the researcher), and recognizes Indigenous People’s intellectual property rights to own the knowledge they share, and to maintain control over how that knowledge is disseminated (Louis, 2007). Several instances have been documented where Indigenous communities have lost control over information shared with researchers, and have not maintained power over how the knowledge has been interpreted and used (Stevenson, 1996).

3.3 Theoretical Framework:

Table 3.1: Socio-Economic Impacts of Renewable Energy Development
-Quantitative/qualitative impacts on employment
-Income generation effects
-Demographic effects
-Energy impacts
-Impact of project on productive diversification of the area
-Social cohesion and community development
-Income distribution
-Impact on tourism
-Local research and development
-Industry creation
-Impact on municipal budget

This research is guided primarily by energy deployment and local sustainability theory [EDST] (Jaramillo-Nieves & Del Rio, 2011; Del Rio & Burgillo, 2009; Del Rio & Burgillo, 2008). EDST was originally proposed as a theoretical lens to help understand how renewable energy projects impact the sustainability of host communities. EDST consists of three concepts: substantive sustainability, procedural sustainability, and endogenous development, each of which is explained below.

Substantive sustainability refers to the tangible economic, environmental, and social impacts of energy projects in host communities (Del Rio & Burgillo, 2008). Here, EDST scholars propose 11 impacts which must be considered as a part of renewable energy projects **[Table 3.1].** Given that we are assessing local sustainability implications of off-grid diesel generation, as opposed to renewable energy projects, we rely on a set of socioeconomic and environmental indicators developed in our own literature review [see Chapter Two] **[Table 2].** In addition, we presented these impacts to community members from the original three pilot communities and NCC staff at a research design summit in July 2018, prior to commencing the fieldwork period. Summit attendees agreed that these were the most pressing potential impacts to evaluate.

Table 3.2 Sustainability Impacts of Off-Grid Energy Systems

Economic	Societal	Environmental
-Cost of electricity	-Self-determination	-Greenhouse gas emissions
-Cost of home heat	-Power outages	-Fuel spills and leaks
-Structure of subsidies	-Public health impacts	-Deforestation
-Continuance of subsidies	-Noise pollution	
-Load restrictions	-Supplies of fuel	

Del Rio & Burgillo's (2008) substantive sustainability concept is based on "three dimensions of local sustainability" (p. 1333), or economic, social, and environmental impacts. As such, we cannot progress without acknowledging Gibson's (2006) influential criticism of the three dimensions [also referred to as three pillars, or triple bottom line] understanding of sustainability. Gibson argues that the three pillars approach facilitates "an entrenched tendency to neglect the interdependency of these factors" (p. 259) – and that focus must be given on the interconnections amongst dimensions. Understanding this criticism, and respecting our two-eyed seeing approach to research, we create space for NunatuKavut Inuit to describe their own understandings of energy sustainability – and avoid categorization into economic, environmental, and social impacts in our analysis.

Procedural sustainability extends beyond tangible impacts: instead considering how local populations perceive the impacts of a project, how the risks and benefits of development are distributed throughout a community, and ultimately the local acceptance of a project (Del Rio & Burgillo, 2009; Del Rio & Burgillo, 2008). At the core of EDST is the notion that projects must maintain both positive substantive and procedural sustainability in order to ensure long-term success. For example, even if a project makes positive tangible contributions (substantive sustainability), continuity is complicated in the long-term if locals maintain negative perceptions, if the majority of risks fall on a subset of the population, or if local acceptance is eroded (procedural sustainability).

Walker & Baxter (2017b) make an important distinction which is not included in the EDST literature. The authors differentiate between distributive justice (the distribution of project risks and benefits) and procedural justice (participation in renewable energy planning and characteristics of that participation). There is emerging research that suggests that procedural justice is at least as important as distributive justice in the social acceptance of projects (see: Walker & Baxter, 2017b; Creamer et al., 2008; Cowell, Bristow, & Munday, 2011). Just as procedural sustainability in EDST threatens the long-term viability of projects, Walker & Baxter (2017b) suggest that development that lacks procedural justice may spur opposition movements that can threaten the viability of renewable energy industries.

Finally, EDST scholars identify endogenous development as a critical factor in local sustainability: or a bottom up development process built on the use of local resources (physical, human, and capital). This is in contrast to top-down or exogenous development processes, characterized by the settlement of firms from beyond the host area. EDST scholars argue that the greater the integration of the energy project into the productive structure of the local economy, the greater its socioeconomic impact on the host community (Jaramillo-Nieves & Del Rio, 2011; Del Rio & Burgillo, 2009, 2008).

Much of the theoretical underpinning employed in this research, such as substantive sustainability, procedural sustainability, and procedural justice, is synthesized in the community renewable energy (CRE) literature (Wyse & Hoicka, 2019; Creamer et al., 2018; Berka & Creamer, 2018). For example, Devine-Wright & Walker's (2008) seminal paper argued that CRE has two primary dimensions: process and outcome. The process dimension of CRE is similar to the previous discussion of procedural sustainability and procedural justice, it considers who a project is run by, who is involved, and who has influence (ranging from closed and institutional to open and participatory). The outcome dimension is closely related to substantive sustainability and distributive justice, it considers how outcomes of a project are spatially and socially distributed, i.e. who the project is for, or who benefits economically and socially (ranging from distant and private to local and collective). To the authors, an ideal CRE project is "one which is entirely driven and carried through by a group of local people and which brings collective benefits to the local community (however that may be defined) - a project that is both by and for local people" (p. 498). As such, findings are compared to CRE literature where appropriate.

In this research, we employ the Indigenous guiding principle of Etuaptmumk or 'Two-Eyed Seeing' (Martin, 2012; Uprety et al., 2012). As noted by Walker et al. (2019), Etuaptmumk is a Mi'kmaq framework, developed by Elders Murdena and Albert Marshall (Eskasoni First Nation), in collaboration with Dr. Cheryl Bartlett. However, the principle of embracing Indigenous and western knowledge systems in research is gaining traction in other jurisdictions (Walker et al., 2019). Two-Eyed Seeing embraces both Indigenous and Western knowledge to address social and environmental challenges. As stated by Bartlett et al. (2012), Two-Eyed Seeing "refers to using the strengths of Indigenous knowledge and ways of knowing with one eye, and the strengths of using western science and ways of knowing with the other eye, and combining both of these together, for the benefits of all" (p. 333). As such, regardless of western scientific notions of energy sustainability, our approach to this research has been to privilege Inuit perceptions and understandings of energy sustainability, while acknowledging that expertise comes from within communities themselves. Keeping with the principles of two-eyed seeing, we note that two of four authors on each manuscript as a result of this doctoral dissertation are Inuk from NunatuKavut. Amy Hudson, from the case study community of Black Tickle, and Dr. Debbie Martin, who has immediate family and ancestral connection to St. Lewis.

Two-eyed seeing is only one principle for linking Indigenous and Western knowledge systems in research, and alternatives have been cited widely such as 'Braiding' (Snivley & Williams, 2016). There is a vast diversity of Indigenous knowledge systems, and we acknowledge that there is no pan-Indigenous approach to co-production of knowledge (Levac et al., 2018). Levac et al (2018) argue that the framework researchers utilize should reflect the specific context and conceptual landscape in which they work. As for this dissertation, a key mentor of the doctoral student is a recognized leader in two-eyed seeing research (Martin, 2012). The doctoral student does not claim to understand NunatuKavut Inuit epistemologies or ways of knowing; as such, the operationalization of two-eyed seeing in this research has involved recognizing the researchers privilege and position and making efforts to meaningfully include NunatuKavut Inuit throughout all stages of research – allowing their own knowledge system to emerge and speak for itself.

3.4 Operational Methods:

3.4.1 Ethics Approval and Fieldwork Period

Ethics approval for this project was initially received from NCC's Research Advisory Committee [RAC] on July 10th, 2018. This approval was then forwarded to the University of Waterloo Office of Research Ethics which completed a supplementary review and approved the application on July 12th, 2018 [ORE#31838]. The research relied on two primary research instruments: mixed-methods community member interviews, and key informant interviews **[Appendix A & B].** Procedures for the research were collaboratively developed with NCC staff and community-members, and were reviewed during an NCC hosted research-design summit (prior to receiving RAC approval) which took place in July, 2018, prior to commencing fieldwork. Fieldwork for the project took place in two phases. The first fieldwork period took place during the summer of 2018. The doctoral student arrived in Black Tickle on July 10th, but did not commence data collection until ethical approval was received on July 12th. The fieldwork period was completed on September 1st. The field researcher spent two weeks in the community of Black Tickle, one week in the community of Norman Bay, and three weeks in the community of St. Lewis, as well as additional trips to other Inuit communities in NunatuKavut in order to enhance the context and cultural understanding of the work.

The data collected during this fieldwork period formed the basis of Chapter Four, entitled "Off-grid energy sustainability in NunatuKavut, Labrador: Centering Inuit voices on heat insecurity in diesel-powered communities". The second fieldwork period of approximately 12 weeks took place from March 4th - May 27th, 2019. The doctoral student spent approximately three weeks each in the partner communities of Cartwright, Charlottetown – Pinsent's Arm, Port Hope Simpson, and Mary's Harbour – Lodge Bay. The data collected during this fieldwork period formed the basis of Chapter Five, entitled "Towards decolonized decarbonization: Integrating Inuit perspectives on the sustainability of off-grid diesel-generation in NunatuKavut, Labrador". Datasets for both fieldwork periods were combined for Chapter Six, entitled "'That's our traditional way as Indigenous Peoples': Towards a conceptual framework for understanding community support of sustainable energies in NunatuKavut, Labrador"

3.4.2 Participant Recruitment

As part of this participatory research, we aimed to include community members directly in as many stages of the research process as possible. In the initial fieldwork phase, we received a youth-employee grant from the Conservation Corps of Newfoundland and Labrador, which enabled us to hire three Inuit youth on a full time basis (12 weeks of employment) to work as local Research Assistants. During the second phase of field research, we formed a research team entitled the NATURE [NunatuKavut Action Team on Understanding Renewable Energy] Youth Council. During both phases of fieldwork, our goal was to build local research capacity, and to empower youth to steer energy transitions in their own communities (NCC, 2009). Youth employees were responsible for

Table 3.3 Demographic Information of Phase One Community Respondents

	Black Tickle	Norman Bay	St. Lewis	% of total
Sample Size	33	6	36	100%
Gender				
Female	19	3	21	57%
Male	14	3	15	43%
Current Profession				
Public Sector	12	3	8	31%
Private Sector	8	3	9	57%
Unemployed	9	0	5	19%
Other	4	0	14	24%
Annual Income (vs $29,000)				
Much Less/Less	18	0	6	32%
Same	4	1	6	15%
Much More/More	9	2	15	35%
No Response	2	3	9	19%
Identify as Inuit, First Nations, or Métis?				
Yes	30	6	31	89%
No	3	0	5	11%

distributing a recruitment letter to all households in the partner communities **[Appendix D].** Any permanent resident (living in the community at least six months per year) of voting age in the province (at least 18 years) was welcome to participate. Youth employees were introduced and trained in research procedures, sat in on many interviews, organized community dissemination events, and participated in weekly staff meetings where preliminary data and other aspects of community energy planning were discussed.

Lack of detailed census data for some communities complicates calculation of the target population. For the initial three pilot communities, we estimate that there are 294 eligible participants. For the expanded phase of research, we estimate that there are approximately 1,275 eligible participants (Statistics Canada, 2016). In total, we conducted 211 mixed-method community-member interviews. In the first fieldwork phase, we conducted 75 interviews across Black Tickle (n = 33), Norman Bay (n = 6), and St Lewis (n = 36). In the second fieldwork phase, we conduced 136 interviews across Cartwright (n = 39), Charlottetown – Pinsent's Arm (n = 30), Port Hope Simpson (n = 31), and Mary's Harbour – Lodge Bay (n = 36). Overall, the 211 respondents represent approximately 13 per cent cent of the target population. We note the 11 percent of participants in the first fieldwork phase, and 24 percent of participants in the second fieldwork phase, identified as non-Indigenous **[Table 3.3 & Table 3.4].** This subsection of the population was included in the research purposefully, to be as inclusive as possible. In addition, NCC staff stated that some community members lack active NCC membership and may identify as non-Indigenous in questionnaires, but remain vital parts of their communities and should be included.

3.4.3 Research instruments

The mixed-method community member interviews **[Appendix A]** sought to: 1) determine how Inuit in NunatuKavut understand and experience off-grid energy sustainability, and 2) assess social perceptions and community support of sustainable energy technologies. We sought to determine what respondents perceived as the greatest energy-related challenges in their communities. We accomplished this by asking respondents to rate each variable in **Table 2,** based on our literature review **(see Chapter 2)** on a scale of one to five (where 1 = not concerned, and 5 = extremely concerned); respondents were also given the opportunity to respond 'Do Not Know' or 'Pass' to any variable. Subsequent qualitative prompts allowed respondents to elaborate on their rationale for concern. As discussed in Section 3.3 of this chapter, EDST theorists suggest that energy sustainability is determined by substantive or measureable impacts and procedural impacts (i.e. perceptions, local acceptance, distribution of risks and benefits). Collecting quantitative survey data allowed us to understand the greatest sustainability concerns (substantive sustainability), while the qualitative prompts allowed community-members to explain their own perceptions and experiences (procedural sustainability).

Table 3.4: Demographic Information of Phase Two Community Respondents

	Cartwright	Charlottetown - Pinsent's Arm	Port Hope Simpson	Mary's Harbour - Lodge Bay	% of total
Sample Size	39	30	31	36	100%
Gender					
Female	15	19	11	13	43%
Male	24	11	20	23	57%
Current Profession					
Public Sector	14	9	10	7	29%
Private Sector	13	16	14	19	46%
Unemployed	7	2	3	2	10%
Other	5	3	4	8	15%
Annual Income (vs $29,000)					
Much Less/Less	12	2	6	6	19%
Same	4	3	3	5	11%
Much More/More	14	23	17	2	54%
No Response	9	2	5	5	15%
Identify as Inuit, First Nations, or Métis?					
Yes	35	24	27	17	76%
No	4	6	4	19	24%

For the social perceptions portion of the study **[Appendix A, Question 2-3]**, we sought to determine quantitatively which supply-side options, energy storage technologies, and demand-side measures that community members supported or opposed. We accomplished this by asking respondents to rate each technology on a scale of one to five (where 1 = strongly oppose, 2 = somewhat oppose, 3 = neutral, 4 = somewhat support, and 5 = strongly support). Again, respondents were also given the opportunity to respond "Do Not Know" or "Pass" to any question. Qualitative follow-ups permitted respondents to elaborate on their rationale for support or opposition.

For supply-side technologies, we aimed to include a diverse list of options in order to compare and contrast themes across answers. As such, we purposefully included conventional (i.e. wind, solar, large-scale hydroelectricity, run-of-river hydroelectricity) and emerging technologies (i.e. tidal, wave, biomass, small modular nuclear). Energy storage technologies (i.e. battery storage and pumped hydro storage) were selected as the only economically feasible options for storing energy in off-grid communities (at this time). Given that this study was amongst the first to assess social perceptions of energy efficiency technologies in Indigenous communities, we chose a range of minor (i.e. LED lighting, thermostats, weather stripping) and major retrofits (i.e. appliance upgrades, improved insulation, windows, heat pumps) to give breadth to the data and ensure generalizability across options. The measures were selected in collaboration with NCC staff as feasible options in the partner communities, which community members were likely familiar with through their experiences with NL Hydro's energy efficiency programming (e.g., Take Charge, n.d.). The doctoral student and hired research assistants recorded responses on a printed or electronic version of the survey. A copy of the survey was made available to the respondents upon request in order to follow along and to enhance clarity while questions were asked. Our mixed-methods research follows a concurrent [or integrated] approach. That is, quantitative [survey results] and qualitative [interview responses] data were collected simultaneously. Both of these data sources were then integrated in the interpretation of results (Creswell & Creswell, 2017). We did this for the purpose of methodological triangulation, i.e. correlating data from multiple data collection methods (Fusch & Ness, 2015).

For the key-informant portion of the study **[Appendix B],** we targeted those who have been involved in the off-grid energy sustainability sector in NL for a minimum of two years. An initial list of key informants was identified across public, private, and community sectors by the research team. These individuals were sent a recruitment letter asking them to take part in the study **[Appendix C].** Additional key informants were identified informally at the community-level as the doctoral student spent time in the field. According to the procedures laid out in our ethics approval, key informants were given the opportunity to decide whether or not they wanted to be identified by name in any publications resulting from the research. We interviewed the President of Lumos Energy/Executive Director of Indigenous Clean Energy Social Enterprise [Chris Henderson], who has previously built community energy plans in Labrador for Nunatsiavut Government (Nunatsiavut Government, 2016). We also interviewed the Chair of the Black Tickle Local Service District [Joe Keefe]. We interviewed nine additional key informants whom opted not to have their identity disclosed. The key informant interviews which were recorded (n = 8) ranged from 34 - 82 minutes. All were capped at 75 minutes, according to the criteria laid out in our ethics approval, although could be extended with the approval of the respondent. Most key informant interviews took place in a private residence or workplace while the doctoral student was in the field. Two key informants opted to have their interviews conducted via telephone. The key informant portion of the study focused on substantive sustainability - or collecting data on the tangible economic, environmental, and societal impacts of existing energy systems. The questions were based around the 13 themes identified in **Table 3.2.** The interviews also included open-ended questions on the technical and economic feasibility of supply-side and end-use sustainable energy technologies. These qualitative data allowed us to compare and contrast expert opinion with that of community members.

3.4.4 Transcription and Analysis

For the quantitative survey component of the study, we have applied basic descriptive statistics using Excel Version 15.13.1. For the qualitative data, directed content analysis was utilized, applied to community-member and key informant interview transcripts (or field notes in the case of respondents who opted not to be recorded). Of 211 community-members, 150 opted to be audio recorded. All interviews [for both community-members and key informants] were transcribed verbatim by the lead author and hired research assistants. Directed content analysis is a form of qualitative content analysis where initial coding starts with theory or relevant research findings, in our case we coded towards the EDST framework previously elaborated (Del Rio & Burgillo, 2009, 2008). We utilized NVIVO Version 11.1.1 to assist in organizing, managing, and coding the qualitative data.

3.4.5 Community Review of Results

To enhance the reliability of the research, preliminary results underwent rigorous community review at five public events. Review events took place in St. Lewis (April 9th, 2019), Port Hope Simpson (April 25th), Mary's Harbour (April 29th), Charlottetown (May 9th), and Cartwright (May 21st). In each case, quantitative-survey data and broad qualitative trends explaining community member concerns, as well as support for sustainable energies, were presented to community members. Attendees were given the opportunity to agree or disagree with preliminary findings, to ask questions or add detail to early trends, or to ask researchers to be interviewed if they felt like their views were not being represented. In all cases, community-members agreed with preliminary findings and no additional interviews were requested. The preliminary data from these public presentations formed the basis of two separate research reports which were publicly hosted on NCC's website for further comment from community members (Mercer et al., 2019; Mercer et al., 2019). Due to the significant expense of travelling to the isolated communities of Black Tickle and Norman Bay, we were unable to hold review events in these communities. However, we were able to present preliminary findings and elicit feedback from community-members at an NCC-hosted Sustainable Energy Research Conference in Goose Bay (January 14-15th, 2019), Resource Stewardship Workshop in Port Hope Simpson (February 14-15th, 2019), and an additional Sustainability Research Conference in Goose Bay (March 6th, 2020). It is also noted that the community review event in St. Lewis (April 9th) did not take place until several months after the initial field work period (July – September, 2018) due to funding constraints. However, community-members from St. Lewis were also engaged at the conferences previously listed in January and February of 2019, as well as March of 2020.

3.4.6 Limitations of the Study

One of the primary limitations of this research is our limited inclusion of off-grid Indigenous communities in Newfoundland and Labrador [and Canada]. Across both phases of fieldwork, we include nine diesel-dependent Inuit communities in NunatuKavut, and we do not include other off-grid Indigenous communities represented by Innu Nation or Nunatsiavut Government (NRCAN, 2018). Cultural differences, socio-economic realities, and differing lived experiences may lead to varied results on a nation-to-nation basis. We note that this was a purposeful decision, as research should be completed *'with and for'* Indigenous communities as opposed to *'on'* communities (Khoser et al., 2012). Our research relationships exist in NunatuKavut, and this research serves to advance their self-determined priorities, independent of the priorities of other Indigenous communities across Canada or the world.

An additional limitation of this study is the risk of bias in qualitative methods, especially the tendency for social desirability in responses (Sovacool, Axsen, & Sorrell, 2018). Off-grid diesel dependence is frequently framed as a challenge in Indigenous communities, and the provincial power corporation has moved to transition off-grid communities away from diesel fuel (Department of Natural Resources, 2019). In addition, the lead field researcher has been publicly involved in renewable energy research through the region (CBC News, 2017b). As such, community members may be predisposed to opposing diesel-generation and magnifying local challenges for the purpose of satisfying the public and the researchers. We sought to address this bias in the informed consent process, by stressing the rationale for energy autonomy and local decision-making, and ensuring participants of the confidentiality of results, and that their perceptions would contribute to community energy planning - no matter which preferences they held.

Another limitation of the study is the cross-sectional nature of the research. Perceptions of existing energy-systems were captured at one point of time, and may not reflect current understandings due to novel experiences such as a fire which occurred at the diesel-plant in Charlottetown in October of 2019 (CBC News, 2019a). However, the depth of the research should make findings relevant for NunatuKavut communities and other jurisdictions over time.

3.4.7 Researcher Relationality and Positionality

Referring back to Section 3.1., on relational accountability, I consider the principle advanced by Wilson (2007). Mainly, that researchers cannot be separated from their work – and that relationships shape who a researcher is, and how they conduct research. Reflecting on this notion, I consider aspects of my own relationships and positionality and how they have influenced this dissertation. My parents and I made an effort to trace back our family lineage in the spring of 2020. In this brainstorming session, we were able to trace as many as seven generations (approximately 175 years), without a single family member born outside of mainland Nova Scotia, Cape Breton, or the Island of Newfoundland. While we believe that some of our ancestors came from Ireland, England, and France, these were never defining (or even acknowledged) features of my or my family's identity. It was not until early high school, in an Introduction to Mi'kmaq History course taught by a white teacher, when I first heard the term *Mi'kma'ki,* the ancestral and unceded homeland of the Mi'kmaq people on which I was raised. Paired with a sheltered upbringing in the predominantly white and middle income suburbs of Halifax, I did not think of Atlantic Canada as anyone's but my own. What I now understand as settler ignorance which defined my childhood.

The first and most long-lasting relationship I must acknowledge, with significant ramifications for my personal and professional life, is my relationship with my Father. A veteran of the Canadian Navy, my father was a first responder to a sudden disaster, and occurred life altering injuries as a result. I am incredibly proud of my Father: his sacrifice, his continued gratitude, compassion, and care for others in face of such negative experiences, are attributes I aspire to. However, I have learned in my adult years the secondary trauma I have experienced as a result of my Father's injuries. Bouts of negativity and depression, fear of invalidation, and intense anxiety over conflict – are personal characteristics I carry with me today from my youth. This relationship has also shaped my research career and methodological preferences. Today, I feel personally devoted to validating the experiences of others. Which likely contributed to my fascination with energy deployment and local sustainability theory, procedural justice, and Two-Eyed Seeing, which all focus to some degree on validating and respecting the experiences and knowledge systems of others as complete and whole. My fear of conflict has at times created difficulty in forging and maintaining relationships with men – a fact which is not lost upon me in the over-representation of women respondents in this dissertation. I do note that this is not uncommon in research on the coast of Labrador; for example, one of the first projects I contributed to in southeast Labrador was only able to recruit women respondents (Mercer & Hanrahan, 2017). In addition, it is important to acknowledge the primary role of women as knowledge holders in NunatuKavut, who use storytelling to mobilize knowledge for the survival and preservation of communities (Hudson & Voddon, 2020). My relationship with my Father has also driven me to be as inclusive as possible, and to care for others no matter the circumstances they are facing, which contributes to my strengths as a community-based participatory researcher.

In the first year of my master's degree at Grenfell Campus: Memorial University in 2014, I began reflecting deeply on my and my family's connection to colonization. Working for Dr. Maura Hanrahan (A Mi'kmaw woman with deep research relationships with NunatuKavut Inuit) as a research assistant, I was exposed to the study of inequity, poor health outcomes, dispossession of resources, and unethical research practices – all linked to Newfoundland and Labrador's colonial history (see: Sakar, Hanrahan, & Hudson, 2015; Hanrahan, Sakar, & Hudson, 2014; Hanrahan, 2008; Hanrahan, 2003; Hanrahan, 2000). While working as a settler-graduate student in this Indigenous research space, I began linking my family's coal-mining history in Cape Breton, my father's career in the Canadian Navy (which upholds colonial rule), and my Great Aunt's complicity as a residential school teacher, as some of my relationships which displaced Indigenous Peoples, dispossessed them of resources and cultures, and ultimately resulted in my ancestor's accumulation of wealth. Without the resources and privileges passed unto me from these relationships, with their direct implications for colonization and assimilation, I would not be in this position today – nor would this dissertation exist. My parents would not have been able to support my undergraduate tuition, and I would not have had the privilege of focusing exclusively on school work, which enabled scholarships, fellowships, and bursaries to participate in Indigenous research spaces. Today, when I introduce myself – and identify as – a settler researcher, I am acknowledging my previous ignorance, commitment to learning, the privilege passed unto me to the detriment of Indigenous Peoples, and the guilt and desire I feel to make amends for past and ongoing injustices by conducting research in a good way.

Soon after meeting Dr. Maura Hanrahan in 2014, an Inuk woman, Amy Hudson (then the Manager, but now the Director of Research, Education and Culture with the NunatuKavut Community Council) quickly became a key advisor and mentor. First over conference calls, then in person during a long-trip via ferry to Black Tickle for fieldwork in the summer of 2015, Amy and I connected almost immediately. Our shared interests over participatory action research, life in rural areas of Atlantic Canada, and our love for small communities – brought us together. While brought into this research space via my relationship with Dr. Hanrahan, it has been my relationship with Amy that has kept me involved and led to the conception and completion of several projects. Amy has trusted me to do research in a good way, sometimes without formal protocols in place, and has been the first person to point out shortcomings and demand accountability in my approach. While working alongside Amy, I have had the privilege to meet numerous other Indigenous women scholars (Dr. Debbie Martin, Dr. Julie Bull, Dr. Maxime Liborion, and student Nicole Blinn) settler-ally women researchers (Dr. Ashlee Cunsulo, Emily Beacock), and community-members (Siobhan Slade) amongst others, who have guided and supported me along the way. I credit each of these individuals for teaching me major lessons which have allowed me to contribute in this research space. Each of these scholars [and friends] have confronted me for failing to consider my positionality, for perpetuating negative stereotypes or using problematic language, or for failing to meet standards of the most ethical research possible. They have also coached me and answered their phones at all times to support me in some of my most challenging moments. They have legitimized my participation in this research space and have created significant opportunity. While being held accountable for my shortcomings and biases has at times unsettled and discomforted me, I view my tendency towards diplomacy and conflict aversion as a result of secondary trauma as a strength which has helped me honour these lessons and trust these nurturing relationships. For those who know me personally, it will come as no surprise that my approach to research and advocacy has shifted dramatically over the course of my graduate studies. Once known colloquially as the 'wind energy guy' in Newfoundland and Labrador (see: CBC News, 2017b), I now cringe at any notion of forcing a particular solution on a community without centering Indigenous rights, community consent, and social cohesion (see: The Independent, 2018). While still reflecting deeply on this personal evolution, I attribute this heavily to lived experience and love for community. In my early days as a graduate researcher, I felt as though my position was to advocate for solutions for communities based on the western education I was receiving. As my time and relationships in communities grew, I saw quite evidently that communities themselves in southeast Labrador are already sustainability experts. I watched Inuit harvest their own food and wood, care for their community and culture, and demonstrate remarkable resilience and adaptability. I have learned that my role is not to impose solutions on community member experts, but to build meaningful relationships, learn as much as I can from locals, and to support communities in any way I am asked.

As a white, straight, and cis-gendered male, I recognize that I fall into perhaps the most privileged class of society (Rider University, n.d.). I have felt no instances of oppression during my fieldwork or educational years. From conference rooms with elite [typically male] executives, to shed-parties with locals, I have been accepted into virtually all spaces which enabled the building of several important relationships. I have worked with colleagues who at times have been intimated, made to feel unwelcome, or have been discomforted, based on their gender identity alone – something which I have never had to experience. I have used my voice to bring attention to colonialism and inequity on the coast of Labrador, and have been met with praise and opportunity – advantages which are not always afforded to my colleagues and acquaintances of diverse backgrounds who speak to the same ideals. Recognizing this privilege, I have at times physically put my body on the line – separating colleagues who were made to feel unwelcome from perpetrators. I strive to work collaboratively with folks from backgrounds different from mine, and accompany them into the privileged spaces I have always occupied. I feel a responsibility to employ my privilege to amplify, elevate, and protect others. This is my act of reciprocity, to acknowledge my family's roles in colonization and assimilation, and to honour the gifts passed onto me from Indigenous women scholars, settler-ally researchers, and community-members alike, who I have had the privilege to build relationships with in this research space. In the words of Scott and Seth Avett, two American folk artists and songwriters whom I have long admired: "I am doing the best I can, in a place built on stolen land with stolen people"

Chapter 4: Off-Grid Energy Sustainability in NunatuKavut, Labrador: Centering Inuit Voices on Heat Insecurity in Diesel-Powered Communities

4.1 Introduction

The Canadian electricity industry is based nearly entirely upon low-carbon energy sources. It is the second largest producer of hydroelectricity in the world with an installed capacity of over 78,000 megawatts [MW]. In 2016, hydroelectricity provided 59 per cent of the national electricity supply. In addition, Canada relied on nuclear-generation for 14.6% of generation, and on non-hydro renewables (wind, solar, biomass) for 8.2% per cent of electricity generation. The small remaining portion is generated via fossil fuels, divided among coal and natural gas (18.9 per cent combined), and a small amount of oil/diesel (0.5 per cent) (National Energy Board [NEB], 2017). There are important regional (provincial) differences in electricity generation in Canada. For instance, Alberta relied on coal and natural gas for 87.7% of generation in 2016, while Ontario, Quebec, and British Columbia relied on low-carbon sources for 91.7%, 99.8%, and 98.4% of electricity generation, respectively (National Energy Board, NEB, 2017).

The dominant role of low-carbon sources is reversed in most off-grid communities in Canada[4]. There are 259 off-grid communities located throughout the country, with a total population of approximately 193,000. Although Indigenous Peoples in Canada represent only 4.9% of the total population, approximately 65% (n=169) of off-grid communities identify as Indigenous (Natural Resources Canada, 2018, Statistics Canada, 2019a][5]. The majority of off-grid communities (73%, or n = 190), have their own fossil fuel power plants, totaling over 500MW of installed capacity. Most of these systems are diesel-fueled, with a small number having natural gas or heavy fuel oil (Natural Resources

[4] An off-grid community is defined as: (1) any community not connected to the North American electricity grid nor the piped natural gas network, and; (2) any permanent settlement (at least five years) with more than 10 dwellings (Natural Resources Canada, 2018)

[5] Indigenous in the Canadian context refers to all individuals who self-identify (i.e. status and non status) as First Nations, Métis, or Inuit. See Joseph (n.d.) for further reading.

Canada, 2018). For comparison, there is 154MW of renewable energy capacity in off-grid communities, which is mostly small hydropower projects (Rickerson et al., 2012).

The province of Newfoundland and Labrador [NL], represents a national microcosm of diesel-dependence in off-grid communities. In 2016, hydropower accounted for 95% of the province's on-grid electricity-generation capacity (7,703MW) (National Energy Board, 2019a)[6]. The electricity generation-mix differs dramatically in off-grid communities throughout NL, where 21 of 27 communities are exclusively dependent on diesel-generation, with an installed generation capacity of approximately 39MW. Of the 27 off-grid communities in NL, 15 are Indigenous (Natural Resources Canada, 2018). Given the similarities between NL's electricity-generation mix, and the rest of Canada's (i.e. large-hydro dependent on-grid, and diesel-dependent off-grid), the province serves as a compelling area for case-study research on off-grid energy sustainability.

It has been argued that diesel-generation poses substantial sustainability challenges for off-grid communities throughout Canada. Most of the existing research has been from techno-economic perspectives. These studies typically examine the feasibility of renewable energy resources in off-grid communities, and model the high costs and greenhouse gas emissions associated with existing diesel-systems (Bhatarrai & Thompson, 2016; Rahman et al., 2016; Arriage et al., 2014; Thomson & Duggirala, 2009). Very limited research has reported how community members themselves perceive and experience the impacts of off-grid energy systems (McDonald & Pearce, 2013). Likewise, the majority of off-grid communities in the country identify as First Nations, Inuit, or Métis, and there are even fewer examples of research which seeks to meaningfully integrate Indigenous Knowledge and perspectives on the topic. Our research seeks to address these gaps in the existing literature.

This paper is the result of a long-standing community-based participatory research [CBPR] partnership between the researchers and the NunatuKavut Community Council [NCC], the governance body which represents Inuit in NunatuKavut, Labrador. CBPR integrates community values and autonomy throughout all stages of the research process, and emphasizes co-ownership of data, shared decision-making power, co-learning, and methods of knowledge dissemination which are beneficial for all

[6] This does not include the 824MW Lower Churchill Project (Muskrat Falls), currently under construction (National Energy Board, 2019a).

involved parties (Castleden et al., 2012; Boser, 2007). CBPR literature argues that research should be initiated by community, allowing for research which begins with a topic of importance to the community and not driven by the researcher's agenda (Castleden et al., 2012; Louis, 2007). Respecting the community-initiation principle of CBPR, we describe the development of this research project.

The relationship between NCC and the lead-author began in 2015, when NCC and existing university partners sought to hire a graduate level student to assist with ongoing research tasks. As trust developed in the relationship, the lead-author was asked by NCC to help apply for funding and to collaboratively implement a research project to address the community priority of water insecurity (Mercer & Hanrahan, 2017). Upon completion of this project, and several years of relationship building, the lead author was again asked to support an emerging research priority: the sustainability of local energy systems. The lead-author was tasked with finding relevant funding opportunities, and worked with NCC staff to identify knowledge gaps and to design research questions, which were compatible with NCC's priorities for advancing community sustainability.

This priority was part of NCC's Community Governance and Sustainability Initiative (CGSI), launched in 2017 by co-author Amy Hudson. The goal of the initiative was and is to support three pilot communities on NunatuKavut's Southeast coast (Black Tickle, Norman Bay, and St. Lewis/Fox Harbour[7]) "to identify and build on existing community strengths and assets, to foster community engagement in creating a strong future and to develop a sustainability plan for their community" (p. 1.) (NCC, 2017a). The role of the researchers was to support NCC staff and community-members in expanding the initiative to consider and address energy-related challenges in the pilot communities. By partnering with the NunatuKavut Community Council, the primary objective of our CBPR project is to integrate Inuit perspectives and determine how existing energy-systems [based on diesel-generation and home heat] impact the sustainability of off-grid communities in southern Labrador. The project was funded by a SSHRC Engage Research Grant. The funding agency was not involved in research design, data collection, analysis, or the interpretation of results.

[7] Referred to as only St. Lewis hereafter

4.1.1.1 Study Setting: NunatuKavut, Labrador

Translated from Inuttitut, NunatuKavut means "Our Ancient Land" and it is the traditional territory of NunatuKavut Inuit. The NunatuKavut Community Council is an Inuit governing organization that represents the rights of approximately 6,000 Inuit who belong to South and Central Labrador (NCC, 2018)[8]. NunatuKavut spans a vast territory, within which several communities are off-grid and diesel-dependent, located along the southeast coast of Labrador. Three of these communities are represented in this research **[Figure 4.1]**.

Inuit on the southeast coast have maintained transhumance (seasonal migration) since time immemorial (Stopp, 2002). Harvesting began in the spring, as families moved to fishing locations on the coast to harvest seals and codfish. In the summer, cod fishing continued, with salmon runs and berry picking taking importance. The arrival of fall marked bird and seal hunting, and by the end of the fall families moved into sheltered bays to prepare for winter trapping and caribou hunts (Martin et al., 2012). Today, families in the region maintain multiple homes, cabins, and camps to accommodate each harvest. As such, traditional way of life persists into the 21st century, as Inuit in NunatuKavut continue to travel their lands, and subsist as their ancestors did in the past. Community members from Black Tickle, Norman Bay, and St. Lewis describe their deep attachment to their lands, waters, ice, and way of life in a series of booklets published by NCC (NCC 2017a-2017c).

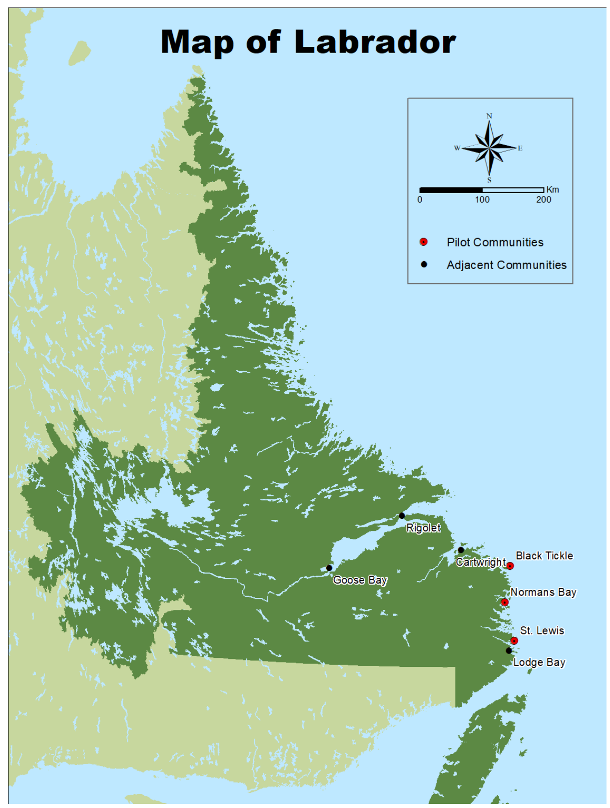

Figure 4.1 Map of Labrador

[8] Additional reading about NunatuKavut Inuit identity, history of land-claim negotiations, and recognition of Indigenous rights and self-determination is available at (NCC, 2019a; NCC, 2019c).

Today, the southeast coast of Labrador is home to several year-round NunatuKavut communities. Cartwright being the most northern community, and others stretching down the southeast and south coast [Figure 1]. Permanent settlement into modern day communities occurred in the 1950's and 60's, at the urging of the Church and the Government of Newfoundland, which wanted to end Indigenous people's seasonal movements for the stated purpose of service delivery, especially schooling (Mercer & Hanrahan, 2017).

Three of these modern, permanently settled Inuit communities are represented in this research: Black Tickle, Norman Bay, and St, Lewis. The three communities are remote diesel-dependent communities, with 1,020kW, 160kW, and 1,005kW of installed capacity in Black Tickle, Norman Bay, and St. Lewis, respectively (NL Hydro, 2016). Black Tickle, Norman Bay, and St. Lewis have small year-round populations of 120, 19, and 180. Transportation to and from the communities is relatively restricted. For instance, Black Tickle is an island community and the most northern of the pilot communities in this study, accessible primarily by a freight/passenger ferry service in the summer/fall, and by dog team or snowmobile in the winter/spring. Air travel to Black Tickle is dependent upon seat availability on a medical flight, which is also extremely costly. Norman Bay is accessible by a governmental helicopter service in the summer/fall, and by snowmobile only in the winter/spring. St. Lewis is the southernmost community in this study and the only road connected community, with an access road of approximately 30kms connecting the community to the Trans Labrador Highway, which in and of itself is a remote, [mostly] gravel highway running from Blanc Sablon, Quebec to Happy Valley – Goose Bay, Labrador.

4.2 The Impacts of Diesel Generation – Missing Indigenous Voices?

The existing literature demonstrates that diesel-generation poses substantial economic, environmental, and societal challenges for off-grid communities in Canada. For example, in diesel-communities with year-round road access, unsubsidized electricity costs are typically $0.45 per kilowatt hour [kWh]. For communities accessible by barge or airplane, costs increase to $0.8/kWh or more. For Arctic communities, rates range from $1.5 – 2.5/kWh (Arriaga et al., 2014). In comparison, grid connected communities in Canada typically pay $0.07 - $0.17/kWh for electricity (Rickerson et al., 2012).

Due to the high costs of diesel-generation, various levels of government are required to provide significant subsidies in order to keep rates affordable for consumers. For instance, in Nunavut – where the entire population lives in 26 diesel-dependent communities, the territorial government spends approximately 1/5th of its annual budget on the energy needs of the territory (McDonald & Pearce, 2012). Cross-subsidization is common throughout the country, where grid-connected ratepayers pay premiums on their electricity bills, which are then re-directed towards off-grid communities. For example, in NL, grid-connected ratepayers contribute $80-90 million on an annual basis towards subsidizing off-grid operations (Warren, 2018). Volume-based subsidies are typically employed in off-grid communities to discourage the use of electricity for heating, and to incentivise electricity conservation (Knowles, 2016). For example, in the pilot communities, residential consumers pay 12.203 c/kWh for the first block of kWh per month and 13.660 c/kWh for the second block (these blocks cover the first 1,000 kWh). All kWh in excess of 1,000 kWh per month are charged 18.523 c/kWh (NL Hydro, 2019). In the pilot communities, rates paid by diesel consumers cover approximately 25% of actual operating costs, with the remainder covered by cross-subsidization (Karanasios & Parker, 2016).

Load-restrictions are an additional challenge facing off-grid communities. Load-restrictions occur when diesel-plants are operating at or above 75% of capacity, at which point no new electrical connections are permitted on the local grid, potentially impeding economic growth, social development, and poverty alleviation efforts. Arriaga et al. suggest that British Columbia, Ontario, and Nunavut are jurisdictions where 25-50% of off-grid communities experienced load restrictions (Arriaga et al., 2017).

Energy security, or secure availability and/or price volatility of fuel sources, also pose economic challenges for off-grid communities. For instance, most off-grid communities purchase annual/semi-annual supplies of fuel, subjecting them to whatever the volatile price may be on the date of purchase. This can create severe challenges for community and utility budgeting: as happened when communities purchased fuel supplies in the summer of 2008 (when prices were at all-time highs), then consumed this fuel throughout 2009 (when prices had fallen by over $0.63 per litre) (Statistics Canada, 2019b; Weis & Illinca, 2010).

Combined, off-grid communities in Canada consume 215 million litres of diesel fuel per year for electricity generation [excluding fuel transportation and heating], representing approximately 770,000 tonnes of carbon dioxide equivalent (Quest, 2018; Arriaga et al., 2014). On a per-capita basis, off-grid residents emit approximately 4.8tonnes of C02e per year for electricity-generation, or over double the 2.2t C02e emitted by a grid-connected resident (Environment and Climate Change Canada, 2017; Arriaga et al., 2014). Emissions also occur during fuel transport to communities via plane, truck, and barge (Pembina Institue, 2016; Hydro One Remote Communities Inc [HORCI]., 2016). In some cases, these emissions can be substantial, especially when fuel is flown in. For example, in 2015, fuel transportation to off-grid communities in Northern Ontario via plane accounted for 24.5% of total electricity-related emissions (HORCI, 2016).

Diesel transportation, storage, and operation poses risks of fuel spills and leaks. This is a serious concern in many Indigenous communities, who remain highly dependent on and value the health of the land and environment. Arriaga et al. report that there are over 2,000 contaminated sites at or near Indigenous communities in Canada. The majority of these sites (approximately 70%), are contaminated by diesel-fuel (Arriaga et al., 2017). Contaminants associated with diesel-spills are proven to cause cancer with prolonged exposure (Advanced Energy Centre, 2015). This represents a minimum number of sites as additional spill sites may not have been reported or recorded.

Many diesel-generators are old or aging, which poses reliability challenges. For instance, in Pikangikum First Nation, in Northern Ontario [prior to being connected to the provincial grid] – the local school board lost approximately 20 percent of its educational time annually due to blackouts at the local diesel generator (Arriaga et al., 2017). It took high school students upwards of an extra year to graduate due in part to these blackouts (Purdon & Palleja, 2018. In addition, diesel-generation can be responsible for significant noise pollution, which can be loud and disruptive – especially in quiet, isolated Northern environments (Natural Resources Canada, 2011).

Some research has indicated that crown-utility controlled diesel-generation may be viewed as an imposition on self-determination in Indigenous communities. Electricity service delivery is frequently the responsibility of the federal government in off-grid Indigenous communities, or of provincial crown power utilities (Fitzgerald & Locekin, 2018; Heerema & Lovekin, 2019; Rickerson et al., 2012). This in and of itself can create challenges for Indigenous decision-making with regards to electricity supply, distribution, and other operational decisions (Rezeai & Dowloatbadi, 2016). Fitzgerald & Lovekin (2018) argue that distrust of utilities is widespread across the North, driven by historical and present-day inequalities that arise from colonization. The authors summarize Indigenous control of remote energy systems in Canada:

> "opportunities for Indigenous inclusion are currently rooted in the colonial market-based reality of energy development in the North, power imbalances between utilities and Indigenous power proponents (where utilities currently have the authoritative advantage) and the lack of transparent information sharing" (p. 9).

Conversely, Karanasios & Parker (2018) find in their analysis of 71 off-grid renewable energy projects in Indigenous communities between 1980-2016, that transformation of remote community electrical systems is shifting from a "utility driven" phase (focusing on utility-owned hydroelectricity and small wind projects, 1980 – 2000) to a more "community driven" phase (focusing on local government owned small solar projects, 2000 – 2016).

While all off-grid Indigenous communities in Labrador remain diesel dependent, the provincial power utility [NL Hydro] has recently launched an 'Expression of Interest [EOI] for Renewable Energy Solutions in Isolated Diesel Communities' in southern Labrador. Heerema & Lovekin (2019) conclude that NL Hydro's EOI process does not appear to emphasize community-led projects and favours an industry-led approach. Suggesting that the "colonial, market-based reality of energy development and utility authority in the North" (p. 9) will continue in the future.

As discussed, most evidence on the economic, environmental, and societal impacts of off-grid diesel-dependence comes in the form of quantitative reporting of a limited number of measures. Conversely, there is limited community-level evidence available which qualitatively analyzes how off-grid residents themselves perceive and experience energy sustainability. Likewise, despite the majority of off-grid communities in Canada identifying as First Nations, Inuit, and Métis, there is limited research which emphasizes the voices and lived experiences of Indigenous Peoples. Karanasios & Parker (2018) call explicitly for further research which integrates Indigenous perspectives on remote community energy systems.

4.2.1 Indigenous Peoples and Renewable Energy Transitions in Canada

While this paper focuses on Inuit perceptions of off-grid diesel-generation in NunatuKavut, we cannot separate this research from the emerging body of literature related to Indigenous Peoples and renewable energy transitions in Canada. Researchers in this area suggest that owing to resource potential, and in-depth understandings of their local environments, Indigenous Peoples are at the forefront of renewable energy transitions in the country (Walker et al., 2019; Jaffar, 2015; Krupa et al., 2015; Henderson, 2013; Krupa, 2012).

Renewable energy technologies may help Indigenous communities enhance self-sufficiency and achieve greater levels of autonomy by materially supplying their own sources of energy, by facilitating processes of self-decision making, or by generating revenue to invest in self-directed priorities (Rezeai & Dowlatabadi, 2016; Bhatarrai & Thompson, 2016). In general, energy autonomy is purported to deliver a wide range of socio-economic and environmental benefits, including: increased security of supply, the potential to reduce the cost of energy, the ability to reduce carbon emissions from a community or region, local employment opportunities, and the potential for financial reward from community ownership and increased independence (Del Rio & Burgillo, 2008; Chicco & Mancerella, 2009)[9].

Stefanelli et al. recently published a systematic review analyzing the motivations of Indigenous communities in Canada for pursuing sustainable energy projects (2018). The authors conclude that motivations are mixed on a nation-by-nation basis. Some Indigenous communities pursue sustainable energy projects to achieve enhanced levels of autonomy and self-determination, while others pursue projects to reduce environmental damage, energy costs, and to generate revenue to invest in community-development initiatives. Other research suggests that while much of the environmental movement in Canada promotes renewables as an economic growth opportunity, most Indigenous

---

[9] As per Rae & Bradley (2012), we define energy autonomy [or energy self-sufficiency] as “the ability of an energy system to function (or have the ability to function) fully, without the need of external support in the form of energy imports through its own local energy generation, storage, and distribution systems” (p. 6499).

communities emphasize renewable energy development as a means of exerting sovereignty (Jaffar, 2015).

Caution is also urged in this literature, as renewable energies may negatively impact Indigenous autonomy if projects are forced on communities or if consultation processes are not meaningful – potentially resulting in inequitable and unjust development processes (Walker et al., 2019; Rezeai & Dowlatbadi, 2016; Krupa et al., 2015). Rezeai & Dowlatabadi (2016) explain several potential downfalls in these scenarios, such as: further intrusion of Western models of resource governance, exposure to risks associated with novel technologies, and massive administrative burdens of projects.

To protect and enhance the autonomy of Indigenous communities, researchers suggest that "truly sustainable renewable energy development requires a project design that reflects community values, incorporates community control, and incentivizes Indigenous ownership" (Krupa et al., 2015, p. 81). Likewise, Walker et al. (2019) conclude that renewable energy is only valuable in terms of lower emissions and improving socio-economic well-being of communities, when energy autonomy and local decision making power are present.

Our research aims to complement this literature in a unique way. NCC's previously mentioned Community Governance and Sustainability Initiative, employs a strength-based [or asset based] community development approach (NCC 2017a – 2017c). Instead of focusing exclusively on deficits, the approach seeks to identify what is already working well in the communities, and how those strengths can be built upon. While we capture novel insights on the impacts of off-grid diesel generation in this paper, we also seek to identify strengths and local acceptance of the existing diesel system, foundational components of community autonomy and integral for future decision making.

4.3 Energy Deployment and Local Sustainability Theory – Two Eyed Seeing:

Our research is guided by 'energy deployment and local sustainability theory' [EDST] (Jaramillo-Nieves & Del Rio, 2010; Del Rio & Burgillo, 2009; Del Rio & Burgillo, 2008). EDST was originally proposed as a theoretical lens to help understand how renewable energy projects impact the sustainability of host communities. EDST consists of three main concepts: substantive sustainability, procedural sustainability, and endogenous development.

Substantive sustainability refers to the tangible economic, environmental, and societal impacts of energy projects in host communities (Del Rio & Burgillo, 2008). Here, EDST scholars propose 11 impacts which must be considered as part of renewable energy projects **[Table 4.1]**. Similar to our discussion in Section 4.2., these are the most frequently considered issues in techno-economic literature; with less attention given to social aspects of sustainable energies and community-member perceptions. Given that we are assessing local sustainability implications of off-grid diesel-generation, as opposed to RE projects, we propose a set of sustainability impacts based on our own literature review **[Table 4.2]**. In addition, we presented these impacts to community members from each pilot community and NCC staff at a research design summit in July, 2018, prior to commencing the fieldwork period. Summit attendees agreed that these were the most pressing potential impacts to evaluate.

Table 4.1: Socio-Economic Impacts of Renewable Energy Development
-Quantitative/qualitative impacts on employment
-Income generation effects
-Demographic effects
-Energy impacts
-Impact of project on productive diversification of the area
-Social cohesion and community development
-Income distribution
-Impact on tourism
-Local research and development
-Industry creation
-Impact on municipal budget

Procedural sustainability extends beyond tangible impacts; instead considering how local populations perceive the impacts of energy projects, how the risks and benefits of development are distributed throughout a community, and ultimately the local acceptance of the project (Del Rio & Burgillo, 2009; Del Rio & Burgillo, 2008). At the core of EDST, is the notion that energy projects must make positive substantive and procedural contributions in order to maintain long-term success. For example, even if a project makes positive tangible contributions [substantive sustainability], continuity is complicated in the long-term if locals maintain negative perceptions, if most of the risks fall upon marginalized groups, or if local acceptance is eroded [procedural sustainability].

Table 4.2: Sustainability Impacts of Off-Grid Energy Systems		
Economic	**Societal**	**Environmental**
-Cost of electricity -Cost of home heat -Structure of subsidies -Continuance of subsidies -Load restrictions	-Self-determination -Power outages -Public health impacts -Noise pollution -Supplies of fuel	-Greenhouse gas emissions -Fuel spills and leaks -Deforestation

Walker & Baxter (2017b) make an important distinction which is not addressed in EDST literature. The authors differentiate between distributive justice (the distribution of project benefits and costs – referred to as procedural sustainability in EDST literature) and procedural justice, which focuses on the participation of locals in renewable energy planning and the conditions of that participation. There is emerging evidence to suggest that procedural justice is at least just as important as distributive justice for local acceptance of projects (Creamer et al., 2019; Walker & Baxter, 2017b; Cowell et al., 2011). Just as EDST suggests that erosion of procedural sustainability impacts the continuity of projects, Walker & Baxter (2017b) suggest that development that lacks procedural justice may spur opposition movements that can threaten the long-term sustainability of renewable energy industries.

EDST scholars also identify endogenous development as a critical factor in local sustainability: a bottom-up development process built on the use of local resources (physical, human, and capital). This is in contrast to top-down development processes, characterized by the settlement of firms from places beyond the host area. The authors argue that the greater the integration of energy projects into the productive structure of the local economy, the greater its socioeconomic impact on the local community (Jaramillo-Nieves & Del Rio, 2010; Del Rio & Burgillo, 2009; Del Rio & Burgillo, 2008).

Much of the theoretical underpinning we employ in this research, such as procedural sustainability, procedural justice, and distributive justice, is synthesized in the community renewable energy (CRE) literature (Wyse & Hoicka, 2019; Creamer et al., 2018; Berka & Creamer, 2018; Walker & Devine-Wright, 2008). For example, Walker & Devine Wright's (2018) seminal paper suggested CRE has two primary dimensions: process and outcome. The first dimension is process: which considers who a project is run by, who is involved, and who has influence (ranging from closed and institutional to open and participatory). The second dimension is outcome: which considers how outcomes of a project are spatially and socially distributed – i.e. who the project is for, or who benefits economically and socially (ranging from distant and private to local and collective). To the authors, an ideal community project is "one which is entirely driven and carried through by a group of local people and which brings collective benefits to the local community (however that may be defined) – a project that is both by and for local people" (2018, p. 498).

In this research, we employ the Indigenous guiding principle of Etuaptmumk or 'Two-Eyed Seeing' (Martin, 2012; Uprety et al., 2012). As noted by Walker et al. (2019), Etuaptmumk is a Mi'kmaq framework, developed by Elders Murdena and Albert Marshall (Eskasoni First Nation), in collaboration with Dr. Cheryl Bartlett. However, the principle of embracing Indigenous and western knowledge systems in research is gaining traction in other jurisdictions. Two-Eyed Seeing embraces both Indigenous and Western knowledge to address social and environmental challenges. As stated by Bartlett et al. (2012), two-eyed seeing "refers to using the strengths of Indigenous knowledge and ways of knowing with one eye, and the strengths of using western science and ways of knowing with the other eye, and combining both of these together, for the benefit of all" (p. 333). As such, regardless of Western scientific notions of energy sustainability, our approach to this research has been to privilege Inuit perceptions and understandings of energy sustainability, while acknowledging that expertise comes from within communities themselves. Keeping with the principles of two-eyed seeing, we note that two of four authors of this paper are NunatuKavut Inuk. Amy Hudson, from the case study community of Black Tickle, and Dr. Debbie Martin, who has immediate family and ancestral connection to St. Lewis. The other authors both identify as Settler-Canadian researchers.

4.3.1 Operational Methods:

Ethical clearance for this research was first given by NCC's Research Advisory Committee. This approval was then forwarded to the Office of Research Ethics at the University of Waterloo, and the

Research Ethics Board at Dalhousie University, whom also completed their own ethics reviews. In this paper, we assess the local sustainability of off-grid energy systems through three primary research instruments: mixed-methods community-member interviews; key informant interviews, and a supporting document review. Our procedures were collaboratively developed in grant-writing with NCC staff, and approved by community members from the pilot communities at an NCC hosted Research Summit in early July, 2018. During an approximately eight-week fieldwork period (July 8 – September 1, 2018), we spent two weeks in the community of Black Tickle, three weeks in the community of St. Lewis, one week in the community of Norman Bay, as well as additional trips to other Inuit communities in NunatuKavut in order to enhance the context and cultural understanding of our work.

With the aid of three grant-paid local Research Assistants, we distributed a recruitment letter to all households in the case study communities. We aimed to speak to all permanent residents (6+ months per year) who were of voting age in the province (18+). Bernard (2012) argues that the number of interviews needed for a qualitative study to reach data saturation is not quantifiable, but researchers should speak to as many people as possible given resource constraints[10]. As such, we aimed to speak to any community member that met our inclusion criteria and was available during the fieldwork period.

In total, we conducted 75 mixed-method community-member interviews: including 33 in Black Tickle, 36 in St. Lewis, and 6 in Norman Bay – representing approximately 31%, 30%, and 32% of the target population, respectively **[Table 4.3].** We note that 11% of our sample self-identified as non-Indigenous. We include this subset in our analysis as we wanted to be as inclusive as possible of all community-members. Furthermore, community-members and NCC staff informed us during research design that individuals that do not possess active NCC membership, may not self-identify as Indigenous, but belong to their community and have valuable insight to contribute.

[10] Fusch & Lawrence (2015) describe data saturation in qualitative research: "data saturation is reached when there is enough new information to replicate the study, when the ability to obtain additional information has been attained, and when further coding is no longer feasible" (p. 1408).

The community-member portion of the study aimed to assess how locals understand and experience energy sustainability. We sought to determine quantitatively what community-members perceived as the most pressing energy-related challenges in their community [based on our previously established sustainability impacts, Table 4.2]. We accomplished this by asking respondents to rate the variables on a scale of one to five (where 1 = not concerned, and 5 = extremely concerned). Qualitative follow-ups permit

ted participants to elaborate on these themes. Additionally, we quantitatively assessed local acceptance of the existing energy system, by asking respondents to rate diesel-generation on a scale of one to five (where 1 = strongly opposed, 2 = somewhat opposed, 3 = neutral, 4 = somewhat support, and 5 = strongly support). We then asked respondents to qualitatively elaborate on their rationale for support or opposition. As per Creswell (2017), our mixed methods instrument follows a concurrent [or integrated] approach. That is, data [quantitative survey questions, and qualitative responses] were collected simultaneously. Both datasets were then integrated in the interpretation of overall results. There are several justifications for combining quantitative and qualitative approaches (Bryman, 2007; Greene et al., 1989)2. However, given the limited resources and short timeline we had to conduct this research [and the significant expense of travelling to/living in remote off-grid communities], we did

Table 4.3: Demographic Information of Community Respondents

	Black Tickle (# of respondents)	St. Lewis (# of respondents)	Norman Bay (# of respondents)	Percentage of Total
Sample Size	33	36	6	
Gender				
Female	19	21	3	57%
Male	14	15	3	43%
Current Profession				
Public Sector	12	8	3	31%
Private Sector	8	9	3	57%
Unemployed	9	5	0	19%
Other	4	14	0	24%
Income (vs $29,000)				
Much Less/Less	18	6	0	32%
Same	4	6	1	15%
Much More/More	9	15	2	35%
No Response	2	9	3	19%
Identify as Inuit, First Nations, or Métis?				
Yes	30	31	6	89%
No	3	5	0	11%

this for the purpose of methodological triangulation: i.e. correlating data from multiple data collection methods (Fusch & Ness, 2015).

For the key-informant portion of the study, we targeted those who have been involved in the off-grid energy sustainability sector in NL for a minimum of two years. According to the procedures laid out in our ethical approval, key informants were given the opportunity to decide whether or not they wanted to be identified by name in any publications resulting from the research. We interviewed President of Lumos Energy/Executive Director of Indigenous Clean Energy Social Enterprise [Chris Henderson], who has previously built community energy plans in Labrador. We also interviewed the Chair of Black Tickle's Local Service District [Joe Keefe]. The remaining interviews were drawn from employees of energy utilities (3x), other private-sector energy firms [1x], and community leaders [1x]. The key informant portion of the study focused on substantive sustainability, or the tangible economic, environmental, and societal impacts of existing energy systems.

For the quantitative survey component of the study, we have applied basic descriptive statistics using Excel Version 15.13.1. For the qualitative data, we used directed content analysis, applied to community-member and key informant interview transcripts [or field notes, in the case of respondents who opted not to be recorded[11]. All interviews [for both community-members and key informants] were transcribed verbatim by the lead author and hired research assistants. Directed content analysis is a form of qualitative content analysis where initial coding starts with theory or relevant research findings, in our case we coded towards the EDST framework previously elaborated (Zhang & Wildemuth, 2009; Patton, 2002a- 2002b). We used NVIVO Version 11.1.1 to assist in organizing, managing, and coding the qualitative data. To enhance the credibility of the project, we prepared and presented a "preliminary results" document for our community partners and project participants, which allowed for feedback (Mercer et al., 2018). The feedback of community members was positive and no changes were requested.

One of the primary limitations of our study is our limited representation of off-grid Indigenous communities in Newfoundland and Labrador [and Canada]. In this study, we include three Inuit communities in NunatuKavut: and do not include other off-grid Indigenous communities in the

[11] In total, 19 community members and one key informant opted not be audio-recorded

province represented by Nunatsiavut Government or Innu Nation. Cultural differences, socio-economic realities, and community priorities may result in very different results on a nation-by-nation basis. We note this was a purposeful decision, as CBPR requires research be completed 'with and for communities' as opposed to 'on' communities (Koster et al., 2012). Our research relationships exist in NunatuKavut, and this research served to address their self-identified priorities. An additional limitation is the risk of bias in qualitative methods, especially the tendency for social desirability in responses (Sovacool et al., 2018. Off-grid diesel dependence is frequently framed as a challenge in Indigenous communities, and the provincial crown power corporation has moved to transition off-grid communities away from diesel. In addition, the lead author for this study has been publicly involved in renewable energy research throughout the region. As such, community-members may be predisposed to opposing diesel and magnifying local challenges for the purpose of satisfying the public and the researchers. We sought to address this bias in our informed consent process, by stressing our rationale for energy autonomy and local decision-making, and ensuring participants that their perceptions would contribute to community energy planning – no matter which preferences they held.

4.4 Results: Diesel-Generation Local Acceptance and Community Concerns

We find that the pilot communities are not necessarily opposed to diesel-generation. Interview results from all three communities gave diesel-generation a mean-acceptance rating of 3.2 out of 5 **[Figure 4.2],** suggesting that they are largely neutral [slightly more supportive than opposed] to the generation-source as a whole. Of the 75 respondents, 35% strongly or somewhat supported diesel-generation, 35% reported being neutral, 24% reported being strongly or somewhat opposed, and 1% responded that they 'Do Not Know'.

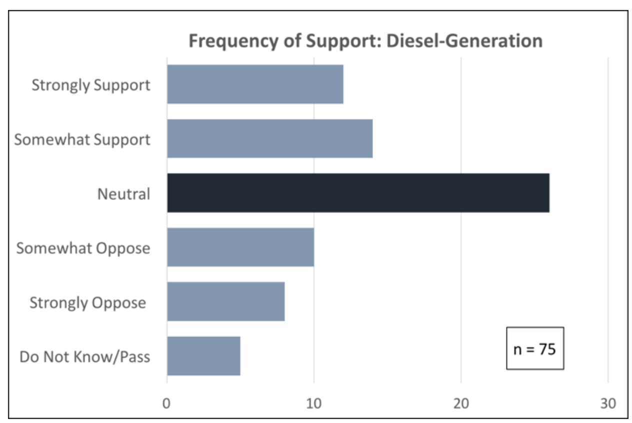

Figure 4.2: Diesel-Generation Frequency of Support

Figure 4.3 presents energy related concerns across all pilot communities. However, we note that differences emerged at the community-by-community scale **[Figures 4.4 – 4.6].** For example, the continuance of energy subsidies emerged as the greatest energy-related concern across all pilot communities [mean concern rating of 4.3/5], however supplies of fuel and the cost of home heat emerged as the greatest energy-concerns in Black Tickle [mean concern rating of 4.5/5 and 4.4/5, respectively].

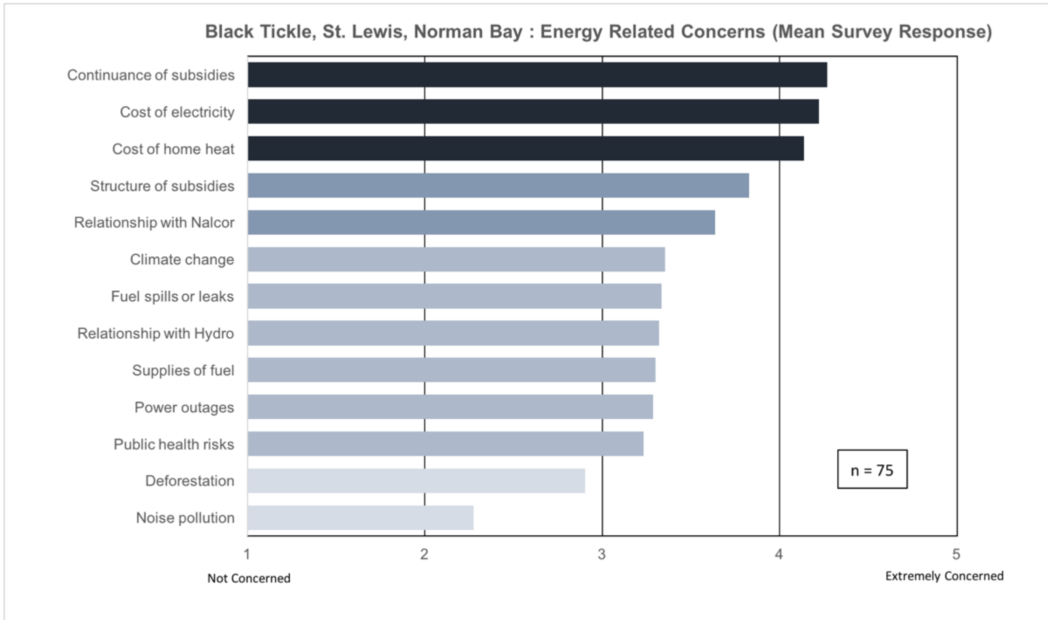

Figure 4.3: Energy Related Concerns Across Pilot Communities

In Section 4.4.1., we explore community support for diesel-generation, establishing what community members perceive as the socio-economic contributions and risks of diesel-generation. In Section 4.2, we contrast the local socio-economic benefits of diesel-generation with ongoing hydroelectric development in the region where most benefits have been exported. Section 4.4.3 focuses on 'procedural justice' issues in relation to the existing energy system, primarily the lack of consultation on energy related decisions. Finally, in Section 4.4.4. we argue that heat

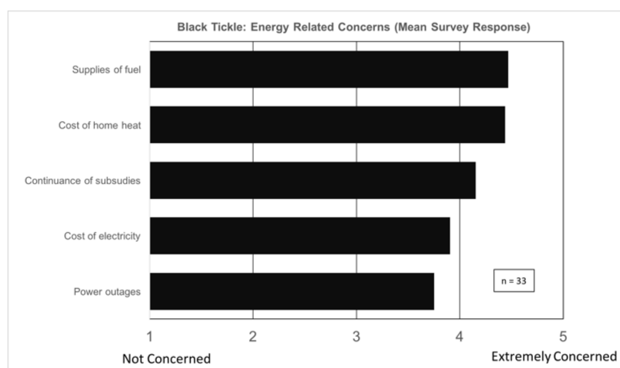

Figure 4.4.: Black Tickle Energy Related Concerns

insecurity [i.e. access to clean, affordable, and reliable heat] is amongst the greatest energy related challenges in NunatuKavut communities

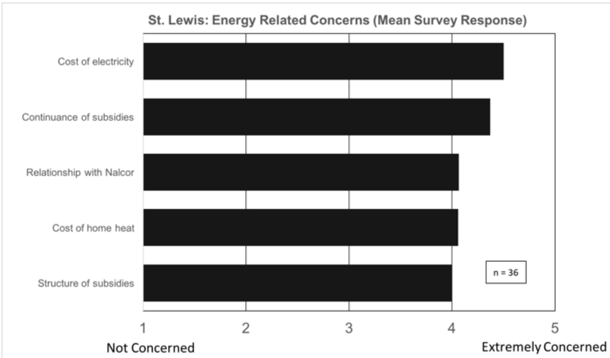

Figure 4.5: St. Lewis Energy Related Concerns

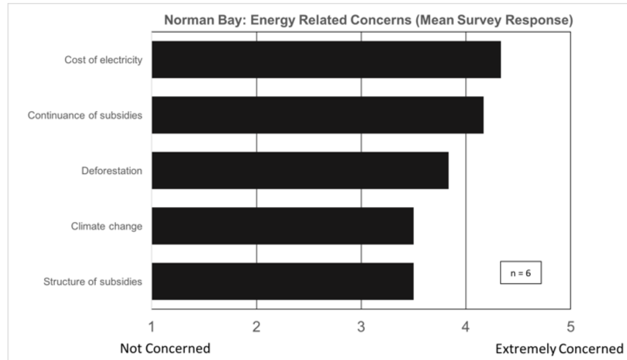

Figure 4.6: Norman Bay Energy Related Concerns

4.4.1 Diesel Socioeconomic Contributions

Diesel is generally supported as a generation-source because respondents are comfortable and familiar with the technology. As explained by one key informant:

> "the diesel plant has been here since the early 70's. I think everybody is like, it's always been here, it's pretty reliable, and everyone is used to it… if you are used to something, and don't have any problems with it, people do not want to change".

Many respondents echoed this sentiment. One respondent stated "I don't mind diesel so much, because diesel has… been around ever since the first power to come here". Another respondent stated "[Diesel] is just what we grew up with, it's the only thing that I know from living here".

Diesel is perceived as highly reliable in harsh Northern climates. A key informant, speaking about the community of Norman Bay, indicated that there had been no power outages locally for the previous 6-7 months. Another key informant, speaking about St. Lewis, stated "we have a fairly new [diesel] plant, it's only about 11 or 12 years old, so we have very few power outages… this plant, even the old one, we had one of the best [performance] records on the coast [of Labrador]". Respondents echoed these sentiments. As stated by one respondent "I think our energy system is fine… I never want to see it disappear… we had… 159 kilometers of wind last winter, in a storm, and we didn't lose power". Another respondent echoed "We very rarely have a power outage. So I mean, why mess with it?".

Given high unemployment rates and dependence on seasonal work in the pilot communities, the employment opportunities associated with diesel generation are regarded as highly valuable. For instance, while the unemployment rate across NL was 15.5% in 2018, the rate reported in the pilot communities was in excess of 19% **[Table 4.3]**. This was reported during the peak of seasonal employment, and does not include respondents whom described being severely underemployed. Census data from 2016 provides unemployment rates of 27.3% and 36.4% in St. Lewis and Black Tickle, respectively (Statistics Canada 2019a – 2019b). Currently, there are three full-time diesel-operation jobs in Black Tickle, two in St. Lewis, one in Norman Bay, as well as supplemental relief and maintenance positions in each community.

Jobs associated with diesel-generation are perceived as valuable as they are high-paying, full-time positions, in communities where little full-time employment is available. As explained by one respondent…

> "[Diesel jobs] are steady: a week on, and week off. Around this community, you get steady income, you got to hang on to it. If we get rid of the [diesel] plant, that is three incomes gone, and more really, because you got the boys shovelling [around the diesel plant] in the winter time… you are losing all of this".

The livelihoods afforded to diesel-workers allows them to contribute to their communities in meaningful ways, oftentimes carrying out additional duties integral to community resilience. The flexibility associated with the jobs and the relatively high incomes allows diesel-workers to own and operate grocery stores, to harvest firewood, fish, and wild game for community Elders and seniors, to assist neighbours with household maintenance, to serve as volunteers for community initiatives, and to act as community leaders. These indirect benefits of diesel employment further enhance the community's support for the generation source.

4.4.2 Diesel-Generation and Community Risk

While diesel-generation is supported in terms of its local socio-economic contributions, it does not come without risks for the communities. For example, climate change was given a mean concern rating of 3.4/5 across all pilot communities **[Figure 4.2].** In 2016, the pilot communities consumed approximately 849,000 litres of diesel fuel for electricity-generation (451,000 litres in St. Lewis, 324,000 in Black Tickle, and 74,000 in Norman Bay) (NL Hydro, 2016). This results in approximately 2,260 tonnes of annual carbon dioxide emissions for electricity generation in the pilot communities (NRCAN, 2014). While this is a small total amount of emissions, per-capita emissions for electricity-generation in the pilot communities (~7.1t C02e) are over three times larger than the national average (2.2t C02e) (Environment and Climate Change Canada, 2017).

When probed about the impacts of climate change, community-members most frequently referred to environmental degradation caused by diesel consumption in general. As stated by one respondent "when it comes to diesel… there is harmful effects going into the environment… we have used it for years, and I'm guessing we will continue in the future, but it comes at a cost". Similarly, one respondent stated "[diesel is] horrible. Not fit to be using. All the more emissions come from the more diesel you use".

Continued fossil fuel dependence made respondents weary, suggesting they desire more sustainable generation sources in the long-term. One respondent explained, "I have this thought that [diesel] is going to run out and there is going to be widespread panic". Similarly, another respondent stated "we need to wean ourselves off of fossil fuels". Expressing desire for more sustainable alternatives, one respondent stated "I would like to see us eventually advance into better types of power possibilities that are better for the environment".

The risks of fuel spills and leaks was given a mean concern rating of 3.3/5 across all pilot communities. Hunting, trapping, fishing, and gathering remain important components of livelihoods and culture in the communities. As such, any amount of fuel spilled on the land, sea, or water could have detrimental impacts for livelihoods and public health. As explained by one respondent "Fuel will just ruin anything that grows. If animals get into it, then they are going to get sick. If we eat the animals, then we are going to get sick". Similarly, another respondent explained…

> "We get our salmon, our char, our codfish, any of our sea mammals… our waterfowl, everything is on the doorstep. So a fuel spill here, would have a big impact on a lot of wildlife, and on a lot of people's actual sustainable [country] foods".

4.4.3 Exogenous Aspects of Local Energy Systems: Dependence on Outsiders

While community-members supported diesel-generation in terms of its local socio-economic contributions, there is significant concern across the pilot communities in relation to exogenous aspects of existing energy systems. For example, the 'continuance of energy subsidies' was rated as the greatest energy-related concern across all pilot communities (mean concern rating of 4.3/5) **[Figure 4.3].** As previously discussed (Section 4.2), off-grid ratepayers are greatly subsidized by financial transfers from grid-connected consumers, only paying 26% of the 'actual cost' of electricity generation (Department of Mines and Energy, 2003). Community-members fear that this subsidy could disappear at anytime, making the cost of electricity untenable for most households and forcing settlement away from off-grid areas.

Across all pilot communities, the community's relationship with the primary utility [NL Hydro] was given a mean concern rating of 3.3/5 **[Figure 4.2].** NL Hydro has exclusive responsibility for electricity provision [fuel imports, electricity generation, storage, and distribution] in 14 of 15 off-grid Indigenous communities in Labrador (Karanasios & Parker, 2016). Community-members fear being exclusively dependent on a crown power utility, and what it may mean for the survival of their communities if the utility ever ceased operation[12]. As explained by one respondent in Norman Bay, "If [NL] Hydro decides to take the power, then we have nothing… we are going to be forced to leave. With only 19 people [residents] here in the winter, I see that happening in the next few years". Similarly, one respondent stated "there is a possibility [NL] Hydro might fold after awhile and move on… the people reliant on diesel will be left in the cold". Another respondent explained "this community is [always] on the edge, are they [NL Hydro] going to boot us out or not?... It is just a constant worry".

---

[12] Provincial legislation ensures that services [i.e. electricity provision] cannot be removed from off-grid communities unless 90% of permanent residents vote in favour of resettlement. Residents may remain in resettled communities, but services are no longer provided (CBC News, 2016).

Across all partner communities, power outages were given a mean concern rating of 3.3/5 **[Figure 4.3]**. Community members feel frustrated that they have to depend on outsiders to fix/maintain local power lines. While local workers are responsible for diesel-operation, they are not permitted to maintain or repair power lines. As explained by one respondent "if everybody knew how to fix the problem [with power lines], you would not have to rely on getting somebody in here, which is really hard at times". This is especially challenging during harsh weather conditions, when power line-related outages cannot be repaired until outside-crews can make it into the communities. As stated by one respondent "In the winter time, if you lose power and it is gone for a couple days… with weather bad, you cannot get a crew in". Another respondent explained

> "There has been other times too, when the weather has been clear, but you are still waiting hours for them to finally get their butts in here to deal with power outages… it could be during a time when it is really cold, so you cannot afford to be without power".

Community-members expressed frustration that they receive little spin-off benefits when outside crews visit. While it is standard practice for utility employees to rent local accommodations or dine at restaurants, these services do not exist in the pilot communities. As explained by one respondent "[For] every other community in Labrador, Hydro [employees] is [sic] supposed to stay in hotels, but we do not have a hotel. They would be spending money if we had a hotel, and again it all comes right back to [negative impacts on community] sustainability". A key informant explained "Not so much [local benefit] now because there is no hotel here. They used to come here and stay, they stay now in [the adjacent communities of] Mary's Harbour or Port Hope [Simpson]".

4.4.4 Hydroelectric Development in NunatuKavut: Dispossession of Resources

While the local socio-economic benefits of diesel-generation drive community support of the generation source, the same cannot be said for ongoing hydroelectric development in the region. Nalcor Energy [NL's crown energy corporation] is currently building Muskrat Falls, an 824MW hydroelectric facility, on the Churchill River approximately 30kms upstream from Goose Bay, Labrador **[Figure 4.1].** Across all pilot communities, respondents gave 'Relationship with Nalcor' a mean concern rating of 3.6/5 **[Figure 4.2].** However, this emerged as one of the greatest energy-related concerns in St. Lewis (mean concern rating of 4.1/5) **[Figure 4.5].** Cooke & Ryan (2019) state "NunatuKavut Inuit have an ongoing relationship with the lands and waters of the Churchill River and Lake Melville, including those downstream from the Muskrat Falls Project" (p. 1). As such, Nalcor's activities surrounding Muskrat Falls are a significant concern of community members. Community-members feel a great sense of loss in relation to the Muskrat Falls project: as one respondent explained "[Nalcor] is not giving us power, that is in our land". Similarly, another respondent explained "They [Nalcor] are stealing from the hydro dams".

A pervasive sense of unfair treatment and inequitable development exists throughout the pilot communities in relation to the Muskrat Falls hydroelectric facility, which provides no power to isolated diesel communities. Community members felt their resources were being taken advantage of for the benefit of outsiders. This is reinforced by the Muskrat Falls transmission assets running directly through [or adjacent to] NunatuKavut Inuit communities, but all the power is exported to urban centres elsewhere in Newfoundland, Nova Scotia, and beyond. As explained by one respondent "this major project, that is right on our doorstep, is soon going to be complete… and it is bypassing us". Similarly, another respondent stated "It boggles me how there is power from Muskrat Falls going to St. John's, and we are using diesel. It makes no sense". Another respondent explained "they [Nalcor] are going to take all this electricity out of Labrador, [and] we are not going to get enough to turn on a flashlight bulb".

Community members perceive that they are paying for Muskrat Falls via increases in their electricity bills and provincial taxes but are seeing no corresponding benefit from the development. As argued by a key informant "I feel that if we are not getting any electricity from Muskrat Falls, our light bills should not be going up. We are not getting any benefit from it". Another respondent explained "If our community is on diesel power…. And we have absolutely nothing to do with electricity coming from Muskrat Falls, we should not have to dish out a cent for it".

4.4.5 Procedural Justice: Utility Lack of Transparency, Consultation, and Local Decision-Making

Respondents in our research felt as though they had little control over energy related decisions within their communities or region. Transparency in decision-making was of central concern. As stated by one respondent "it is not much of a relationship [with the existing utilities]. They tend to do things their own way, it is not transparent". A key informant explained…

> "I would prefer that they [existing utilities] got into contact with the towns and say… 'these are the plans for this year', 'do you have any issues with this?', 'is there anything we can do to help your community', but they do not".

Community members stated that lack of consultation was most problematic during the sanctioning of Muskrat Falls. One respondent captured this feeling of powerlessness as they stated "I do not like dams, never did… no good for me to say. The government wants to do it; they are going to do it anyway". Similarly, another respondent explained:

> "[Existing utilities] were bulldozing through [Muskrat Falls sanctioning], not listening to anybody, not listening to the environmentalists, not listening to the scientists. I lost a whole lot of respect for the organization… they were not listening to the people; it was all about profit".

While noise pollution was given the lowest mean concern rating of any particular variable we assessed (2.3/5), community-members expressed frustration that their particular complaints related to the diesel system have gone unaddressed in project planning. For instance, when a new diesel-plant was being built in the community of St. Lewis, community-members advocated for the plant to be built in a new location, in order to mitigate noise pollution impacts. As explained by one respondent "I cannot stand where [the diesel plant] is located. When the plant was rebuilt just a few years ago, they had an opportunity to move it outside the community, and they chose the dollar over safety or noise pollution". Similarly, another respondent explained:

> "I brought it [noise pollution concerns] up to [NL] Hydro when they were building the new plant. They come in with some kind of machine [that measures sound] … and said there's

nothing wrong with it…. there is nothing wrong with it for them, because they are not living here".

4.4.6 Heat Insecurity: Access to Clean, Affordable, and Reliable Heat

Our findings suggest that heat insecurity is amongst the greatest energy-related challenges in NunatuKavut[13]. As previously discussed, in Black Tickle, supplies of fuel and the cost of home heat emerged as the highest rated concern within NunatuKavut communities (mean concern ratings of 4.5/5, and 4.4/5, respectively). In total, 24% of respondents from Black Tickle reported living in an 'inadequately heated home', compared to 14% and 0% in St. Lewis and Norman Bay, respectively. Respondents' descriptions of 'inadequately heated homes' ranged from 4 – 17 degrees Celsius throughout the winter. A systematic review by Public Health England (2014) concluded homes should not fall below 18 degrees Celsius in order to avoid health impacts, such as: cardio-vascular disease, respiratory illness, increased levels of minor illnesses (colds, flu, exacerbation of existing conditions such as arthritis and rheumatism), and degradation of mental health.

4.4.6.1 Cultural Importance and Accessibility Challenges of Firewood

Black Tickle is located on the Island of Ponds, a tundra island, as a result, there is no locally available wood source in the community **[Figure 4.1].** Despite this, approximately 42% of respondents remained reliant on wood heat, a much smaller proportion than in the other case study communities **[Table 4.4].** Respondents across all three pilot communities reported that firewood harvesting is an important cultural tradition, albeit sometimes an expensive and time-consuming process due to the need to travel inland.

[13] Nunatsiavut Government (2016) defines heat security broadly as access to clean, reliable, and affordable heat

Primary Heat Source	Black Tickle	St. Lewis	Norman Bay	Percentage of Total
Oil	11	2	0	17%
Wood	11	30	6	63%
Electric	8	1	0	12%
Wood/Oil Mix	3	3	0	8%

Table 4.4: Primary Heating Source by Community

As for the cultural importance of firewood harvesting, one respondent explained… “we don’t have no issues with going to get wood, it’s a whole thing. My kids, and my dad, and my mom, we all go”. Similarly, another respondent explained:

> “[firewood harvesting] is a tradition, because we are Southern Inuit, so we’ve done it our whole life… I can remember getting ready and going in the woods with my father, two and three years old… you go in and you have a boil up, get the firewood”.

Firewood permits are inexpensive in the communities, typically $25 for adults, and $16.50 for seniors, allowing the permit holder to cut upwards of 10 cords of firewood. The more significant costs are associated with burning gasoline, maintenance for snowmobiles and komatiks [snowmobile trailers], and the operation of chainsaws.

In Black Tickle, respondents reported travelling between 70-105kms (round trip) to access firewood. A much longer distance than respondents in St. Lewis (40 – 60kms) or Norman Bay (10 – 44kms). Across all three communities, respondents generally reported consuming 8-11 cords of firewood per year for space heating, with some outliers [who typically supplement with furnace-oil] consuming only 4-6 cord per year. A komatik load typically carries half a cord, suggesting 20 trips are required to haul a permits’ worth of firewood. Most respondents in Black Tickle reported burning ~19 litres of gasoline per trip, suggesting that household gasoline costs for firewood harvesting are $600-700 per year in the community.

This does not include the labour of firewood harvesters (typically 4-7 full days to cut 10 cords of wood) or the maintenance, lube, and wear-and-tear costs for snowmobiles, komatiks, and chainsaws. As explained by one respondent “you go through [the costs]: chainsaw, your snowmobile, the truck… you have to look at all the ways it is going to cost”. Another respondent stated “[in the case of breakdown] skidoo parts is not cheap either”.

There are significant greenhouse gas emissions associated with firewood harvesting. Our sample suggests that approximately 13 homes in Black Tickle are dependent on firewood, each completing ~20 snowmobile trips to harvest firewood per year. This equates to approximately 5,910 litres of gasoline consumed and 13.5 tonnes of C02e emissions from burning gasoline alone, not accounting for chainsaw operation, or the burning of the firewood itself (NRCAN, 2014).

4.4.6.2 Fuel Security: Local Shortages and Long Distance Hauling

Due to local unavailability of wood resources, a larger proportion of Black Tickle respondents are reliant on oil-furnaces compared to the other pilot communities **[Table 4.4].** Access to furnace oil became significantly restricted in the community in 2016, when the only local supplier announced that they would be discontinuing fuel storage and sales in the community (The Labradorian, 2017). As a result of this, the volunteer local governance committee [Local Service District] took on responsibility for furnace oil/gasoline imports, with the assistance of $50,000 of funding from the provincial government. The Chair of the Local Service District explained that they operate strictly on a cost-recovery basis, charging residents only the direct fuel and transportation costs of importing drums. This has led to several fuel-access challenges in the community.

The LSD is only able to import a limited supply of fuel/gasoline [~100 drums at a time] via freight ship in the ice-free season [June – December]. The LSD works to ration available fuel supplies to community-members [households are limited to purchasing one drum at a time when fuel is available]; however, respondents reported many instances of unavailability and unequal access. Referring to unavailability, one respondent explained “sometimes it [fuel] just doesn’t come in at all”. Another respondent explained “by the time you are out of the [rationed] drum, if you need to go get another one, it might not even be there”. Unequal access to fuel disproportionately affects low-income earners. As explained by one respondent:

> "it is pretty much first come, first serve. So if you got the money to buy 100 drums, you can have 100. The next feller, if he only got enough money…. to buy one drum, and there is neither one left, tough [luck]".

Even when fuel is available in the community, the requirement to purchase 'by the 46-gallon drum' can be a significant financial challenge for community members. A significant portion of Black Tickle respondents (>30%) are dependent on employment insurance [E.I.] in the winter months (approximately $400 bi-weekly) **[Table 4.3].** A drum of furnace oil/gasoline cost $302 or $328, respectively in 2018. This suggests community members may spend greater than 80% of their bi-weekly income on fuel needs. As explained by one respondent "You either buy a drum of fuel, or you eat for two weeks. You do not have the option of having both". A key informant explained "most the time you are almost taking your full pay cheque, just to buy a drum of gas".

The fuel access burden was less severe prior to the departure of the local fuel supplier, as community members had the option to purchase small amounts of fuel on an as-needed basis. Community members could purchase a 20 litre can of fuel, at a cost of approximately $30, which would typically last them a day or two. Small purchases eased the financial-burden and allowed community-members to maintain access to furnace oil.

On average, respondents reported consuming 12 drums of furnace oil per winter, which would cost approximately $3,700. Given that 55% of respondents in Black Tickle reported earning much less or less than $29,000 per year, we suggest that a large proportion of the community is living in energy poverty – what has been described as spending in excess of 10% of yearly income on energy needs (Schuessler, 2014).

The fuel supply imported by the LSD is exhausted by mid-February of each year, leaving the community with no local access to furnace oil or gasoline. As stated by one respondent "[Fuel] gets in on a boat in the fall time, that lasts until February, and then it is gone". When the supply is exhausted, community-members are forced to travel to Cartwright via snowmobile to purchase fuel and haul it back to their community [a roundtrip of approximately 200kms]. Hauling fuel is an expensive and time-consuming endeavour. Respondents reported making between 5-9 trips to Cartwright per winter to haul fuel, and burning between 20-80 litres of gasoline per trip. This suggests community members are burning $180 - $1,300 per winter in gasoline, just so they can access furnace oil. This does not account for maintenance or wear-and-tear costs associated with snowmobiles or komatiks. As explained by one respondent "You got to spend the money to go down, spend the money to come back, in gas… we got to have materials for the cart, if you break your cart. Springs or shocks, or anything that happens with your [snow] machine".

4.4.6.3 Electric Heat: Utility Restrictions, Inadequate Infrastructure, Lack of Local Capacity

Three primary barriers exist to accessing electric heat in the case study communities: utility policy financially restricts the ability to use electric heat, electrical upgrades required for households are prohibitively expensive, and there is a lack of local capacity for electricians. As discussed in Section 4.2, electricity rates in most of NL's off-grid communities are structured in order to discourage the conversion to electric heat. Any consumption in excess of subsidized blocks of electricity [upwards of 1,000 kWh monthly] is charged at a rate of 18.252 c/kWh (NL Hydro, 2019; Karanasios & Parker, 2016). Electric heating in the winter requires several thousand kilowatt hours. As such, respondents who relied exclusively on electric heat reported paying electricity bills ranging from $400 – 900 monthly, a cost which is untenable for most households in the community.

Many of the homes in Black Tickle were built in the 1970's and do not have the proper infrastructure to support electric heat. For example, a panel box greater than 200 amps is typically required to support electric heat, and most households currently have 100 or 120-amp service. One respondent, with in-depth knowledge on the topic, spoke to the results of a community survey where only 5 of 22 households studied in Black Tickle possessed panel boxes adequate for electric heat. In addition, the wiring of homes would likely have to be upgraded which is a significant cost. As explained by one respondent "My house was built in 1979. So [for] wiring, I'd have to remove everything: walls, partitions… it would be literally cheaper to rebuild than to renovate". Another respondent explained "[for electric heat] we would have to rewire everything, that would cost you in the thousands".

Electrical upgrades are significantly more expensive in off-grid communities due to remoteness and lack of local electricians; as such, residents have to pay the transportation and accommodation costs of contractors. As explained by one respondent "there is no electrician in the community to do it [upgrades], and it is very expensive to have an electrician come here". The Chair of the Local Service

District explained “you have to pay their way in the summer on the boat [ferry service] and back, and a place for them to stay, and food to eat… can’t afford it”. Many respondents have received panel-box upgrade quotes from electricians, ranging from $2,500 to $5,000 (plus travel, accommodations, etc.). These conversions are significantly cheaper in grid-connected areas. As explained by a key informant “[If electricians] supply it [electrical equipment in urban areas] … get it for probably $2,000 or less… Whereas here you are supplying your own gear and still looking at $5,000 to get it done”.

4.5 Discussion

Referring to the community energy literature [Section 4.3], off-grid diesel systems offer a unique case study. Walker & Devine Wright (2008) define an ideal community renewable energy [CRE] project as one which is both ‘by and for local people’. Our findings suggest that off-grid diesel systems in NunatuKavut could be considered ‘for local people, but by outsiders’. In this case, the outcome dimension of diesel-systems drives local support and acceptance. However, the process dimension erodes community support.

The outcome dimension of diesel-systems is ‘local and collective’ (Walker & Devine-Wright, 2008). Due to the isolated nature of the partner communities, their exclusive reliance on diesel-generation, and the general lack of other economic development opportunities, the socio-economic contributions of diesel are felt directly by locals and enhance community acceptance of the generation source. Community familiarity with the diesel-system, diesel’s reliability in harsh climates, the valuable employment opportunities created, and broader contributions to community resilience – are valuable components of the existing energy system, and as a result, a considerable portion of community members “never want to see [diesel] disappear”.

Community support is not unanimous however, and our use of Etuaptmumk stresses two key themes which erode support for diesel systems: environmental degradation, and risks of fuel spills and leaks. These findings supplement existing techno-economic literature, which often asserts the challenges of diesel-systems (i.e. emissions, risk of fuel spills), but fails to explain what these impacts mean, or how they are experienced by community members (i.e. access to country foods). While in totality, the outcome dimension of diesel-systems can be considered local and collective, community members are frustrated about some exogenous aspects of the energy system. The main concerns are related to reliance on outsider subsidies, maintenance crews and lack of local benefits when maintenance crews utilize non-local accommodations and services.

We contrast the local socio-economic contributions of diesel-generation with a regional hydroelectric project (i.e. Muskrat Falls), where community members feel an inequitable sense of development and dispossession of resources. In NunatuKavut diesel-powered communities, the process dimension of Muskrat Falls can be classified as 'closed and institutional', while the outcome dimension is felt 'distantly and privately' (Walker & Devine-Wright, 2008). As previously discussed (Section 4.2.1.), the motivations of Indigenous communities for participating in energy transitions are mixed (Steffanelli et al., 2018). While some communities pursue projects in pursuit of energy autonomy and greater self-sufficiency, others pursue projects primarily for local socio-economic and environmental benefits. Our findings place greater emphasis on local socio-economic benefits of projects. We find that community members are more accepting of known diesel-based energy systems which benefit locals, than massive hydroelectric projects where the vast majority of benefits are exported.

Conversely, the process dimension of diesel-systems, aligns closely with the 'closed and institutional' model of community involvement (Walker & Devine-Wright, 2008). Walker & Baxter (2017b) identified 'the ability to affect outcomes' as a key procedural justice issue affecting acceptance of generation sources, and to a lesser degree: information sharing, opportunities to participate, and general resident-developer relationships. The ability to affect outcomes emerged as a significant concern related to diesel-systems and regional hydroelectric development. Community members expressed frustration that the existing utility [NL Hydro] would not take seriously or address their concerns related to noise pollution. Likewise, community members felt as though they were not being adequately involved in the Muskrat Falls development, and that they were powerless in influencing decisions - captured by one respondent "if the government wants to do it, they are going to do it anyway". The resident-developer relationship in general is fraught: where community members worry NL Hydro is in a position of power and could influence the very survival of their communities by shutting off the electricity. Information sharing emerged as a lesser, but still evident procedural justice issue. Communities felt that the existing utilities are not transparent in their planning or activities. This supports the findings of Mercer, Sabau, and Klinke (2017), whom suggested a general lack of information sharing with regards to NL's utilities and their interests in renewable energy development.

EDST urges understanding not only of procedural sustainability (i.e. local perceptions) but also substantive sustainability (i.e. tangible economic, environmental, and social impacts). While a great deal of our analysis focused on perceptions of community energy systems, we also make the case that heat insecurity has reached crisis proportions in Black Tickle. The community currently has no secure heat source; even when available, fuel supplies are unaffordable to many community members; and in many instances this can be directly tied to utility policy (i.e. subsidy levels which discourage electric heat).

The emerging literature on Indigenous Peoples and sustainable energy transitions in Canada urges that renewable energies are only acceptable when grounded in energy autonomy and local decision making. Our research concludes that off-grid communities in southeast Labrador are not necessarily opposed to diesel-generation, and that community members value socio-economic aspects of the energy system such as familiarity, reliability, and employment. Diesel-generation is not without its challenges, but it is currently necessary and builds community resilience in the absence of reliable and affordable alternatives. Respecting the autonomy of communities, any proposed energy transition should recognize and seek to maintain community-identified strengths, and avoid imposing a western 'sustainability' agenda on communities (Rezaei & Dowlatabadi, 2016). This is a dramatic shift compared to much popular discourse which refers to 'dirty diesel' in off-grid communities (Environmental Commissioner of Ontario, 2019; Trewn, 2019; Lovekin, 2017; Lovekin et al., 2016; Canadian Nuclear Association, 2016; Miller, 2016).

Similar to community members in the study, we as authors recognize the need for urgent decarbonization in the face of global climate change. As stated by one respondent "we need to wean ourselves off fossil fuels". With that said, our research points to the need for 'decolonized decarbonization' in off-grid communities. We define decolonized decarbonization as sustainable energy transitions which are grounded in community autonomy and local decision-making, which recognize and protect community strengths associated with existing energy systems (i.e. familiarity, reliability, employment), and which seek to support communities in addressing self-identified priorities (i.e. environmental degradation, access to country foods, exogenous development, procedural justice).

4.6 Concluding Remarks

While Canada is generally perceived as a global leader with regards to low-carbon electricity deployment, the same cannot be said for off-grid communities throughout the country. Of the 259 off-grid communities in Canada, 190 remain almost exclusively reliant on diesel-generation for their electricity needs. A growing body of literature purports that diesel-generation poses substantial economic, environmental, and societal challenges for off-grid communities; however, to our knowledge, there is no qualitative analysis of how community members perceive and experience the local impacts of off-grid energy systems. Likewise, despite the majority of off-grid communities in Canada identifying as First Nations, Inuit, or Métis, there is even less research which seeks to meaningfully integrate Indigenous perspectives on the topic.By partnering with the NunatuKavut Community Council, and the Inuit diesel-dependent communities of Black Tickle, St. Lewis, and Norman Bay, our research sought to address this gap in existing knowledge. This is a timely area of research, as Canada continues to work towards decarbonization via sustainable energy development, and Indigenous communities remain at the forefront of this transition (Steffanelli et al., 2018; Henderson, 2013; Krupa, 2012).

Our CBPR approach, which has involved deeply engaging with community residents, spending a great deal of time in the community, and reviewing the results of our research with the community, demonstrates the importance of engaging Indigenous communities directly in energy sustainability studies to develop a more comprehensive understanding of Indigenous People's perspectives. For instance, while a growing body of research criticizes diesel-generation, our research suggests off-grid communities are not necessarily opposed to existing energy systems. Among the 75 respondents participating in this study, only 24% were opposed to diesel while 35% supported existing diesel systems and another 35% were neutral. Building off Walker & Devine-Wright's (2008) seminal contribution on community energy: we find that the outcome dimension of diesel systems is 'local and collective', while the process dimension is 'closed and institutional'. Given that 'ideal' community energy systems are both 'by and for local people', we suggest that diesel-systems can be valued to the extent that they are 'for local people, but by outsiders'. This can be contrasted with large-scale hydroelectric development in the region, which can be classified as 'for outsiders, by outsiders'.

Our findings serve to better respect the autonomy of communities. We do this by identifying what is already working well at the community level as a result of diesel-generation (i.e. local jobs, reliability, familiarity), and protect the community from being unduly imposed upon by projects which are not compatible with their desires. Any proposed sustainable energy transition should protect these benefits, while seeking to address what community-members themselves perceive as their greatest energy-related challenges (i.e. environmental degradation, risk of fuel spills and leaks, as well as issues related to exogenous development and procedural justice).

This paper serves as the first example of research to fully investigate what living in a diesel-dependent community is like from the local perspective. Doing so allowed us to identify heat insecurity as a key challenge in off-grid communities, an issue which has been given inadequate attention in the existing literature. This is demonstrated most vividly in Black Tickle, where upwards of 24% of community members report living in inadequately heated homes, fuel supplies are restricted across all potential heating sources, and the high costs of fuel/retrieving fuel result in a significant portion of community members living in energy poverty.By privileging Inuit voice and community expertise in conducting research with these three pilot communities in NunatuKavut, we not only filled an existing gap in the literature as it relates to off-grid energy sustainability, we also captured people's active interests and investment in the preservation and survival of their communities. Community participation and knowledge sharing in this research is indicative of NunatuKavut Inuit self-determination, demonstrating the success of our collaborative community led research that seeks to acknowledge and support community knowledge and autonomy in decision making and planning.

We cannot assume that results from partner NunatuKavut Inuit communities apply to the 167 other sovereign, autonomous, and diverse Indigenous off-grid communities throughout Canada. As such, we encourage researchers to seek permission and meaningful partnerships with other First Nation, Inuit, and Métis communities, and we call for future research which is grounded in energy autonomy, local decision making, and integrates Indigenous perspectives. Such research, if desired, may broaden our understanding of community acceptance, sustainable energy transitions, and the impacts of off-grid energy systems.

Chapter 5: Towards Decolonized Decarbonization: Integrating Indigenous Perspectives on the Sustainability of Off-Grid Energy Systems in NunatuKavut, Labrador

5.1 Introduction:

Canada is the seventh largest producer of renewable energy [RE] in the world; RE currently provides approximately 17% of the country's total primary energy supply (Natural Resources Canada [NRCAN], 2019). Large-scale hydropower accounts for 60% of Canada's electricity generation, wind power accounts for 4%, biomass/geothermal account for 2%, and less than 1% is generated by solar power. The remainder is generated by nuclear generation (15%), natural gas (9%), coal (9%), and a small amount of petroleum (<1%).

The electricity-generation mix differs dramatically in Canada at the off-grid community scale. There are 259 off-grid communities in Canada, of which 190 (74%) are almost exclusively dependent on diesel fuel for electricity-generation - with over 500MW of installed capacity. To contrast, there is approximately 154MW of renewable capacity in off-grid communities, which is mostly small hydropower projects (NRCAN, 2019; Rickerson et al., 2012). There are approximately 193,000 residents in off-grid communities, which are distributed throughout the country in every province and territory (excluding the Maritimes). While 4.9% of the population of Canada identifies as Indigenous, 66% of off-grid communities (n = 169) identify as First Nations, Inuit, or Métis. As such, off-grid diesel-dependence in Canada must be thought of as an issue disproportionately affecting Indigenous Peoples. Despite this, there are few examples of research which seek to explicitly integrate Indigenous perspectives on the impacts of off-grid energy systems (Mercer et al., 2019).

Newfoundland and Labrador, Canada's most easterly province, mirrors the broader electricity-generation trend in the country. For instance, in 2016, large-scale hydropower accounted for 95% of the province's electricity generation capacity – not accounting for the 824MW Lower Churchill Project (i.e. Muskrat Falls) currently under construction in central Labrador (National Energy Board [NEB], 2019a). Conversely, 21 of 27 (78%) off-grid communities in the province remain dependent on diesel fuel. There are 15 Indigenous off-grid communities in the province (56%), represented by one of: NunatuKavut Community Council in southeast Labrador, Nunatsiavut Government in northern

Labrador, and Innu Nation in the community of Natuashish. All 15 Indigenous off-grid communities in Labrador remain dependent on diesel-fuel to meet their electricity needs (NRCAN, 2019).

Our recent research, in partnership with the NunatuKavut Community Council (NCC – the Inuit governing organization which represents Inuit of south and central Labrador) sought to address the knowledge gap of Indigenous perspectives on the impacts of off-grid energy systems. Working in three pilot Inuit communities in NunatuKavut (Black Tickle, Norman Bay, and St. Lewis), we aimed to "integrate Inuit perspectives and determine how existing energy-systems [based off of diesel-generation and home heat] impact the sustainability of off-grid communities in southern Labrador" (Mercer et al., 2019, p. 2). We concluded that "off-grid communities in southeast Labrador are not necessarily opposed to diesel-generation, and that community-members value socio-economic aspects of the energy system such as familiarity, reliability, and employment" (p. 1). Given the lack of affordable and reliable energy alternatives, Inuit in NunatuKavut saw diesel-generation as necessary for community continuity and resilience. Concurrently, community members (1) remained extremely concerned about environmental degradation as a result of diesel-consumption; (2) feared the risks of fuel spills and leaks and resultant threats to country foods; (3) were frustrated by *exogenous* aspects of the diesel system such as reliance on outsider subsidies and maintenance crews ; (4) perceived procedural aspects of energy governance as unjust; and (5) believed heat insecurity [i.e. access to clean, affordable, and reliable heating resources] was amongst the greatest energy-related challenges in their territory.

Given the novelty of our findings, and the implications for community autonomy, priorities, and local decision-making, we were invited back to the territory by NCC's Department of Research, Education, and Culture to replicate our research procedures in remaining diesel-dependent communities in NunatuKavut. This research aims to expand our original research model to six new partner communities on NunatuKavut's southeast coast: Cartwright, Charlottetown, Pinsent's Arm, Port Hope Simpson, Mary's Harbour, and Lodge Bay **[Figure 5.1].** This expanded phase of the research was funded primarily by NunatuKavut Community Council own-source revenue along with *'A SHARED Future'*, which is a program of research that receives its funding from the Canadian Institutes of Health Research (CIHR). CIHR had no involvement in research design, data collection, data analysis, or writing of results.

There is a harmful and colonial legacy of non-Indigenous researchers conducting research on Indigenous Peoples. Partnership research and community-based approaches have been promoted as being more compatible with the ethical and community dynamics of research with Indigenous Peoples (Smith, 2013; Kovach, 2009). As such, we follow the tenets of community-based participatory research, and note that NCC staff and community-members were integrally involved in all stages of this project (Castleden et al., 2012; Koser et al., 2012). Our efforts to undertake reciprocal and respectful research are detailed in Sections 3 - 3.2. In Smith's (2013) seminal contribution on decolonizing methodologies, the author refers to critical questions that Indigenous communities may ask to determine the value and effectiveness of western researchers. The author states

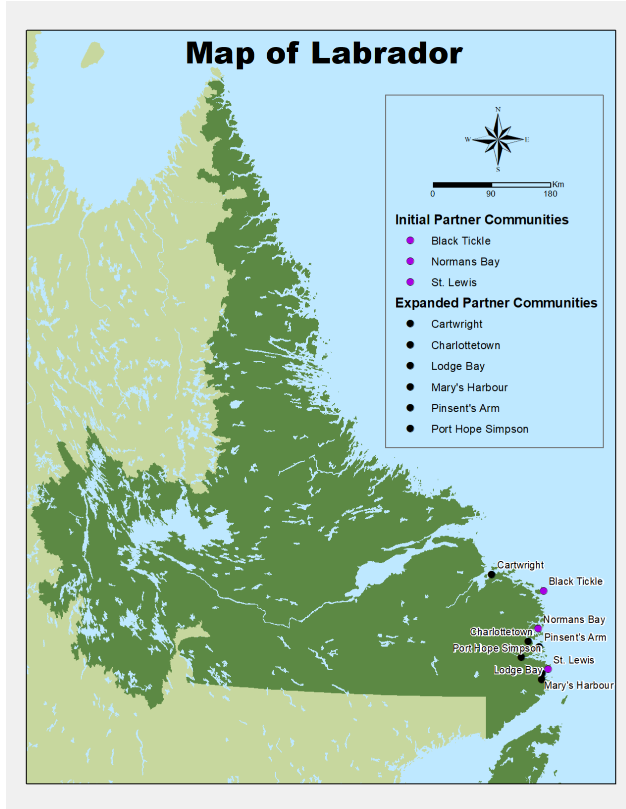

Figure 5.1: Map of Expanded Partner Communities

> "criteria that a researcher cannot prepare for, such as: Is her spirit clear? Does he have a good heart? What other baggage are they carrying? Are they useful to us? Can they fix up our generator? Can they actually do anything?".

To reply to Smith's rhetorical question: the goal of our research is to not fix up the community's generator. Our goal is to partner with and empower community-members to provide their own understandings of the sustainability of off-grid diesel generation - and to decide for themselves which parts, if any, of existing energy systems - must be improved.

5.1.1 A Brief Review of the Literature:

A growing body of techno-economic research has asserted and demonstrated the economic, environmental, and societal challenges of diesel-generation in off-grid communities. From an economic perspective: diesel-generation is expensive, serves as a financial strain on governmental budgets through required subsidization, poses energy security [i.e. availability and affordability] challenges, and oftentimes restricts community socio-economic development and growth via local load restrictions (see: Arriaga, Brooks, & Moore, 2017; Arriaga, Cañizares, & Kazerani, 2014; McDonald & Pearce, 2013; Weis & Illinca, 2010). From an environmental perspective: diesel-generation and fuel transportation contributes to global climate change and pose risks of fuel spills and leaks (see: Arriaga et al., 2017; Bhattarai & Thompson, 2016; Thompson & Duggirala, 2009). From a societal perspective: diesel-generation may be unreliable, disruptive via noise pollution, pose local health challenges, and utility-controlled diesel-plants may be perceived as an imposition on the autonomy of Indigenous off-grid communities (see: Heerema & Lovekin, 2019; Fitzgerald & Lovekin, 2018; Arriaga et al., 2017; Rezaei & Dowlatbadi, 2016; Advanced Energy Centre, 2015; Government of Canada, 2011). Given these challenges, many researchers, policymakers, and advocates have argued for a transition to renewable sources of energy in off-grid diesel-dependent communities (see: Rahman, Khan, Ullah, Zhang, & Kumar, 2016; Nunatsiavut Government, 2016; Knowles, 2016; Heerema & Lovekin, 2019). As noted above, much of the evidence on the impacts of off-grid diesel-generation comes in the form of quantitative reporting of a limited number of measures. Conversely, there is limited qualitative research which seeks to understand how community-members themselves perceive and experience off-grid energy challenges. There is even less research which integrates Indigenous Knowledge and perspectives, even though most off-grid communities in Canada identify as First Nations, Inuit, or Métis. Karanasios & Parker (2018) call explicitly for further research which integrates Indigenous perspectives on remote community energy systems.

We situate our research in the emerging body of literature related to Indigenous Peoples and sustainable energy transitions in Canada. Much of this literature purports that due to an urgent global need for decarbonization, in-depth knowledge of their local environments, and significant [renewable] resource potential in their territories, Indigenous Peoples are at the forefront of sustainable energy transitions (Walker et al., 2019; Jaffar, 2015; Krupa, Galbraith, & Burch, 2015; Krupa, 2012). Karanasios and Parker (2018) point to the shift from the old model of external ownership and control to an increasing emphasis on local ownership and adoption based on local sustainability goals. Enhanced energy autonomy in Indigenous communities via sustainable energy development may lead to several socio-economic and environmental benefits, such as: increased security of supply, the potential to reduce carbon emissions, local employment opportunities, and the potential for financial reward from community ownership and increased independence (see: Del Rio & Burgillo, 2008, 2009; Chicco & Mancarella, 2009). Steffanelli et al. (2019) recently published a systematic review analyzing Indigenous Peoples motivations for participating in sustainable energy transitions: the authors conclude that motivations are mixed on a nation-by-nation basis. That is, some Indigenous communities pursue sustainable energies for enhanced autonomy and self-sufficiency, while others pursue projects to reduce environmental damage, energy costs, and to generate revenue to invest in self-directed priorities. Several authors urge caution: as sustainable energy projects devoid of Indigenous ownership and control may erode community autonomy resulting in unjust or inequitable development processes (Walker et al., 2019; Rezaei & Dowlatabadi, 2016; Krupa et al., 2015). Given the mixed motivations of communities for pursuing projects, and the tensions that emerge from sustainable energies being forced on communities, we have called for *'decolonized decarbonization'* (Mercer et al., 2019). That is, sustainable energy transitions "which are grounded in community autonomy and local decision-making, which recognize and protect community strengths associated with existing energy systems, and which seek to support communities in addressing self-identified priorities" (p. 12).

5.1.1.1 Study Setting:

Translated from Inuttitut, NunatuKavut means "Our Ancient Land", and refers to the territory of Inuit in south and central Labrador. The NunatuKavut Community Council (NCC) is the representative governing body for approximately 6,000 Inuit. Inuit in NunatuKavut have deep and enduring connections to their lands, waters, and ice, and have practiced seasonal transhumance (or migration) since time immemorial. For example, harvesting of country foods traditionally occurred on a year round basis. In the spring, families would move to the coast to harvest seals and codfish. In the summer, cod fishing continued, along with salmon-fishing and berry picking. Fall marked the beginning of bird hunting, and by the end of fall families moved back into sheltered bays to prepare for winter trapping and caribou hunts (Martin et al., 2012; Stopp, 2004). Today, families in NunatuKavut maintain multiple cabins and camps to accommodate each harvest, which maintains connections to ancestral homes, and traditional way of life (Martin et al., 2012). Today, the southeast coast of Labrador is home to several modern Inuit communities. Cartwright being the most northern community, and others stretching down the southeast and south coast of Labrador. Communities were permanently settled in the mid 20th century at the urging of the Church and the Government of Newfoundland, who wanted to end Indigenous People's seasonal movements for the stated purpose of service delivery, especially schooling (Mercer & Hanrahan, 2017).

Six of these modern Inuit communities are represented in this paper: Cartwright, Charlottetown, Pinsent's Arm, Port Hope Simpson, Mary's Harbour, and Lodge Bay. The six communities are all remote diesel dependent communities with 2,200kW of installed capacity in Cartwright, 3,405kW serving both Charlottetown and Pinsent's Arm, 2,325kW in Port Hope Simpson, and 2,615kW serving both Mary's Harbour and Lodge Bay (Department of Natural Resources, 2019). Most of the communities are exclusively dependent on diesel-fired electricity; the exception is Mary's Harbour and Lodge Bay, which currently have a 240kW run-of-the-river hydroelectric system and a 250kW solar array (plus battery storage) under development and is anticipated to displace upwards of 30% of annual diesel consumption on the interconnected system, though is not included in the 2,615kW figure reported above.

The partner communities have relatively small populations: with 427 residents in Cartwright, 290 in Charlottetown, 55 in Pinsent's Arm, 412 in Port Hope Simpson, 341 in Mary's Harbour, and 65 in Lodge Bay (Statistics Canada 2016). The Trans Labrador Highway is the only public road serving south and central Labrador. Heading southeast from Happy Valley-Goose Bay is Route 510, the mostly gravel highway stretches over 600km to the Labrador – Quebec border. The route runs through dense boreal forest for most of its length and there are no roadside services between communities. Route 510 passes directly through the communities of Port Hope Simpson, Mary's Harbour, and Lodge Bay. However, gravel access roads eastwards of approximately 94km and 30km are required to reach the communities of Cartwright and Charlottetown, respectively. Pinsent's Arm is connected to the community of Charlottetown via Route 511-10, a gravel access road of approximately 24km.

5.2 Theoretical Approach: Energy Deployment and Local Sustainability Theory

This research is guided by energy deployment and local sustainability theory [EDST] (Del Rio & Burgillo, 2008, 2009; Jaramillo-Nieves & D
el Rio, 2011). EDST is a theoretical lens originally put forward by scholars to help understand how renewable energy projects impact the sustainability of host communities. EDST consists of three primary concepts: substantive sustainability, procedural sustainability, and endogenous development. Substantive sustainability refers to the tangible economic, environmental, and societal impacts of energy projects. Del Rio & Burgillo (2008) propose 11 socio-economic indicators which must be considered as a result of projects **[Table 5.1].**

As we assess the impacts of diesel-generation, as opposed to renewable energy projects, we propose a set of variables based on own literature review **[Table 5.2].** Procedural sustainability extends beyond tangible impacts, instead considering how locals perceive the impacts of projects, how the risks and benefits of a project are distributed throughout the community, and ultimately the local acceptance of a project. EDST scholars argue that projects must maintain positive substantive and procedural contributions in order to maintain long term viability. For example, even if tangible impacts are positive, continuity may be threatened in the long-term if locals maintain negative perceptions, if project risks fall upon marginalized groups, or if local acceptance is eroded. EDST also stresses the importance of endogenous development, or development built on the use of local (physical, human, and capital resources). The authors argue that endogenous projects have greater socio-economic impacts than exogenous projects, characterized by settlement of firms from beyond the host area

Table 5.1: Socio-Economic Impacts of Renewable Energy Development
-Quantitative/qualitative impacts on employment
-Income generation effects
-Demographic effects
-Energy impacts
-Impact of project on productive diversification of the area
-Social cohesion and community development
-Income distribution
-Impact on tourism
-Local research and development
-Industry creation
-Impact on municipal budget

Walker & Baxter (2017b) acknowledge the importance of distributive justice (distribution of project risks and benefits) for the local acceptance of sustainable energy projects. However, the authors also suggest that procedural justice (i.e. local participation in project planning, and the characteristics of that participation) is equally as important. As such, we consider both distributive justice and procedural justice in our theoretical approach.

Table 5.2: Sustainability Impacts of Off-Grid Energy Systems

Economic	**Societal**	**Environmental**
-Cost of electricity	-Self-determination	-Greenhouse gas emissions
-Cost of home heat	-Power outages	-Fuel spills and leaks
-Structure of subsidies	-Public health impacts	-Deforestation
-Continuance of subsidies	-Noise pollution	
-Load restrictions	-Supplies of fuel	

Our theoretical approach has a great deal of overlap with the community renewable energy (CRE) literature (e.g., Walker & Devine-Wright, 2008; Creamer et al., 2018; Berka & Creamer, 2018**).** For instance, in Walker & Devine-Wright's (2008) seminal paper, the authors argue that CRE projects have two primary dimensions: process and outcome. The process dimension considers by whom a project is run by, who is involved, and who has influence (ranging from closed and institutional to open and participatory). The outcome dimension considers how the benefits of a project are spatially and socially distributed, i.e. for whom a project is for (ranging from distant and private to local and collective). To Walker & Devine-Wright (2008), an ideal CRE project is "one which is entirely driven and carried through by a group of local people and which brings collective benefits to the local community (however that may be defined) – a project that is both by and for local people" (p. 498).

This research employs two-eyed seeing [TES], or Etuaptmumk, as a guiding principle. Originally put forward by Mi'kmaq Elders Murdena and Albert Marshall, as well as Dr. Cheryl Bartlett, TES combines Indigenous and western knowledge systems to address environmental and social challenges. (Barlett, Marshall, & Marshall, 2012). As stated by Bartlett et al. (2012), TES "refers to using the strengths of Indigenous knowledge and ways of knowing with one eye, and the strengths of using western science and ways of knowing with the other eye, and combining both of these together, for the benefit of all" (p. 333). While we interviewed a small number of key informants and non-Indigenous community-members, the voices and experiences of NunatuKavut Inuit themselves form the backbone of this research.

EDST lends itself neatly to TES research. For example, while we rely on western theoretical principles and operational methods, the procedural component of EDST values Inuit perceptions of energy sustainability, just as highly as any other impact. Furthermore, recognizing the *process* dimension of community renewable energy, our approach has been to center NunatuKavut Inuit in all stages of this research. For example, the project was led by NCC staff, who held ultimate decision-making power over all aspects of the research. As discussed in section 5.2.1., we hired nine Inuit youth to support the project as local Research Assistants, involved in key tasks such as participant recruitment, data collection, and data transcription. We note that two of four authors of this paper are NunatuKavut Inuk. Amy Hudson, from the partner community of Black Tickle, and Debbie Martin, who has an immediate and ancestral connection to the community of St. Lewis. In this research, community-members describe their own experiences with off-grid energy sustainability. Community-members were empowered to approve results at public review events, and participated in the analysis of data by giving preliminary feedback.

5.2.1 Operational Methods

The research methods implemented by Mercer et al. (2019) are followed. Ethics approval for this project was initially received from NCC's Research Advisory Committee [RAC]. This approval was then forwarded to the University of Waterloo's Office of Research Ethics and Dalhousie University's Research Ethics Board whom each completed their own supplementary reviews. The research uses two primary research instruments: mixed-methods community member interviews, and key informant interviews. Procedures for this study were collaboratively developed with NCC staff and community-members, and were reviewed during an NCC hosted research-design summit (prior to receiving RAC approval) which took place in July, 2018, prior to commencing fieldwork. During a 12-week field-work period from March 4th – May 27th 2019, the lead author spent approximately three weeks in each partner community. Beginning in Port Hope Simpson, then moving onto Mary's Harbour/Lodge Bay, Charlottetown/Pinsent's Arm, and Cartwright.

As part of this participatory research, a research team entitled the NATURE [NunatuKavut Action Team on Understanding Renewable Energy] Youth Council was formed. Nine Inuit youth from across the territory were hired to work as research assistants, to build local capacity, and to empower residents to steer energy transitions in their own communities (NCC, 2019b). NATURE Youth Council members were tasked with distributing a recruitment letter to all households in the partner communities. Any permanent resident (living in the community at least six months per year) of voting age in the province (at least 18 years) was welcome to participate. Youth Council members were trained in research procedures, sat in on many of the interviews, organized community dissemination events, and participated in weekly staff meetings where preliminary findings and other aspects of community energy planning were discussed.

Lack of detailed census data for some communities complicates calculation of the target population, however our estimate based on available data is that there are approximately 1,275 eligible participants across the six partner communities (Statistics Canada, 2016). In total, we conducted 136 mixed methods community-member interviews, including 31 in Port Hope Simpson, 36 in Mary's Harbour/Lodge Bay, 30 in Charlottetown/Pinsent's Arm, and 39 in Cartwright **[Table 5.3],** representing approximately 11 per cent of the target population. We aimed to speak to any person whom met our inclusion criteria, and were available during the fieldwork period. Overall, 24 percent of respondents identified as non-Indigenous. This subsection of the population was included in our research purposefully, to be as inclusive as possible. In addition, NCC staff stated that community-members who lack active NCC membership and may identify as non-Indigenous in questionnaires, are vital parts of their communities and should be included.

Table 5.3: Demographic Information of Community Respondents					
	Cartwright	**Charlottetown/ Pinsent's Arm**	**Port Hope Simpson**	**Mary's Harbour/ Lodge Bay**	**Percentage of Total**
Sample Size	39	30	31	36	100%
Gender					
Male	15	19	11	13	43%
Female	24	11	20	23	57%
Current Profession					
Public	14	9	10	7	29%
Private	13	16	14	19	46%
Unemployed	7	2	3	2	10%
Other	5	3	4	8	15%
Income (vs. $29,000)					
Much Less/Less	12	2	6	6	19%
Same	4	3	3	5	11%
Much More/More	14	23	17	20	54%
No Response	9	2	5	5	15%
Identify as Indigenous?					
Yes	35	24	27	17	76%
No	4	6	4	19	24%

The mixed-method community-member interviews sought to determine how Inuit in NunatuKavut understand and experience off-grid energy sustainability. First, the local acceptance of diesel-generation was assessed, by asking respondents to rate diesel-generation on a scale of one to five [where 1 = strongly opposed, 2 = somewhat opposed, 3 = neutral, 4 = somewhat support, and 5 = strongly support]; respondents were also given the opportunity to respond ‘Do Not Know’ or ‘Pass’. Qualitative prompts then allowed respondents to elaborate on their rationale for support or opposition. We then sought to determine what respondents perceived as the greatest energy-related challenges in their communities. We accomplished this by asking respondents to rate each variable in **Table 5.2** on a scale of one to five (where 1 = not concerned, and 5 = extremely concerned), respondents were also given the opportunity to respond 'Do Not Know' or 'Pass' to any variable. Qualitative prompts then allowed respondents to elaborate on their rationale for concern. Our mixed-methods research follows a concurrent [or integrated] approach. That is, quantitative [survey results] and qualitative [interview responses] data were collected simultaneously. Both of these data sources were then integrated in the interpretation of results (Creswell & Creswell, 2017). We did this for the purpose of methodological triangulation, i.e. correlating data from multiple data collection methods (Fusch & Ness, 2015).

The key informant interviews aimed to gather data on the tangible economic, environmental, and societal impacts of off-grid energy systems. Inclusion criteria for key informants included a minimum of two years' experience working in a position related to energy sustainability in Newfoundland and Labrador, and the ability to communicate in English – the language spoken by all community members. Key informants were identified throughout the interview process and during informal discussions at the community level. In total, four key informant interviews were conducted.

5.2.2 Data Analysis

For the quantitative component of the study (i.e. likert scale questions in the community-member interviews), basic descriptive statistics were generated with Excel version 15.13.1. For the qualitative component of the study, we have used directed content analysis, applied to community-member and key informant transcripts (for those who consented to be audio-recorded or field notes in the case of respondents who opted not to be audio recorded). In total, 94 community-members and two key informants consented to be audio-recorded. Interviews were transcribed verbatim by the lead author and a hired graduate student. Directed content analysis is a form of qualitative content analysis in which coding starts with theory or relevant research findings. In our case we coded towards the EDST variables outlined in Section 5.2 (Zhang & Wildemuth, 2009; Patton, 2002a – 2002b). NVIVO Version 11.1.1. was used to assist in organizing, managing, and coding the qualitative data.

To enhance the credibility of the project, preliminary results underwent rigorous community review at four public events while we were in the field. Events took place shortly after the three-week fieldwork period in each partner community, occurring in Port Hope Simpson (April 9th, 2019), Mary's Harbour (April 29th), Charlottetown (May 9th), and Cartwright (May 21st). In total, we estimate reaching approximately 75 community-members through these events, including Elders, town council members, utility employees, and the general public. We did not track the name of attendees, nor did we restrict participation to only respondents. This helped us confirm results from participants, and get further feedback from those who were not interested in participating in the study formally. The preliminary results sessions presented the quantitative survey data collected in each community on local acceptance of diesel-generation, key energy-system concerns identified at the community level, and broad qualitative trends that the researchers had observed in field notes. Attendees were given the opportunity to agree or disagree with preliminary findings, to ask questions or add detail to early trends, or to ask the researchers to be interviewed if they felt that their views were not being represented. In all cases, community-members expressed consensus and no additional interviews were requested. Inuit youth hired via the NATURE Youth Council took notes during these meetings. The preliminary data from the public sessions formed the basis of a research report which was publicly hosted on NCC's website for further comment from community members (Mercer et al., 2019). Again, no changes were requested.

The primary limitation of this research is the narrow representation of Indigenous off-grid communities in Newfoundland and Labrador and Canada. This study includes six Inuit communities in southeast Labrador, and none of the other off-grid communities in the province represented by Innu Nation or Nunatsiavut Government. Socio-economic realities, cultural differences, and varied lived experiences with off-grid energy systems may result in different results on a nation-by-nation basis. We note that this decision was purposeful, as community-based participatory research should be done *'with and for'* community, as opposed to *'on'* community (Koster et al., 2012). Our research relationships exist in NunatuKavut, and this project served to address their self-identified priorities. An additional limitation of the study is the cross-sectional nature of the research. Perceptions of existing energy-systems were captured at one point of time, and may not reflect current understandings due to novel experiences such as a fire which occurred at the diesel-plant in Charlottetown in October of 2019 (CBC News, 2019b). However, the theoretical depth of the study should make findings relevant for NunatuKavut communities and other jurisdictions over time.

5.3 Results: Diesel-Generation Local Acceptance and Community Concerns

Across 136 respondents, the mean acceptance rating of diesel was 2.9 / 5, or just slightly on the opposition side of neutral. While this suggests that community-members are ‘neutral’ to the generation source on average, our qualitative analysis suggests that support for diesel-generation is better defined as ‘mixed’. In this study, “Neutral” was the most frequent survey response (41% of respondents), with a considerable proportion of respondents being opposed (31%) or supportive (24%) **[Figure 5.2].** When combining datasets with the initial three pilot communities [Black Tickle, Norman Bay, and St. Lewis] (Mercer et al., 2019), the mean acceptance rating of diesel-generation (n = 211) is 3.0 / 5, with almost exactly the same percentage of community members being opposed or supportive (29 and 28%, respectively).

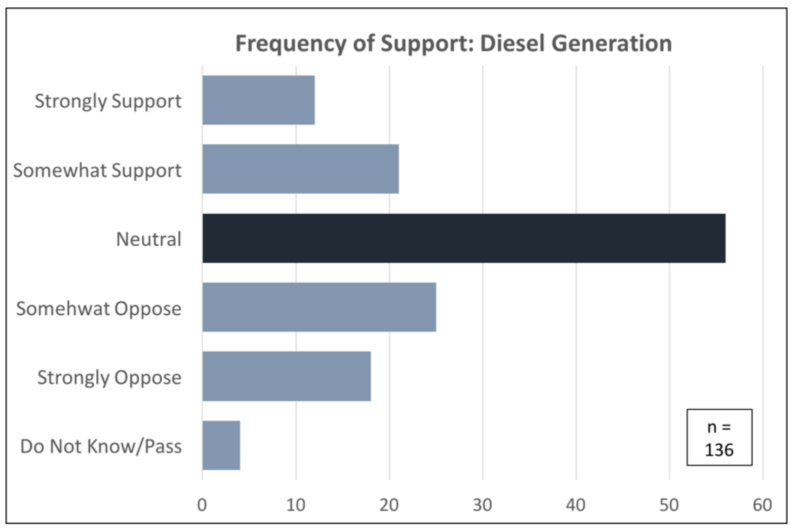

Figure 5.2: Frequency of Support for Diesel Generation

We argue these mixed results are attributed to community-members balancing diesel’s socio-economic contributions and its associated risks. In the following sections we explore what community-members perceive as strengths and weaknesses of their existing energy system, but we stress this should be viewed through the lens of balance. Inuit in NunatuKavut possess highly informed and nuanced understandings of the impacts of diesel-generation on community sustainability. Community-members perceive diesel-generation as: (1) as familiar, proven, and necessary; (2) as reliable and secure; and (3) as a valuable source of employment. Concurrently, community-members remain extremely concerned about: (1) energy security challenges, particularly the volatility of energy prices and dependence on outsider subsidies; (2) how the cost of home heat affects particular segments of the population; (3) environmental challenges such as climate change and the risk of fuel spills anleaks; (4) implications resulting from local power outages; and (5) relationships with existing utilities.

Figure 5.3 presents energy related concerns across all pilot communities. However, we note that important differences emerged at the community-by-community scale **[Figures 5.4 – 5.7].** For example, across all pilot communities 'Continuance of Subsidies', 'Cost of Electricity', and 'Cost of Home Heat' emerged as the only variables with mean concern ratings exceeding 4.0 / 5. However, at the individual community scale, 'Risk of Fuel Spills and Leaks' (Mary's Harbour/Lodge Bay), 'Power Outages' (Cartwright), and 'Climate Change' (Port Hope Simpson) emerged as serious energy-related concerns (meaning concern ratings of 4.1, 4.0, and 3.9, respectively).

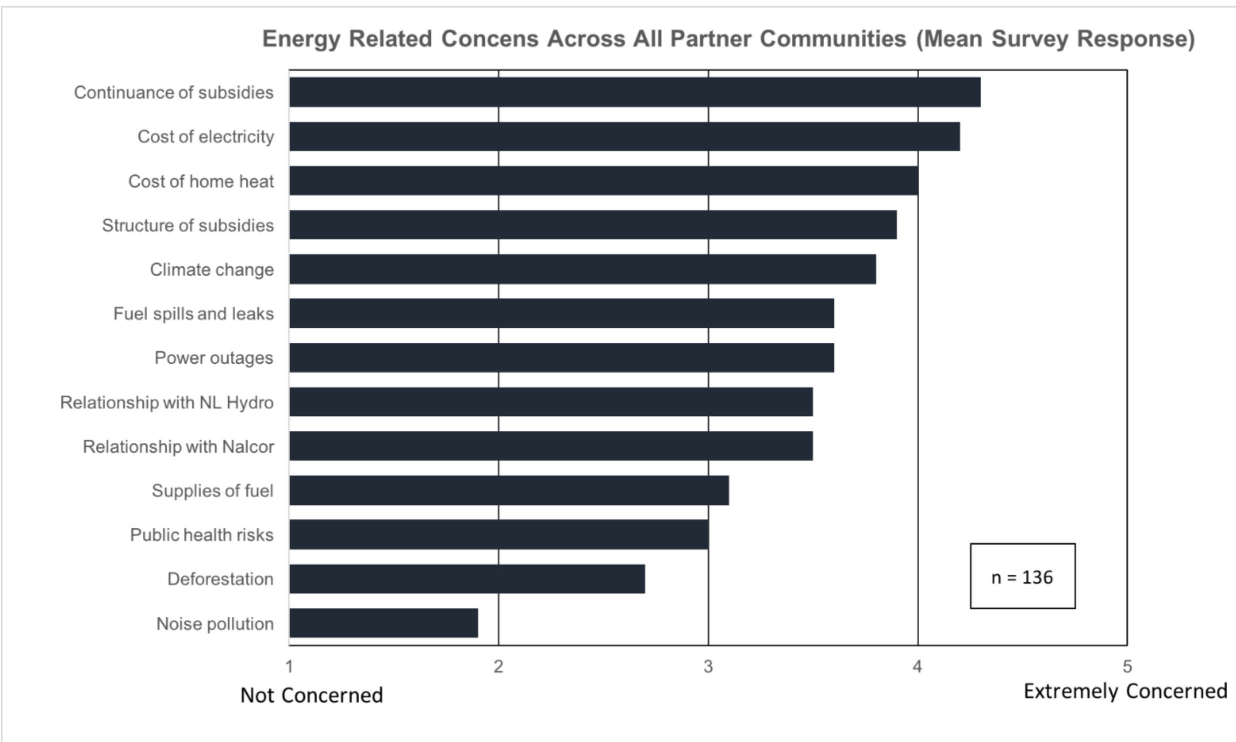

Figure 5.3: Energy Related Concerns Across All Partner Communities

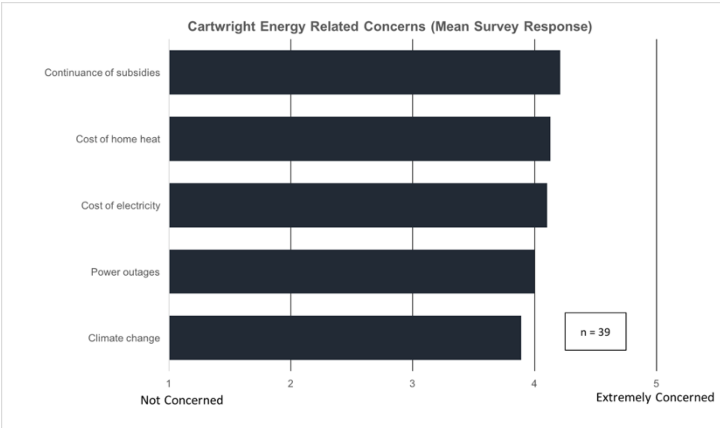

Figure 5.4: Cartwright Energy Related Concerns

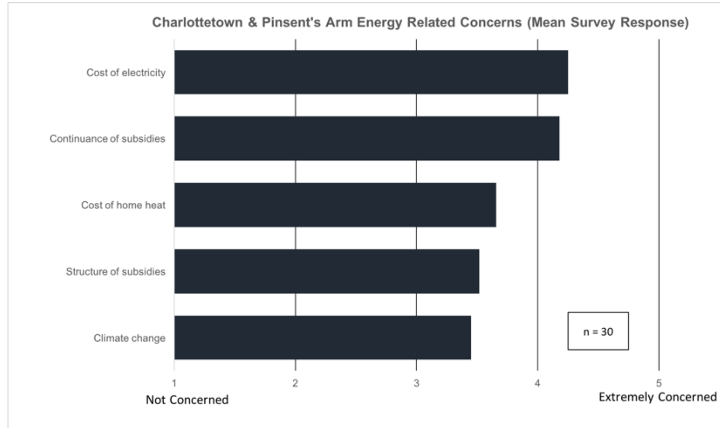

Figure 5.5: Charlottetown & Pinsent's Arm Energy Related Concerns

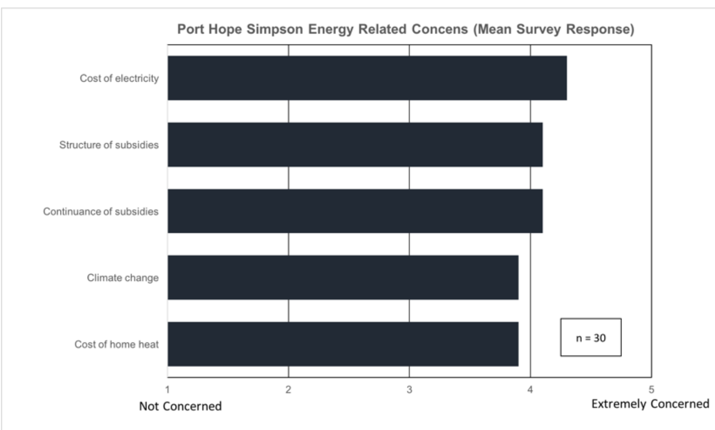

Figure 5.6: Port Hope Simpson Energy Related Concerns

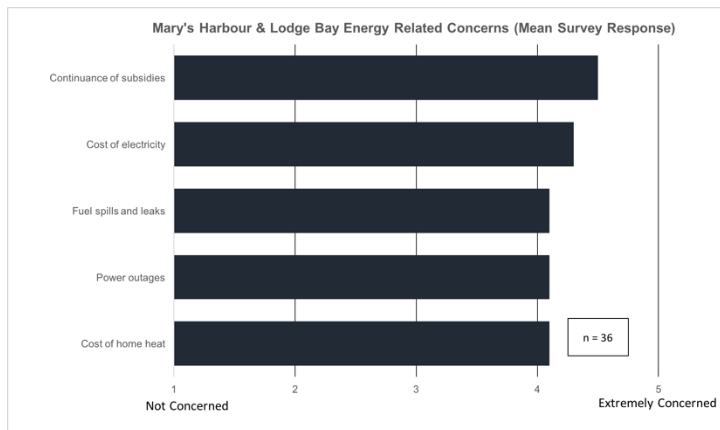

Figure 5.7: Mary's Harbour & Lodge Bay Energy Related Concerns

5.3.1 Positive Socioeconomic Contributions of Diesel Generation

5.3.1.1 Familiar, Proven, and Necessary

Diesel is supported by some as a generation source that community-members are familiar with and have had positive first-hand experiences. As stated by one respondent "I somewhat support it [diesel-generation], because it is tried and tested". Similarly, another respondent stated, "diesel power works, it is proven". Many respondents qualified their support along the lines of "well, that's what we got, so [I strongly support]" – suggesting diesel-entrenchment and resulting familiarity drive community support.

Aside from the small-scale renewable energy projects currently under construction in the community of Mary's Harbour, all six partner communities are exclusively dependent on diesel-generation for electricity provision. As such, diesel power supports clean drinking water systems, sanitation, and healthcare facilities. Diesel is currently essential for basic human needs such as lighting, heating, cooking, and telecommunications (Institute for Energy Research, n.d.). Given the lack of affordable and reliable alternatives in remote communities, diesel-generation is perceived as necessary for sustaining life. As explained by one respondent "We got that [diesel] now. We got no other choice". Another respondent stated "Diesel, right now it is our only alternative… I would not want to lose it". A key informant explained "it is the only [power] source we have, it is the only thing that is available".

While community-members perceive diesel-generation as necessary, they frequently weigh this against the detrimental impacts of the generation source. As explained by one respondent "there is nothing great about it [diesel-generation]… but it is what we have". Another respondent explained "these power plants create a lot of emissions… but they are necessary". Similarly, one respondent stated "it is dirty, and it's expensive, but it is all we have right now".

5.3.1.2 Reliable and Safe

A key informant characterized diesel-systems as '*decentralized'*. That is, electricity is generated directly where it is consumed, instead of at distant power plants which require massive transmission and distribution infrastructure – potentially leading to prolonged outages in case of failures. The key informant explained that locality allows plant operators to readily maintain and repair systems. Another key informant explained "[Diesel is] very reliable, we scarcely have power failure". Community-members also perceived diesel as a reliable power source. As explained by one respondent "[Diesel] is reliable, we do not have many outages". Similarly, another respondent explained "[it is] not often that we be without power".

Community-members believe that diesel is a relatively safe source of power. This is shaped by years of operation, without any major hazards occurring. As explained by one participant "[we] never had any major [issues], never had no fires". Similarly, another respondent stated "over the years here, diesel power… it is pretty safe… we never had no big issues around here". One respondent explained "we got through all these years, and lots of people lived a good old age… I don't think diesel killed them".

5.3.1.3 Valuable Employment Opportunities

Most adults in partner communities work in seasonal industries such as the fishery and rely on employment insurance benefits in the off-season. For instance, in 2016 unemployment rates ranged from 38% in Mary's Harbour to 60% in Lodge Bay (Statistics Canada, 2016). Diesel-generation is highly valued by community-members, as it creates high-paying, year-round employment opportunities – in communities where limited full-time work is available. A key informant confirmed that there are at least two full-time diesel plant operation jobs in each community, as well as supplemental relief and maintenance positions.

Figures available via Nalcor Energy (2017) (Newfoundland and Labrador Hydro's parent company) suggest that diesel-plant operators earn on average $117,700 per year. Median incomes in the partner communities range from $28,608 in Cartwright to $35,904 in Mary's Harbour (Statistics Canada, 2016). As such, the total salary of diesel-plant operators is approximately 3-4 times greater than median incomes. As stated by one respondent “Newfoundland and Labrador Hydro, they employ quite a few people in our community”. Similarly, another respondent explained “[NL] Hydro jobs have always been good jobs in our community”. One respondent spoke to how proud they were to work for NL Hydro, especially in their attainment of ISO 14001 certification, an international certification for effective environmental management systems.

The six partner communities in this research are all small, tight-knit communities, with deep interconnections and relationships amongst all residents. A significant proportion of the population is connected to a diesel-plant operator as an immediate family member, relative, acquaintance, or neighbour. As such, respondents frequently sought to protect the livelihoods afforded to diesel-workers which are intimately tied to the financial stability of their homes and communities. A key informant described potential diesel job losses as families being “cut” from communities. Another respondent explained “My husband works with… Hydro… that’s our living… I am not in support of nothing that is going to take diesel out of this town”. Another respondent stressed “I have my father and my brother; both spent their careers at the diesel plant”.

5.3.2 Community Risks

5.3.2.1 Energy Security: Subsidy Dependence and Price Volatility

Weis & Illinca (2008) defined energy security in an off-grid context as both the secure supply and stable price of fuel sources. While the security of supply did not emerge as a major concern across partner communities (mean concern rating of 3.1/5 [**Figure 5.3]),** concerns related to price and volatility were acute. The continuance of energy subsidies, the cost of electricity, and the structure of energy subsidies emerged as serious energy-related concerns (mean concern ratings of 4.3/5, 4.2, and 3.9, respectively) [Figure 5.3].

Electricity rates are heavily subsidized in the partner communities which keeps rates affordable for consumers. According to the NL’s Department of Mines and Energy (2003), ratepayers in diesel-powered communities contribute 26 per cent of the ‘actual cost’ of electricity generation. Community-members expressed concern about their ability to afford electricity bills if existing subsidies were discontinued. As explained by one respondent "If you never had subsidies, it would be a lot more expensive, it would be… a lot harder to live in those [diesel-powered] communities". Similarly, another respondent stated "right now we have the subsidies so our light bill [is]… lower…. If we never had that subsidy our light bills will be going up triple and quadruple". Another respondent stated "If the subsidy weren't there, it would probably double my light bill, maybe even more than that… subsidies certainly make a difference and I wouldn't want to see it discontinue".

The structure of subsidies impacts those reliant on electric heat. Monthly consumption in excess of 1,000kWh is charged at a rate of 18.523 c/kWh (an increase from the subsidized rate of 12.203 c/kWh), and electric heating requires several thousand kWh per month in the winter. This makes the cost of electric heat untenable for most households. A key informant explained "they have a maximum amount of kilowatts that you can burn, and once you go over that of course it gets more expensive". A respondent stated

> "we work really hard to keep… our kilowatts at 1,000, so we stay on the subsidy… we are all constantly watching, and my husband can read the meters, he goes out… to make sure that we are within our lines"

Only a small proportion of respondents rely exclusively on electric heat (5%) **[Table 5.4].** These respondents reported high electricity bills relative to the incomes of most community members. As explained by one respondent "I've got a small bungalow house… my [monthly] light bill is almost like $900 dollars". Another respondent explained "In the winter we be paying anywhere between $500 to $600 a month in electric heat, and that's with the wood stove going in the daytime".

Table 5.4: Primary Heat Source by Community	Cartwright	Charlottetown & Pinsent's Arm	Port Hope Simpson	Mary's Harbour & Lodge Bay	Percentage of Total
Wood	29	26	23	27	77%
Wood-Oil	2	1	4	5	9%
Oil	3	2	2	1	6%
Electric	2	1	2	2	5%
Other	3	0	0	1	3%

One of the greatest concerns across partner communities is the uncertainty surrounding future electricity rate increases. As a result of cost-pressures created by the Lower Churchill Hydroelectricity Project, and in the absence of rate mitigation measures, electricity rates for domestic consumers on the island portion of the province are expected to almost double from 12.3c/kWh in 2019 to 22.9c/kWh by 2021 (Synapse, 2019). As explained by one respondent "Right now our Hydro bills are really good… but I can't see that happening down the road because of Muskrat Falls". Similarly, another respondent stated "Right now our electricity bills are not too bad, but if they double or triple or whatever they are planning on doing, then it's going to be a huge difference". One respondent stressed "If it's true what they say, that they [rates] are going to double, how… are we going to live? Never [be able to] live on the coast [of Labrador]".

Respondents stressed how rate increases would impact the majority of community-members dependent on fixed, seasonal, and generally low incomes. As explained by one respondent "Most people in this area, is seasonal worker[s]… if you have to dish out an extra $100, $150 dollars a month…. That could hurt some peoples bottom line". Another respondent explained "when you are getting older, and your wage is not increasing much, and the cost [of electricity] starts going up… something's going to have to suffer". Another respondent stated "Hydro is doubling… when you don't have a large income, and that just makes it all that much harder".

5.3.2.2 Cultural Importance of Firewood Harvesting: Heat Insecurity as a Distributed Risk

The cost of home heat emerged as the third highest energy-related concern across partner communities, with a mean concern rating of 4.0/5 **[Figure 5.3].** Respondents expressed satisfaction and cultural connection with wood heat, but also expressed worry for those who cannot harvest their own firewood and must depend on expensive heating alternatives. As demonstrated in **Table 5.4**, a large majority of respondents utilize wood (or wood-and oil mix) for space heating (77% and 9%, respectively). Firewood permits are inexpensive, costing $25 per household (seniors are provided a discount at $16.50) allowing the permit holder to harvest upwards of 10 cords of timber. Wood consumption varies widely and is dependent on factors such as house size, number of occupants, and heating fuel mixtures, ranging from 2 – 15 cords across respondents. Average consumption across 53 respondents who reported their wood use was approximately 7.4 cords, which is within the limits of a single household permit.

The main costs of firewood harvesting are related to gasoline for snowmobiles and chainsaws, maintenance, wear and tear on equipment, and manual labour. Most respondents viewed these costs as reasonable. As explained by one respondent “Only thing expensive about it is getting gas. Other than that, just a bit of manual labour. If you’re willing to do it, it’s not that hard”. Another respondent explained “We got lots [of wood] around here…go in and get your wood, and haven’t got to pay much for it, just a little bit of gas”. Another respondent stated “[It’s] very cheap, average gas bill for cutting and [getting it] home here is $300”. Distance travelled (and subsequent gasoline burned) is the main component of firewood costs. Distance travelled varied by community and household, ranging from 1.5 – 65km (one way). However, the average across 49 respondents who reported their distance travelled was 12.8km.

Respondents suggested that firewood harvesting is much more than a heat source in NunatuKavut communities and can be considered an integral part of local culture and land-based way of life. As previously discussed, Inuit in NunatuKavut maintain multiple dwellings in order to accommodate seasonal harvests of wildlife and fish (Martin et al., 2012). In this research, 77% of respondents across partner communities reported owning at least one cabin or camp outside of their community. Firewood harvesting frequently occurs concurrently with sustenance activities at cabins or camps. As explained by one respondent “going into the cabin, doing that [firewood] harvesting in the spare time for something to do”. Another respondent explained “I basically kill two birds in one stone. Spend time in the cabin, I cut wood”. Respondents expressed a deep, therapeutic, connection to firewood harvesting. As stated by one respondent “the reason I… want to get it myself is because I enjoy the wood[s]”. Another respondent stated “it is enjoyable to be able to go in and get it yourself, is what it is, therapy”.

Community-members contrasted the relatively low cost of harvesting firewood with electric heat, furnace oil, and commercial firewood. A key informant explained that wood-heated homes typically have electricity bills of less than $100 per month. A respondent explained "I am using wood heat, my light bill should be around $60-80. If I turn on electric heat… my light bill could be $500". Another respondent stated "If I was not burning wood… my [NL] Hydro bill would go five times higher". A small proportion of community members (9%) rely exclusively on furnace oil, with most viewing the heating source as prohibitively expensive **[Table 5.4].** A key informant explained the unaffordability of furnace oil for those on fixed incomes

> "People [in our communities] are 65 and most of them are getting their old age security and their Canada Pension… about $1,200 a month... at my house I figure I would burn a drum [of oil] a week… that's $1,200 a month for oil in the wintertime".

One respondent stated "well you're talking about spending $500 on 50 gallons of furnace oil… that's a bit steep when you've got a 200-gallon tank. Another respondent explained "In regards to oil [costs], maybe [spending] $3,000 a year". Similarly, commercial firewood was perceived as expensive compared to self-harvesting in the generally low-income communities. Commercial firewood costs vary by community and subsequent delivery charges, but are generally greater than self-harvesting. As explained by one respondent "[self-harvesting is] way cheaper than buying it… buy 7 cord here for like $700 dollars. You're probably [self-cutting] 10 or 12 cord, for $250 probably, max". Another respondent explained "Let's say for instance I went to buy me [sic] wood, for four cord, it's $480".

Heat insecurity, i.e. access to clean, affordable, and reliable heat, is seen as a distributed risk in the partner communities affecting primarily those who cannot harvest their own firewood (Nunatsiavut Government, 2016). Firewood harvesting is primarily the responsibility of men in NunatuKavut communities, creating heating challenges for single mothers, widows, and women generally. Across the six partner communities, eight respondents reported living in an 'inadequately heated home', six (75%) of whom were women. As stated by one respondent "It's hard if you're a single person, it's fine if you're a man, but it's that much harder for a woman to go in the woods and haul her own firewood". Similarly, another respondent stated "I don't have to worry about getting firewood and stuff, but some people like single parents… it's not so easy". Another respondent stated "It's so hard [home heating]

… we can't get our own wood, because my husband is gone [passed away], so we got to depend on everyone else [to cut it for us]".

Firewood access is also a challenge for seniors and others with mobility challenges. As explained by one respondent "kids and elderly can't be going out and getting wood… they have no alternative heat source and it's not good". Similarly, another respondent explained "I'm 70 years old, I'm not going in the woods, hauling wood…. You can buy wood from people, but you still got to saw it up". Another respondent stated "a lot of people can no longer get their own wood supply, and they are relying pretty well on oil, and oil is very expensive… I'm concerned about what's going to happen to these people".

5.3.2.3 Climate Change: Shifting Local Conditions and Threats to Inuit Way of Life

Across partner communities, respondents rated *'Climate Change'* as the fifth highest energy related concern, with a mean concern rating of 3.8/5. In general, community-members categorize diesel-power as an environmentally destructive generation source. As explained by one respondent "diesel… it's bad for the environment. Anything bad for the environment is a no no". Another respondent stated "diesel plants, everyone knows they are not good for the environment".

Emissions from diesel-plants were a specific concern of community-members, with links established to processes of climate change. As explained by one respondent "every year, it's getting warmer… are these, the power plants around here, affecting all this?". Another respondent explained "As it is leaving the [diesel] plant, going into the atmosphere, well we knows [sic] what we are doing there". Total diesel-consumption throughout the six partner communities is approximately 5.2 million litres per year (NL Hydro, 2018a), ranging from roughly 1 million litres in Port Hope Simpson to 1.5 million in Charlottetown/Pinsent's Arm. While this results in a small total amount of carbon dioxide emissions (~14,000 tonnes), we note that per-capita emissions (8.6t CO_2e) for electricity generation are almost four times larger than the national Canadian average (2.2 CO_2e) (QUEST, 2018).

Community members have observed shifts in local climate, particularly intensifying wind speeds and more frequent extreme weather events. With regards to intensifying wind speeds, one respondent explained "This is an effect of climate change this year… it's windier now than it's ever been".

Similarly, another respondent explained “Dad always says he never seen wind like it was the last two or three, four or five years. It’s always windy here… I always says that’s global warming”. Another respondent stated “This past winter, we’ve had so much wind. More than I could ever remember”. Remarking on the increased frequency of extreme weather events, one respondent stated “Look at the window. Storms are getting worse. Bitter cold in some places, droughts, floods… and it’s only going to get worse”. Similarly, another respondent explained “Take this area for instance, climate change, has affected our winter – we had a [unbelievable] winter. One that would make people think climate change isn’t happening. But it was an early winter, and it was extreme”. Another respondent stated “More extremes, it’s not just [warming]”.

Community members perceive these impacts of climate change as a threat to their traditional way of life and access to resources. Impacts on the fishery are a particular concern of community members, as the fishery continues to uphold commercial and cultural significance. One respondent explained “Climate change, you know, fishing now the last five years. The storms are getting stronger, it’s harder and harder for us to fish because the wind is getting worse”. Similarly, another respondent explained “The ice conditions are terrible… last two of the last three years, I’ve had to push through ice in July [in my fishing vessel]. That’s concerning to me. So it [climate] change directly affects what I’m doing [fishing]”. Another respondent stated “One or two degrees [Celsius increase] even in the crab fishing, for the survivability of eggs, for the mating all that kind of stuff, makes a whole lot of difference”.

5.3.2.4 Fuel Spills and Leaks: Threats to Country Foods

Across partner communities, the risk of fuel spills and leaks was the sixth highest rated concern, given a mean concern rating of 3.6/5 **[Figure 5.3].** However, we note that this concern was rated noticeably higher in the partner community of Mary’s Harbour/Lodge Bay, with a mean concern rating of 4.1/5 **[Figure 5.7].** Diesel fuel is stored in each partner community, and respondents feared the potential for fuel spills from storage facilities. As explained by one respondent “You are storing thousands upon thousands of gallons… there can be catastrophic problems if you get the solution into the water”. Similarly, another respondent stated “anything that might happen up to the dyke where the hydro plant is, that’s going to kill everything in and around it”.

Community members intrinsically value the health of the land and water, making the threat of fuel spills a significant concern. One respondent explained "As a human being, they are very important to me [the health of the water and land]… it is a one time use here, we do not get another ocean". Similarly, another respondent explained "you are going to kill the fish, you are going to pollute the water, you [are] going to pollute the land". The communities maintain a sustenance lifestyle, as such, any amount of fuel spilled on the land and water can have detrimental effects on people's access to country foods. As explained by one respondent "with the oil spill, the fish, and the seals, and the birds, they are doomed". Similarly, another respondent explained "If there was oil spill… [I fear for] out and around berry picking grounds". Because of this intrinsic value and reliance on country foods, community members do not separate the health of the land from their own health. One respondent stated:

> [fuel spills] concerns our health and the wildlife of Labrador. We use this area for fishing, so anything that pollutes our waters are not going to be beneficial for our health. The food, I'd rather natural food than imported… where I know where I'm getting it from.

Another respondent explained "look at all the effects it [fuel spills] could have… from what we eat… we use the waters… we hunt, whatever else is using the land [will be affected]".

5.3.2.5 Household Spills in Mary's Harbour and Lodge Bay

Concerns were elevated in the partner communities of Mary's Harbour and Lodge Bay due to a recent and frequent history of household oil spills and leaks. One key informant explained "there is up to three [household spills] so far this winter". A respondent explained "In the last year or two we have had at least four home [oil] tanks spill [in this community]". Household oil spills are a significant challenge as they displace community-members from their homes, they are expensive to remediate, and they worsen an already precarious heat access situation.

Due to freezing of the ground, only limited remediation can happen in the winter months, oftentimes forcing community-members from their homes for lengthy periods before spills can be remediated. A key informant explained "you can't remove the soil, everything is frozen all winter. So it's usually because of the time of the year, that it takes so long [to remediate]". A respondent stated "One happened last fall and of course over the winter there's not much clean-up you can do…. we had one…. winter before last, and the lady was out of her house the whole winter". Similarly, another respondent explained "two of my friends… are involved right now with oil spills at their house, and it's taken forever for them to get it rectified and back home".

While generally covered by household insurance, oil spills are expensive to remediate in off-grid communities, due to the requirement to bring in outside remediation crews. As explained by one respondent

> "What they are after spending now with insurance, I'd say they'd been better off if they had taken down the house and bulldozed it and clean up and put a new room [house] in there… they've had people here for weeks [cleaning up]".

Similarly, another respondent explained "It's costing you to clean up when you've got an oil spill… one house clean-up [in Mary's Harbour] was $120,000, and the one over here, [they] probably could've built a new house". Another respondent stated "Hundreds of thousands of dollars [to remediate]". Two key informants expressed worry that household spills may go unreported if homeowners lack insurance due to these significant remediation costs. One informant stated "They [recent homeowners with spills] all had insurance… if they didn't have insurance, we probably wouldn't have heard about it".

The local history of household spills has created fear in relying on furnace oil. With regards to this sense of fear, one respondent explained "I refuse to burn fuel. The tank is always empty, because I'm just too afraid of the spills… especially the past year with all the goings on [spills in the community]". Similarly, another respondent explained "I don't like stove oil no more. I just had two big baths of my house with furnace oil, [I] don't want anything to do with it ever again". Another respondent stated "No one would want to be out of their house for six months or a year. I'm out every second, third day. I'm checking the tank; I'm checking the lines [for leaks]".

This sense of fear sometimes forces community-members to convert to expensive new heating systems, placing further restrictions on an already precarious fuel access situation for seniors and low income individuals. As explained by one respondent "The smell of it [oil] now gives me the creeps. I'm not having it [a spill] again, so I need a different source of heat and the only thing I can go with now is electric heat". Similarly, another respondent explained "I'm in the process now of taking out oil… I use wood and oil, so I'm getting rid of oil… I'm probably going to put a heat pump in, plus electric for backup. So getting rid of oil, no more oil". Another respondent stated "[Because of my oil spill] it's going to cost me $10,000 to put electric heat in my house. Where the hell am I going to get the money to put it there?".

5.3.2.6 Power Outages: Loss of Heat, Essential Services, Electronics and Dependence on Outsiders

Across all partner communities, power outages emerged as the seventh highest energy-related concern, with a mean concern rating of 3.6/5 **[Figure 5.3].** However, we note that this emerged as a more serious concern in the partner communities of Mary's Harbour/Lodge Bay and Cartwright (both with mean concern ratings of 4.0/5) **[Figure 5.7 & Figure 5.4].** A key concern resulting from power outages is loss of heat and essential services in cold northern climates. Power outages affect all heat sources, as electricity is required to operate furnace blowers, and fire risks are elevated if blowers are non-operational. As explained by one respondent "Most of us have furnaces which requires power for the blower and things like that for safety. So [in the case of power outages] we wouldn't have the ability to heat the home". Similarly, another respondent stated "not everybody has a wood stove… you got people in apartment complexes that rely on electric or oil heat… if we have a power outage that's like 18 hours long, they are going to be froze". Another respondent stated "When we get a cold morning… minus thirty [degrees Celsius], and the generator goes down – a lot can happen".

Power outages and heat loss disproportionately impact seniors and public housing residents. When residents are no longer able to harvest their own firewood, they turn to oil furnaces or electric heat. A key informant explained that prolonged power outages in Cartwright have resulted in seniors living in 5-10 degree homes in the winter. A respondent stated "If the power goes out, all the seniors in the community won't have any power, so they won't have any heat". Another respondent explained "You think about the seniors, and the ones that aren't so lucky, who don't have alternative sources of heat".

Power outages may also disrupt essential services and businesses reliant on electricity in off-grid communities such as water pumps, refrigeration, fish plant operation, sewer, schooling, grocery stores, and medical devices. One respondent explained "if you got the generator give out for two days, that's potentially like water lines freezing up and busting in homes". Similarly, another respondent stated "people rely on the power for health reasons… respirators, or could be on anything. You get those power outages; it also comes along with health issues". Another respondent stated "if you had one or two generators down here in the summertime, and you might have $600,000 - $700,000 worth of crab… and there's no backup [to keep it refrigerated], what do you do?".

Power surges result in the destruction of household appliances and other electronics in the partner communities. As explained by one respondent "It adds up, spending more in lightbulbs… it got to be affecting our computers, our TVs…. these surges we're getting". Similarly, another respondent stated "It happens quite often… people have lost TVs, people have lost fridges, people have lost expensive equipment due to power outages". Another respondent stated "Every time we get power outages, something in your home burn up, or you lose… a TV, or a toaster".

Destruction of appliances and electronics is financially challenging for generally low-income community members as compensation by the utility is uncommon and replacements are expensive and oftentimes unavailable in remote regions. One respondent explained that their neighbour lost $2,000 in equipment as a result of power surges, and was compensated only $600 by the utility. Similarly, another respondent explained "I lost a TV one time, but no one had no proof that it was caused by the electric power outage, so I had to buy it myself". Another respondent stated "If you lose an appliance due to a power outage, unless you want to pay triple the regular cost [locally], you got to travel to get one, and that's not always possible in the middle of winter".

Multiple key informants explained that distribution-related power outage repairs are dependent on outside maintenance crews in the partner communities. This can be challenging in winter months, as harsh weather conditions can prevent choppers, charters, and vehicles from entering the communities for several days – potentially resulting in prolonged power outages. This issue is prominent in Cartwright, which is amongst the most remote of the partner communities. One respondent explained "If it happens in the winter, it could be days before a crew can get in to fix it, if there's something serious like wires down". Similarly, another respondent stated "it takes two or three days for the right people to come in here, and if we already had the right people… we wouldn't go without power for so long". Another respondent explained "Last winter we had a power outage for 18 hours, because somebody couldn't get in and then there was bad weather… the right things weren't here to fix it, so it's a long time to be without power".

5.3.2.7 Dispossession of Resources: Inequitable Sense of Development

Relationships with existing utilities, Nalcor and NL Hydro, were both given mean concern ratings of 3.5/5 across partner communities **[Figure 5.3].** Community-members feel as though they are being dispossessed of their resources for the benefit of outsiders. This is mostly in relation to the Muskrat Falls project, a large-scale hydro dam being built on the traditional territory of NunatuKavut Inuit. The transmission assets of Muskrat Falls directly bypass the partner communities en route to markets in Newfoundland, Nova Scotia, and the Northeast United States. One respondent explained "We are in Labrador, and the power is coming out of here, we should be having the benefits of it". Similarly, another respondent explained "Muskrat Falls… I know that's been hell… I see us losing so much, so much has been taken out of Labrador. For what? For what in return?". Another respondent stated "Should never be allowed, [to] take the resources out of Labrador, [and] to give it to someone else".

Community-members feel an inequitable sense of development in relation to Muskrat Falls, and that they are bearing the majority of the risks of the project, but are not seeing any corresponding benefit. One respondent explained:

> "[Inuit in Labrador] are losing their fish [as a result of Muskrat Falls], they are losing their wildlife… they are losing their homes because of all this water… They are going to take all of this away from Labrador… they don't realize what they are taking".

Similarly, another respondent stated "Taken from our water, our land, brought over our land, destroyed it, and what are we getting out of it?... We're not getting a damn thing". Another respondent stated "Why should we kill this part of Labrador and deliver [power] to the United States or other parts of Canada".

In general, respondents describe a tumultuous relationship with Nalcor Energy, and believe the Crown Energy Corporation has largely been dismissive of community concerns. One respondent explained

> "I don't think they take in account how we feel about it [Muskrat Falls]… they operate in such a big scale… the community… in general is not really important, because who are we? We are just this town towards 300 people out of all the province [of 500,000]".

Another respondent explained "Nalcor, no matter what goes on… they are going to do what they ultimately want to do anyways, they don't care about the people. They care about their bottom line… and that is all they are going to see". Another respondent stated "They [Nalcor] are being really selfish… they are only concerned about them, they are not concerned about the South or North Coast of Labrador as a whole, when it comes to using diesel or renewable energy".

5.4 Discussion

With the invitation from the NCC's Department to Research, Education and Culture to partner and lead this project with six new communities, we were able to confirm and build upon several important themes discovered in our initial research (Mercer et al., 2019). The emerging literature related to Indigenous Peoples and sustainable energy transitions in Canada urges that renewable energy projects may only offer advantage when grounded in community autonomy and local decision making (Walker et al., 2019; Krupa et al., 2012). We urge researchers, policymakers, developers, and advocates alike to take caution – as our research demonstrates that community-members are not necessarily opposed to diesel-generation, that some aspects of the existing energy system are valued, and forcing energy transitions on community ignores these benefits and may be perceived as an imposition on local autonomy. Across the six partner communities (n = 136), only 31% of respondents were opposed to the existing diesel generation system. This confirms the finding of our initial study, wherein 75 community-members gave diesel-generation a mean acceptance rating of 3.2 / 5, as well as the findings of McDonald & Pearce (2013) whom demonstrated a 'reluctant acceptance' of diesel-generation in Nunavut.

Our research findings have made us reflect on problems embedded in the federal government's flagship diesel-reduction policy entitled the "Indigenous Off-Diesel Initiative" (Government of Canada, 2019). The name of the policy in and of itself ignores Indigenous rights, implying a decision to 'get off diesel', and ignoring Canada's commitment to free, prior, and informed consent [FPIC] for developments on or which affect Indigenous territories. FPIC is an essential component of self-determination, which renewable energy projects are frequently purported to enhance (Rezeai & Dowlatabadi, 2016). In addition, we suggest the policy name is inattentive and dismissive of historical traumas. As discussed in Section 5.2, Inuit in NunatuKavut have practiced seasonal migration since time immemorial. The communities settled permanently at the urging of the Church and Government in the mid 20th century, forcing them to rely on diesel-generation in year-round communities. Now that communities have adapted to the generation source, colonial bodies are again suggesting dramatic changes to infrastructure which communities perceive as necessary for their survival. Our findings confirm the need for decolonized processes: that is, grounding potential energy transitions in community autonomy and local decision making, recognizing and protecting strengths associated with existing energy systems, and supporting communities in addressing self-identified priorities.

To understand community support of existing energy systems, we consider the *process* and *outcome* dimensions outlined in the community energy literature (Walker & Devine-Wright, 2008). The *outcome* dimension of off-grid diesel systems can be described as *'local and collective'*. Many community-members perceive diesel-generation as necessary for their very survival. The added operational benefits of diesel-generation such as relative reliability and valuable employment opportunities further enhance community support for the generation source. In our initial research, we described the *process* dimension of local energy systems as *'closed and institutional',* with several issues emerging such as unresponsiveness to community concerns and lack of transparent information sharing (Mercer et al., 2019). *Process* and *procedural justice* concerns emerged in this study as well, related to dispossession of resource and powerlessness in decision-making. However, the six new partner communities generally have larger populations, more services, and greater economic opportunity than the original pilot communities. As a result, community-members are less dependent on existing utilities for community survival and prosperity. As such, we suggest that communities leading their own social and economic development opportunities may be one potential pathway for improving relationships with existing utilities and perceived challenges of off-grid energy systems.

We contrast community-member experiences with the local diesel-system with that of the Muskrat Falls hydroelectric facility. Here, the *outcome* dimension can be considered 'distant and private'. Community-members feel as though they are being dispossessed of their resources, that they are bearing the majority of the risks associated with the project, and that the vast majority of project benefits are being exported. The *process* dimension of the project can also be considered 'closed and institutional': community-members feel as though they are unable to influence decisions made by developers, and that their concerns are of little importance. This should serve as an awakening for renewable energy proponents: that unless developments are led by and benefit community principally, that social preference leans towards known diesel-based systems which enhance local socio-economic conditions.

Our empirical findings point towards inequitable distribution of energy-system risks as a central community concern - or what EDST describes as 'procedural sustainability'. This is demonstrated most vividly in the ratings of community-member concerns. For instance, while the cost of electricity was rated as the second highest energy system concern [**Figure 5.3],** we found that the vast majority of respondents (86%) are reliant on wood heat [or wood and oil mix], and are largely satisfied with current electricity rates. As such, we suggest that this is a distributed risk: affecting predominantly low income or seasonal workers, and those dependent on electric heat. The structure of energy subsidies further enhances this risk, punishing financially the small-proportion of the population who depend on electric heat. Similarly, the cost of home heat was rated as the third highest energy-related concern **[Figure 5.3],** an issue which affects predominantly women, seniors, and others who cannot access their own wood heat in the partner communities. We found that 62% of respondents who reported living in an 'inadequately heated home' across both phases of research were women. We also find that the effects of power outages are felt unevenly across community: for example, it is more difficult for low income earners to replace electronics and appliances, and the loss of heat and blowers disproportionately affects seniors and public housing residents who cannot access their own sources of wood heat.

In general, our findings suggest that energy system risks are felt disproportionately by segments of a community's population, but also disproportionately across communities. While three concerns were rated in the top five of all partner communities [e.g. the continuance of energy subsidies, the cost of electricity, the cost of home heat], major concerns emerged at the individual community scale such as the risk of fuel spills and leaks in Mary's Harbour/Lodge Bay, and the threat of power outages in

Cartwright. Our research establishes the necessity of community-led energy-planning research on a community-by-community scale, as opposed to regional plans which may diminish the importance of individual community concerns.

The social acceptance of diesel-generation is eroded by *exogenous* aspects of community energy systems. For example, community-members fear being heavily reliant on outsider subsidies (approximately 75% of diesel-generation costs), and what this may mean for the continuance of their communities if these subsidies were to diminish or disappear. Likewise, community-members expressed significant worry around external cost pressures created by the Muskrat Falls project, and how increased rates may affect their ability to live in diesel-powered communities. Additional *exogenous* factors included dependence on outside maintenance crews to repair damaged power lines, which often leaves communities without power for days on end, and dependence on outside fuel spill remediation crews, which can displace community-members from their homes for extended periods. Again, we point to the need for energy autonomy, community control, and local decision making as key measures to address diesel-system risks.

5.5 Concluding Remarks:

Canada is frequently regarded as a global leader in renewable energy development. However, it is a dramatically different scenario at the off-grid scale, where 190 of 259 communities remain almost exclusively dependent on diesel-generation. A growing body of literature asserts the economic, environmental, and societal challenges of diesel-generation, however there has been limited qualitative evidence related to community-member experiences or Indigenous perspectives. This is especially problematic, given that a large majority of off-grid communities identify as First Nations, Inuit, or Metis, and these voices have been largely excluded from the existing evidence base.

Our initial research with and for the NunatuKavut Community Council, in the Inuit diesel-dependent communities of Black Tickle, Norman Bay, and St. Lewis, sought to address this gap in the existing literature (Mercer et al., 2019). The novel findings of this project challenged conventional understanding of the implications of diesel-generation for community sustainability. We found that community-members are not necessarily opposed to diesel-generation, and in fact, value socio-economic contributions of the generation source such as familiarity, reliability, and employment. That said, significant concerns remained about environmental degradation, the risks of fuel spills and leaks, exogenous aspects of development, and procedural injustice. Given these insights, we were invited back to the territory of NunatuKavut to expand our research approach to six new partner communities. Doing so allowed us to validate Inuit perspectives and knowledge. Mainly that communities are not-necessarily opposed to diesel generation, and that employment, safety, security, and reliability are highly valued aspects of existing energy systems. Centering Inuit voices in this research has helped us further our understanding of the impacts of off-grid energy systems. Primary energy system concerns are related to *exogenous* aspects of development: mainly price fluctuations which are outside of the control of community-members, dependence on subsidies provided by outsiders, and reliance on outside maintenance and remediation crews. Energy autonomy and local decision making may have the power to counteract these detrimental impacts.

Our research demonstrates the expertise of community-members. Community-members add rich detail to commonly cited challenges of off-grid diesel systems. For instance, how power outages can be life threatening due to loss of heat, the havoc that surges can wreak on household appliances and electronics, and the loss of essential services. Or how fuel spills and leaks, which are intricately connected to people's health, can cause homelessness, worsen heat insecurity, and are extremely difficult to remediate.

We hesitate to recommend future areas of research, as research with and for Indigenous communities should be initiated by communities themselves. However, we encourage researchers to build meaningful relationships, seek partnerships, and gain permission from Indigenous communities to carry out energy-related research. Such research, if desired, may help further understanding of the impacts of off-grid energy systems, and the diversity of strengths and community positions which must be recognized in any proposed sustainable energy transition.

Chapter 6“That’s Our Traditional Way as Indigenous Peoples”: Towards a Conceptual Framework for Understanding Community Support of Sustainable Energies in NunatuKavut, Labrador

6.1 Introduction:

Canada is a global leader in renewable energy development, which provides 17% of the country’s total primary energy supply (Natural Resources Canada [NRCAN], 2019). Low carbon generation sources such as large-scale hydroelectricity, nuclear-generation, and non-hydro renewables (wind, solar, biomass) account for approximately 82 per cent of electricity-generation in Canada. The remainder is supplied by natural gas, coal, and a small amount of petroleum.

Where the electricity-generation mix differs dramatically in Canada is at the off-grid scale. The Government of Canada (2011) defines an off-grid community as: (1) any community not connected to the North American electricity grid or piped natural gas network; and (2) any permanent settlement (of at least five years or longer) with at least 10 dwellings. According to these criteria, there are 258 off-grid communities throughout the country (NRCAN, 2018). The vast majority of off-grid communities in Canada (n = 190) rely almost exclusively on diesel fuel for electricity generation. While 4.9% of the population of Canada identifies as Indigenous, a large majority of off-grid communities (n = 170) are First Nations, Inuit, or Métis (NRCAN, 2018). As such, off-grid diesel-dependence in Canada must be thought of as an issue predominantly affecting Indigenous Peoples.

Newfoundland and Labrador [NL] represents a national microcosm of the diesel-dependence challenge - serving as a compelling area for case study research. For example, large-scale hydroelectricity currently accounts for 95 per cent of the province’s electricity generation, a figure which is expected to rise to 98 per cent with the anticipated completion of the 824 megawatt [MW] Lower Churchill [Muskrat Falls] Hydroelectric Project (Government of Newfoundland and Labrador, 2015). Conversely, there are 27 off-grid communities throughout the province, of which 19 are exclusively dependent on diesel-fuel. Of the 19 diesel-dependent communities in NL, 14 are Indigenous (NRCAN, 2019).

Existing research has demonstrated that diesel-generation poses substantial challenges for off-grid communities. From an economic perspective, diesel-generation is expensive, requires significant governmental subsidies, poses energy security challenges, and local load restrictions may hinder economic growth, social development, and poverty alleviation efforts (see: Arriaga, Brooks, & Moore, 2017; Arriaga et al., 2014; McDonald & Pearce, 2012; Weis & Illinca, 2010). From an environmental perspective, diesel-generation poses a risk of fuel spills and leaks, and diesel plant emissions are a contributor to global climate change (see: Arriaga, Brooks, & Moore, 2017; Thompson & Duggirala, 2009). From a societal perspective, diesel-generation may contribute to local health problems, reliability challenges, and can be disruptive due to noise pollution (see: Advanced Energy Centre, 2015; Government of Canada, 2011). Furthermore, government-controlled electrical utilities may be perceived as an imposition on the autonomy of Indigenous communities (see: Heerema & Lovekin, 2019; Fitzgerald & Lovekin, 2018; Rezeai & Dowlatabadi, 2016;). Given these challenges, several researchers, policy-makers, and advocates have called for a transition to renewable sources of energy in off-grid communities (see: Prubatha et al., 2020; Bhatarrai & Thompson. 2016; Henderson, 2013). For example, the Canadian Prime Minister has pledged to "eliminate diesel from all indigenous communities by 2030" (Sharma, 2019) and the federal government has invested over $700 million in diesel displacement initiatives (Government of Canada, 2019).

Several scholars have pointed towards the necessity of community autonomy and local decision-making in ensuring equity and justice in renewable energy development (see: Walker et al., 2019; Steffanelli et al., 2018; Krupa et al., 2015). The 92nd Call to Action by the Truth and Reconciliation Commission of Canada (2015) encourages corporations to "Commit to meaningful consultation, building respectful relationships, and obtaining the free, prior, and informed consent of Indigenous peoples before proceeding with economic development projects" (p. 10). Furthermore, the 43rd and 44th Calls to Action call on all levels of government in Canada to fully adopt and implement the *United Nations Declaration on the Rights of Indigenous People* [UNDRIP] as a framework for reconciliation. A key principle of UNDRIP is the right to free, prior, and informed consent before "the undertaking of projects that affect indigenous peoples' rights to land, territory and resources" (United Nations Human Rights Office of the High Commissioner, 2013, p. 1).

With these commitments in mind, emerging research has criticized the federal government's approach to diesel displacement in off-grid communities (Mercer et al., forthcoming). For example, the name of

Canada's flagship diesel reduction program "Indigenous Off-Diesel Initiative" implies a decision to alter community energy systems (i.e. transitioning off diesel), and ignores the necessity of free, prior, and informed consent. While a significant body of research encourages the development of renewable sources of energy in Indigenous off-grid communities, limited research has analyzed community support or perceptions of off-grid energy systems. This is a major research gap, as many western researchers simply assume that energy transitions are desired in Indigenous off-grid communities.

This community-based participatory research [CBPR] is led by the NunatuKavut Community Council's [NCC] Department of Research, Education and Culture. NCC is the governing body which represents Inuit in south and central Labrador. The research seeks to address the aforementioned gaps in the literature, and to build a framework based on community values to support energy-related decision-making in NunatuKavut. At its core, CBPR includes: co-ownership and control of data; integration of community autonomy and values through all stages of the research process; co-learning between researchers and community; and knowledge dissemination which is beneficial for all involved parties (see: Castleden et al., 2012; Koster et al., 2012; Martin et al., 2012).

Our participatory research sought to understand community-member perceptions and support of energy technologies in diesel-powered NunatuKavut communities. We secured a grant from the Social Science and Humanities Research Council of Canada [SSHRC] to support this research in three initial pilot communities (Black Tickle, Norman Bay, and St. Lewis). Upon dissemination of preliminary findings, the university researchers were invited back to the territory by NCC's Department of Research, Education and Culture, to expand our initial study to six new partner communities (Cartwright, Charlottetown, Pinsent's Arm, Port Hope Simpson, Mary's Harbour, and Lodge Bay) **[Figure 6.1]**. This expanded phase of research was funded primarily by NCC own-source revenue, as well as a financial contribution by the Canadian Institute of Health Research funded project entitled 'A SHARED Future'. The funding agencies had no involvement in research design, data collection, data analysis, or interpretation of results.

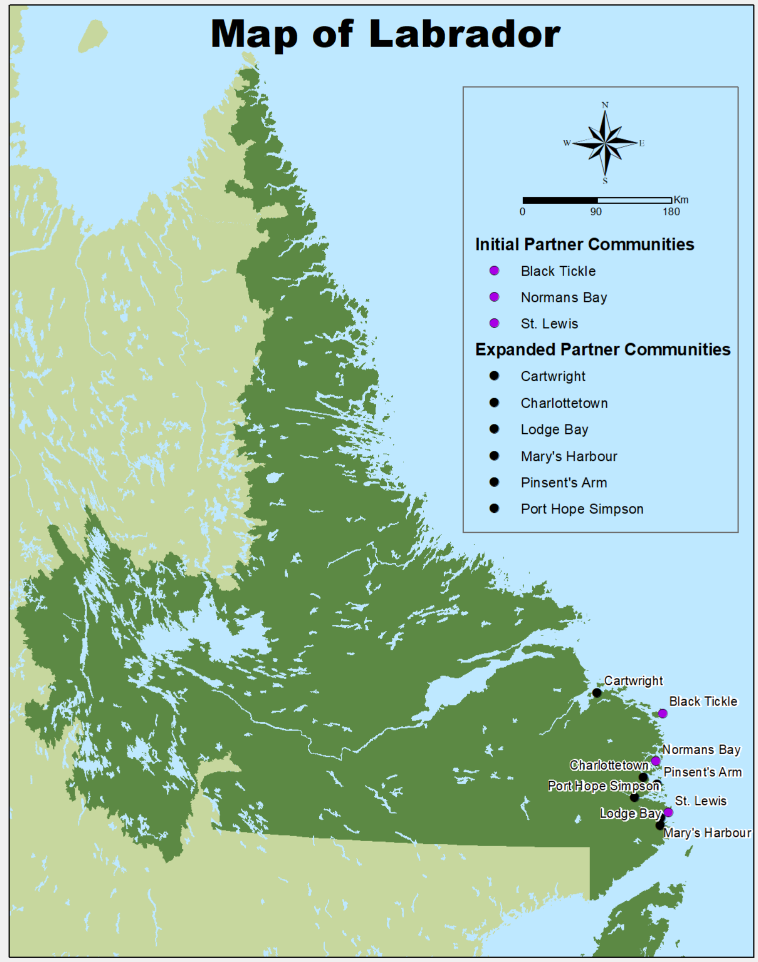

Figure 6.1: Map of Partner Communities

6.1.1 A Brief Review of the Literature - Indigenous Perceptions and Support for Off-Grid Sustainable Energies:

Limited research has examined Indigenous perspectives and support of off-grid energy systems. Despite this, there are a few common themes found in the literature. Existing studies agree that Indigenous off-grid communities are not widely opposed to diesel-generation (McDonald & Pearce, 2013; Mercer et al., 2019; McDowell, 2012). McDonald & Pearce (2013) examined Inuit perspectives of off-grid energy systems in Nunavut, and demonstrated a "reluctant acceptance of diesel by communities" (p. 101), which they attribute to the necessity of electricity for survival in harsh northern climates and a lack of reliable alternatives. Mercer et al. (2019) concluded that residents of Inuit diesel-dependent communities in southeast Labrador hold diverse views of support, neutral or opposition with slightly more being supportive of diesel-generation than those opposed. They value several socio-economic contributions such as: (1) familiarity and comfort; (2) valuable employment opportunities in isolated communities; (3) relative reliability in harsh northern climates; and (4) the resilience that diesel plant operators help to foster in their communities. The results of McDowell (2012) were slightly more negative. They determined that 62 per cent of residents are 'dissatisfied' with the use of diesel for electricity and home heat in the Kluane Lake Region, Yukon.

The available research suggests that Indigenous perspectives of renewable energy are guided primarily by knowledge of local natural resources (Bryn, 2018; McDonald & Pearce, 2013; McDowell, 2012). Community-members generally support generation sources which they perceive as having strong and consistent potential, and express hesitation for scarce or inconsistent resources. While knowledge of natural resources appears key to guiding community support, several studies refer to inadequate local human resources as a rationale eroding support. The uncertain ability of communities to support sustainable energy installation and maintenance creates reluctance (Coates & Landrie-Parker, 2016; McDonald & Pearce, 2013; McDowell, 2012).

Several studies suggest support for sustainable energies is shaped by previous experiences with the technologies. For instance, several failed wind energy projects in Nunavut have created negative public images and eroded support for new projects (Hobson, 2019; Bryn, 2018; Coates & Landrie-Parker, 2016; Cherniak et al., 2015; McDonald & Pearce, 2013). McDonald & Pearce (2013) demonstrate how large-scale hydroelectric development in northern Ontario and Quebec have stoked fears around methylmercury contamination in Nunavut. Conversely, some evidence suggests that successful developments have encouraged community support of renewable energy. For example, residents of Kluane Lake Region expressed awareness and pride surrounding a test geothermal well drilled adjacent to their communities (McDowell, 2012).

Potential impacts on wildlife and aquatic life, which are integral for sustenance in many Indigenous communities, erode support for sustainable energies (McDonald & Pearce, 2013; McDowell 2012). Of particular concern is the impact of wind turbines on migratory birds (McDonald & Pearce, 2013; McDowell, 2012), and the impacts of hydro dams on migratory fish species (McDonald & Pearce, 2013). Some research also suggests that unfamiliarity and unawareness of costs and benefits erodes support for sustainable energies in off-grid communities (Bryn, 2018; McDonald & Pearce, 2013).

6.1.1.1 Study Setting - NunatuKavut, Labrador:

Translated from Inuttittut, NunatuKavut means “Our Ancient Land”, and is the traditional territory of NunatuKavut Inuit. The NunatuKavut Community Council [NCC] is the governing organization which represents the rights of approximately 6,000 Inuit who belong predominantly to south and central Labrador. NunatuKavut spans a vast territory, within which several communities are off-grid and diesel-dependent. Nine of these communities are represented in this research.

Inuit on the southeast coast of Labrador have always practiced seasonal transhumance (Stopp, 2002). In the spring, families moved to fishing locations on the coast to harvest seals and codfish. In the summer, cod fishing continued with salmon runs and berry picking gaining importance. The arrival of fall marked bird and seal hunting, and by the end of fall families moved into sheltered bays to prepare for winter trapping and caribou hunts (Martin et al., 2012). Today, families in NunatuKavut maintain multiple homes, cabins, and camps in order to accommodate each harvest. As such, traditional ways of life persist for Inuit in NunatuKavut as community-members continue to travel their lands and subsist as their ancestors did in the past. Community-members themselves describe enduring connections to their lands, air, water, ice and way of life in a series of booklets published by NCC (NCC, 2017a; NCC, 2017b; NCC, 2017c). Today, the southeast coast of Labrador is home to several modern NunatuKavut communities. Cartwright being the most northerly community, and others stretching down the south coast of Labrador. Permanent settlement into modern communities occurred in the 1950’s and 60’s, at the urging of the Church and the Government of Newfoundland, who wanted to end Indigenous Peoples seasonal movements for the stated purpose of service delivery - especially schooling (Mercer & Hanrahan, 2017).

Nine of these modern Inuit communities are represented in this research: Cartwright, Black Tickle, Norman Bay, Charlottetown, Pinsent’s Arm, Port Hope Simpson, Mary-s Harbour, Lodge Bay, and St.

Lewis [Fox Harbour]. All of the partner communities are off-grid and diesel dependent, with 2,220kW of installed capacity in Cartwright, 1,005kW in Black Tickle, 160kW in Norman Bay, 1,965kW in Port Hope Simpson, and 1,020kW in St. Lewis. Local mini grids connect the adjacent communities of Charlottetown - Pinsent's Arm and Mary's Harbour - Lodge Bay, with 3,160kW and 2,635kW of installed capacity, respectively (NRCAN, 2018). All of the partner communities have relatively small year round populations **(**ranging from 19 residents in Norman Bay to 427 in Cartwright (Statistics Canada., 2016).

The partner communities of Norman Bay and Black Tickle are not road-connected, and transportation to and from the communities is severely restricted. For instance, Norman Bay is accessible by a twice-weekly helicopter service in the summer and fall (weather dependent), and by snowmobile only in the winter and spring. Black Tickle is an island community, accessible primarily by a weekly ferry service in the summer and fall, and by snowmobile in the winter and spring. Air travel to Black Tickle is dependent on seat availability on a medical flight, which is extremely costly. The remaining partner communities are connected via the Trans Labrador Highway [TLH], the only public road serving south and central Labrador. Heading south from Happy Valley-Goose Bay is Route 510, the mostly gravel highway stretches over 600 kilometers to the Labrador - Quebec border. The route runs through dense boreal forest for most of its length, and there is no cell phone connection or road side service available between communities. Route 510 passes directly through the partner communities of Port Hope Simpson, Mary's Harbour, and Lodge Bay. However, gravel access roads of approximately 94kms, 30kms, and 30kms connect the coastal communities of Cartwright, Charlottetown, and St. Lewis to the TLH. Pinsent's Arm is connected to the community of Charlottetown via Route 511-10, a gravel access road of approximately 24kms.

6.2 Operational Methods:

Table 6.1: Demographic Information of Phase One Community Respondents				
	Black Tickle	**Norman Bay**	**St. Lewis**	**% of total**
Sample Size	33	6	36	100%
Gender				
Female	19	3	21	57%
Male	14	3	15	43%
Current Profession				
Public Sector	12	3	8	31%
Private Sector	8	3	9	57%
Unemployed	9	0	5	19%
Other	4	0	14	24%
Annual Income (vs $29,000)				
Much Less/Less	18	0	6	32%
Same	4	1	6	15%
Much More/More	9	2	15	35%
No Response	2	3	9	19%
Identify as Inuit, First Nations, or Métis?				
Yes	30	6	31	89%
No	3	0	5	11%

Ethical clearance for this research was first given by NCC's Research Advisory Committee. This approval was then forwarded to the Office of Research Ethics at the University of Waterloo, and the Research Ethics Board at Dalhousie University, who also completed their own ethics review. In this paper, we assess social perceptions of energy technologies through two primary research instruments: mixed-method community-member interviews and key informant interviews. Our procedures were collaboratively developed with NCC staff in grant writing, and were approved by community members at an NCC hosted research summit in early July, 2018. Data collection proceeded in two phases: from July 8 - September 1st, 2018 in the partner communities of Black Tickle, Norman Bay, and St. Lewis and from March 4th - May 27th, 2019 in the expanded partner communities of Cartwright, Charlottetown/Pinsent's Arm, Port Hope Simpson, and Mary's Harbour/Lodge Bay. The field researcher spent approximately three weeks in each partner community.

As part of this project, we formed the NATURE Youth Council - an acronym for NunatuKavut Action Team on Understanding Renewable Energy (NCC, 2019b). In total, 10 Inuit youth were hired from across NunatuKavut to build research skills and capacity, and to empower youth to steer energy transitions in their own communities. NATURE Youth Council members were responsible for delivering a recruitment letter to all permanent households in the case study communities. We aimed to speak to all permanent residents (6+ months per year) who were of voting age in the province (18+). We aimed to speak to any community member who expressed interest in participating upon receiving a recruitment letter, and were available during the fieldwork period.

In total, we conducted 211 mixed-method community member interviews **[Table 6.1-6.2].** Across all partner communities, we estimate interviewing approximately 16 percent of the target population. We note that 19 percent of the sample identified as non-Indigenous. NCC staff encouraged us to include all permanent residents in the study, in order to be as inclusive as possible. In addition, it was noted that individuals that do not possess active NCC membership may not self-identify as Indigenous in questionnaires, but belong to their community and have valuable insight to contribute.

Table 6.2: Demographic Information of Phase Two Community Respondents					
	Cartwright	**Charlottetown - Pinsent's Arm**	**Port Hope Simpson**	**Mary's Harbour - Lodge Bay**	**% of total**
Sample Size	39	30	31	36	100%
Gender					
Female	15	19	11	13	43%
Male	24	11	20	23	57%
Current Profession					
Public Sector	14	9	10	7	29%
Private Sector	13	16	14	19	46%
Unemployed	7	2	3	2	10%
Other	5	3	4	8	15%
Annual Income (vs $29,000)					
Much Less/Less	12	2	6	6	19%
Same	4	3	3	5	11%
Much More/More	14	23	17	2	54%
No Response	9	2	5	5	15%
Identify as Inuit, First Nations, or Métis?					
Yes	35	24	27	17	76%
No	4	6	4	19	24%

The community-member portion of the study aimed to assess community support and social perceptions of energy technologies. We sought to determine quantitatively which supply-side options, energy storage technologies, and demand-side measures that community-members supported or opposed. We accomplished this by asking respondents to rate each technology on a scale of one to five (where 1 = strongly oppose, 2 = somewhat oppose, 3 = neutral, 4 = somewhat support, and 5 = strongly support). Respondents could also reply “Do Not Know” or “Pass” to any questions. Qualitative follow-ups permitted respondents to elaborate on their rationale for support or opposition.

For the key-informant portion of the study, we targeted those who have been involved in the off-grid energy sustainability sector in NL for a minimum of two years. The key informant portion of the study consisted of open-ended questions on the technical and economic feasibility of supply-side and end-use sustainable energy technologies. In total, we conducted 11 key informant interviews.

For the quantitative survey component of the study, we have applied basic descriptive statistics. For the qualitative data, we used directed content analysis, applied to community-member and key informant interviews [or field notes, in the case of respondents who opted not to be recorded]. In total, 42 of 211 community-members, and 3 of 11 key-informants, opted not to be audio-recorded. All interviews were transcribed verbatim by the lead author and hired research assistants. Directed content analysis is a form of qualitative content analysis where initial coding starts with theory or relevant research findings, in our case we coded the preliminary themes developed at community review events discussed below (see: Zhang & Wildemuth, 2009; Patton, 2002a – 2002b). We used NVIVO Version 11.1.1. To assist in organizing, managing, and coding the qualitative data.

To enhance credibility of the project, preliminary results underwent rigorous community-review at five public events. Review events took place in St. Lewis (April 9th, 2019), Port Hope Simpson (April 25th), Mary's Harbour (April 29th), Charlottetown (May 9th), and Cartwright (May 21st). In each case, quantitative-survey data and broad qualitative trends explaining support/opposition for supply-side and end-use energy technologies were presented to community members. Attendees were given the opportunity to agree or disagree with preliminary findings, to ask questions or add detail to early trends, or to ask the researchers to be interviewed if they felt that their views were not being represented. In all cases, community-members agreed with preliminary findings and no additional interviews were requested. The preliminary data from these public presentations formed the basis of two separate research reports which were publicly hosted on NCC's website for further comment from community members (Mercer et al., 2019; Mercer et al., 2018). Due to the significant expense associated with travelling to the isolated communities of Black Tickle and Norman Bay, we did not hold review events in these communities. However, we were able to present preliminary findings and elicit feedback from community members from these communities at an NCC-hosted Sustainable Energy Research Conference in Goose Bay (January, 2019), Resource Stewardship Workshop in Port Hope Simpson (February, 2019), and an additional Sustainability Research Conference in Goose Bay (March 6, 2020).

The primary limitation of this research is our limited inclusion of Indigenous off-grid communities in Canada. In the research, we include nine Inuit communities in southeast Labrador, and no respondents from 161 other Indigenous off-grid communities across Canada. Due to cultural differences, socio-economic realities, and varying lived experiences - results may differ dramatically on a nation-by-nation [and perhaps community-by-community] basis. We note that this was a purposeful decision, as participatory research is intended to be 'with and for' community, as opposed to 'on' community. Our research relationships exist in NunatuKavut, and this study was part of NCC's self-determined priorities.

6.3 Findings: Perceptions of Sustainable Energies

The qualitative analysis demonstrates five primary themes which guide community support or opposition for sustainable energy technologies in NunatuKavut communities. Collectively, these themes are represented as the ***CARES Framework for Understanding Community Support*** **[Figure 6.2].**

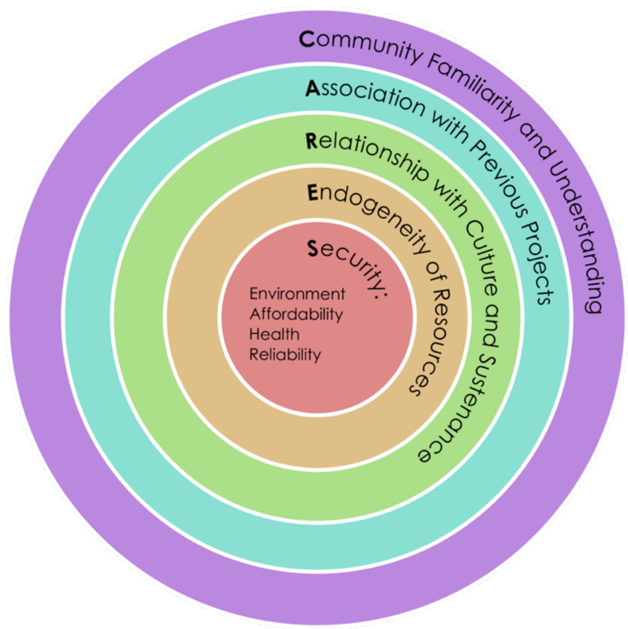

Figure 6.2: CARES Framework for Understanding Community Support

In the following sections, we merge the quantitative support levels of community members **[Figure 6.3]** with components of the CARES Framework, to explain community member support and opposition of sustainable energy technologies.

6.3.1 Conventional Hybrid Renewables - Wind and Solar:

As demonstrated in **Figure 6.3**, wind and solar power received the highest mean support ratings of any supply-side generation option across NunatuKavut communities, with mean support ratings of 4.3 and 4.2 out of 5, respectively. The profiles of support for wind and solar power are similar **[Figures 6.4 -6. 5].**

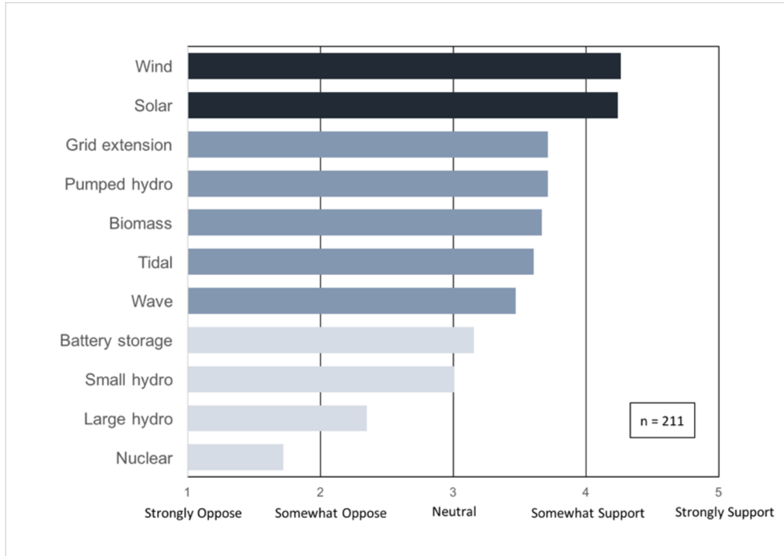

Figure 6.3: Mean Support by Generation Source

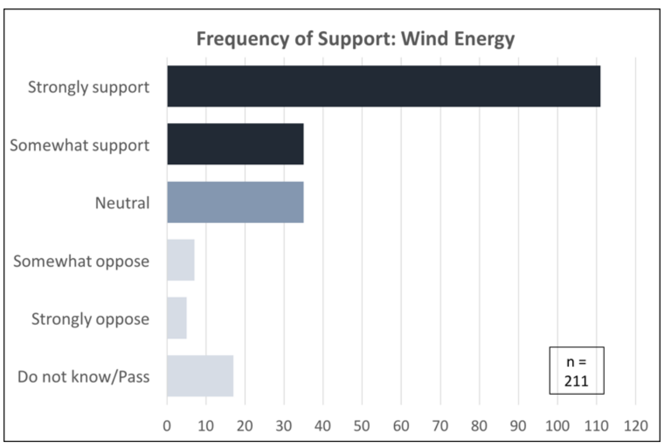

Figure 6.4: Frequency of Support for Wind Power

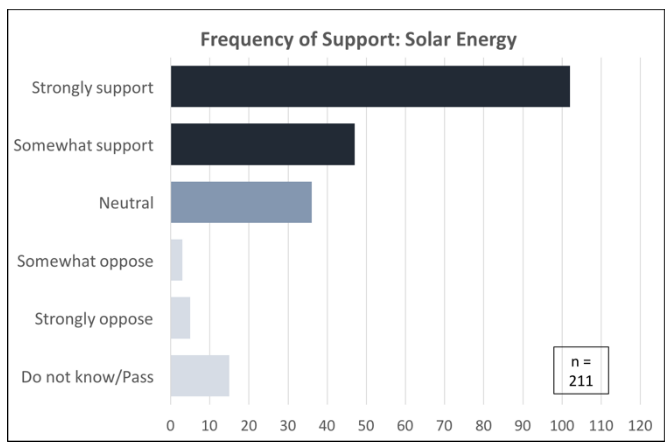

Figure 6.5: Frequency of Support for Solar Power

6.3.1.1 Endogeneity of Resources:

Support for wind energy development is driven largely by community members desire to make use of of an abundant and local resource (i.e. an endogenous physical resource). As stated by one respondent

"You are using all that wind that is out there, that is just blowing away in the wind". Another respondent stated "We get a lot of wind, and if we got to put up with the wind - we might as well get something out of it". Support for wind-development was high across partner communities, ranging from mean support ratings of 3.9 to 4.6 in Charlottetown/Pinsent's Arm and Black Tickle, respectively **[Table 6.3].**

Table 6.3: Support for Generation and Storage Technologies by Community (Mean Survey Response)

	Black Tickle (n = 33)	St. Lewis (n = 36)	Norman Bay (n = 6)	Port Hope Simpson (n = 31)	Mary's Harbour/Lodge Bay (n = 36)	Charlottetow n/ Pinsent's Arm (n = 30)	Cartwrigh t (n = 39)
Wind	4.6	4.4	4.0	4.0	4.2	3.9	4.5
Solar	3.7	4.1	5.0	4.5	4.4	4.0	4.6
Tidal	3.2	4.2	2.7	3.4	3.4	3.6	3.9
Wave	3.2	3.7	3.0	3.0	3.5	3.5	3.8
Small hydro	2.4	2.5	2.2	3.3	3.7	3.2	2.9
Large hydro	2.2	2.5	1.6	2.0	3.1	2.6	1.9
Biomass	2.9	3.9	4.5	3.9	3.8	3.5	3.8
Small nuclear	1.4	1.9	2.0	1.5	2.1	1.6	1.7
Grid extension	3.3	4.0	3.5	3.9	4.2	3.5	3.4
Battery storage	2.8	3.0	3.0	3.5	3.8	2.6	3.1
Pumped hydro	3.5	4.1	3.7	4.0	4.0	3.3	3.3

The sense of endogeneity for solar was mixed across respondents and partner communities. This is evidenced by the larger range in mean support ratings, from 3.6 to 5 in Black Tickle and Norman Bay, respectively **[Table 6.3].** Many respondents perceived solar as a strong local resource. For example, one respondent stated "We're getting full sun, 365 days of the year, so use that for energy". Similarly, another respondent stated "We have lots of nice, bright sunny days in Labrador, so I think there's power to utilize". Conversely, other respondents perceived solar as a poor local resource. As stated by one respondent "Solar, I don't think that one can be applied here, just not enough sunshine". Similarly, another respondent explained "The sun don't shine for days and weeks, so I don't see solar working very well".

Community-members generally understand solar as an available resource which they can benefit from, while simultaneously recognizing that it has more potential in other regions and less potential than other local resources [e.g. wind]. One respondent explained "It's [solar] not as plentiful here then you might like to have, but certainly it works".

6.3.1.2 Association with Previous Projects:

Wind development maintains predominantly positive associations in the partner communities. As explained by one respondent

> "I've seen it [wind development] in Nova Scotia, I've seen it down around St. Lawrence [Newfoundland]. They are producing enough power in St. Lawrence to cover the town's needs, plus the mine [locally]. So out there is considerably bigger than here - so I don't see why they can't invest in it [here]".

Similarly, another respondent explained "I know a little bit more about those [wind turbines].... Just the other day when we were flying over Nova Scotia, we were seeing a lot of those windmills and you know, [they] look good, simple".

As discussed previously, Inuit in NunatuKavut continue to live a land and sustenance-based lifestyle, maintaining multiple dwellings to accommodate seasonal harvests. Of 211 respondents in this research, 136 (65 per cent) reported owning - or their families owning - a cabin or camp. Many respondents reported positive experiences deploying solar energy at their cabins. As stated by one respondent "We have a summer home in William's Harbour… the last few years we've been using solar energy out there to run pretty much [everything], and it's working". Similarly, another respondent explained "we have the solar power at both cabins and they are really good".

Many respondents have observed successful implementation at other cabins which has encouraged their own interest. As explained by one respondent

> “my dad put a solar panel on his cabin and he’s got the little battery that is charged all the time… he can use a stove, my mom can use the washer, so that is a great source of energy - I am thinking that may be a better way to go for us”.

Similarly, another respondent explained “In William’s Harbour… I know that there’s solar power there after witnessing what others have out there for solar power”.

6.3.1.3 Environmental Stewardship:

More so than other resources, wind and solar are regarded as low-impact development opportunities, which make use of the territory’s abundant natural gifts without inflicting undue damage on land, waters, or people. As explained by one respondent “If you can utilize windmills, solar panels… why use a dam and screw all the environment up?”. Similarly, another respondent stated “I look at the wind power or solar power, you are not doing no damage to the land”.

Wind and solar are seen as measures to displace diesel-consumption and resulting emissions. As explained by one respondent “if we want to cut back on the fuel we’re going to burn and the emissions are going to go up into the atmosphere - I would love to see some power here besides diesel”. Another respondent said “If it’s here, and available to us, like a wind power, like a solar - then we should try to capture what we can, so we can offset [diesel]”.

6.3.1.4 Affordability:

Views were mixed across respondents regarding how conventional renewables would affect the affordability of energy in the partner communities. Several respondents asserted the potential for long-term savings from wind and solar power. For example, one respondent explained “once it’s set up and that, I don’t think it’s expensive”. Similarly, another respondent stated “Solar or wind, it’s going to be costly starting off. But other than that, I’d like to see it because the diesel prices and power rates are through the roof”.

Conversely, several respondents expressed hesitation due to these prohibitive costs. As explained by one respondent “Solar would be ideal, but… the panels themselves are like $20,000…. How are people going to afford to put panels on their roof?”. Similarly, another respondent explained “Solar power…. It’s a good idea, but it costs too much just to get into. It’s a price out of our reach”.

Community members expressed support for wind and solar development, if they believed they would improve affordability or protect against the volatility of energy prices. As explained by one respondent “I think wind power would work good [sic] because it would be cheaper”.. Another respondent stated “After awhile, it will become cheaper than bringing in diesel all year long”.

6.3.1.5 Reliability:

Wind and solar power are sometimes resisted due to their potential implications for the reliability of local energy systems. Of particular concern is the ability of energy infrastructure to withstand Labrador’s harsh weather conditions such as intense wind speeds and heavy snowfall. With regards to intense wind speeds, a key informant explained “there’s like a… double edged sword with wind - you got to have the wind to produce it, but then too much wind actually damages it”. Similarly, a respondent explained “Reliability would be a big one [challenge], because wind turbines can’t operate in a lot of wind, and we gets [sic] a lot of wind here”. With regards to snowfall, a respondent explained “I’m constantly keeping the snow off the roof for the weight. I don’t know if I could handle [the snow clearing required] with the solar panels”. Another respondent explained “I wouldn’t go hard on solar power because of all the snow… that we get”.

6.3.1.6 Health and Comfort:

Some community members expressed concern about wind development and its potential implications for health via noise pollution. As explained by one respondent “if you are going to have a windmill, it needs to be in a spot that’s reasonable, sensible, you don’t want to hear the noise”. Similarly, another respondent stated “With wind generation, they was talking about the pulsing that comes from it, they tries to keep it away from people, people be talking about they have adverse affects from it”.

6.3.2 Grid Extension - Coastal Transmission Line:

Across partner communities grid extension (via a coastal transmission line) was given a mean support rating of 3.7 out of 5 **[Figure 6.3].** Respondent frequency of support for grid extension is demonstrated in **Figure 6.6.**

6.3.2.1 Association with Muskrat Falls - Endogenous Development with Risks:

Perceptions of grid-connection are dominated by associations with transmission assets of Muskrat Falls – a large scale hydroelectric project currently under construction in central Labrador. Respondents are not necessarily supportive of grid connection in and of itself, but stressed a sense of injustice that power from a project on their own territory is bypassing them. As explained by one respondent "It's on our land, it's destroyed so much already… if it is there [though], I think we should have our paws into that". Another respondent said "the line is bypassing right by us, we should be able to avail of it".

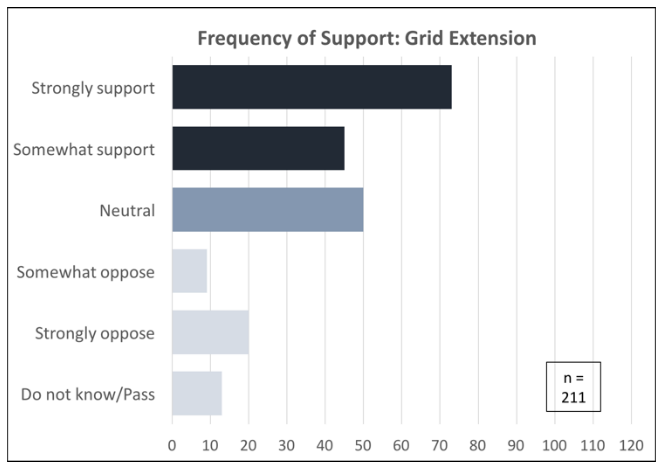

Figure 6.6: Frequency of Support for Grid Extension

Community-members expressed frustration that they were not the principal beneficiaries of renewable energy development in their own territory. As explained by one respondent "I think it's ludicrous to pump all this money into a project that doesn't benefit the residents". Similarly, another respondent explained "We're in Labrador, and the power's coming out of here, we should be having the benefits of it".

While community-members desire to make use of an available physical resource, they stressed that this type of development poses risks for human resources. Of particular concern is the potential for job losses by closing local diesel plants. As explained by one respondent "If the transmission line goes through, well then that eliminates five jobs here in the community, which is really needed". Similarly, another respondent stated "Concerning in terms of sustainability for jobs here and the economy… there is three jobs here, it is the same in every community". Community-members also referred to the risk of distant power outages with transmission, and the inability to repair problems locally. As explained by one respondent "[I oppose transmission] because of the winds and the storms and not being able to get somebody out on the line if something happens". Another respondent stated "we would be without power more times than we would be with it".

6.3.2.2 Affordability:

Some community-members supported grid extension, in the hopes that they could benefit from significantly reduced rates that grid-connected consumers elsewhere in Labrador pay. As explained by one respondent "If energy is as cheap as it is in say Goose Bay… as opposed to being here, we can get power from them [transmission lines]". Another respondent stated "I think the power should be cheaper if we're on the grid".

Conversely, many respondents were aware of the significant costs associated with transmitting electricity to remote communities. As explained by one respondent "From Muskrat is all DC power… the problem is the step down to AC, it's very expensive…. millions and millions of dollars". Another respondent explained "Hundreds of millions of dollars to put a transformer system [on the coast], because the power that comes out of Muskrat Falls is DC power and you've got to invert the power".

6.3.2.3 Environmental Stewardship:

Views were mixed across respondents regarding the environmental implications of grid extension. Many recognized the potential to displace diesel consumption, resulting emissions, and to lessen the risks of fuel spills. As explained by one respondent "If we had a wire out from Muskrat Falls… there would be no smoke in the atmosphere whatsoever". Another respondent stated "You could get clear of a lot of those fumes, then the diesel wouldn't be hauled in by truck…. could be a truck going on the road somewhere and spill thousands of litres".

Conversely, many respondents worried about the deforestation and the visual impacts on Labrador's landscape. As explained by one respondent "[transmission lines] do so much damage to our environment, cutting all the trees down, destroying it". Another respondent said "This is one of the last untouched places, Labrador, so try to keep it that way".

6.3.3 Community-Hesitation: Emerging Renewables

As demonstrated in **Figure 6.3**, biomass, tidal, and wave energy received similar mean support ratings across NunatuKavut communities, at 3.6, 3.6, and 3.5 out of 5, respectively. The three emerging renewable energy technologies tested (biomass, tidal, wave) have similar profiles of support **[Figures 6.7 – 6.9]**. Where emerging renewables differ from conventional renewables is the number of respondents who express neutrality, and respondents who selected 'Do Not Know' or 'Pass'.

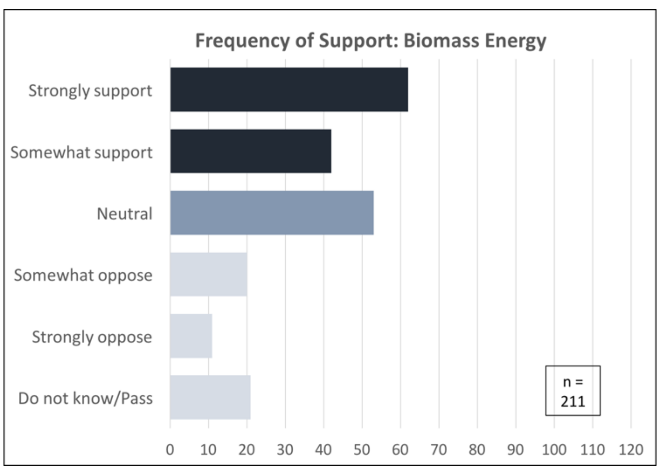

Figure 6.7: Frequency of Support for Biomass Energy

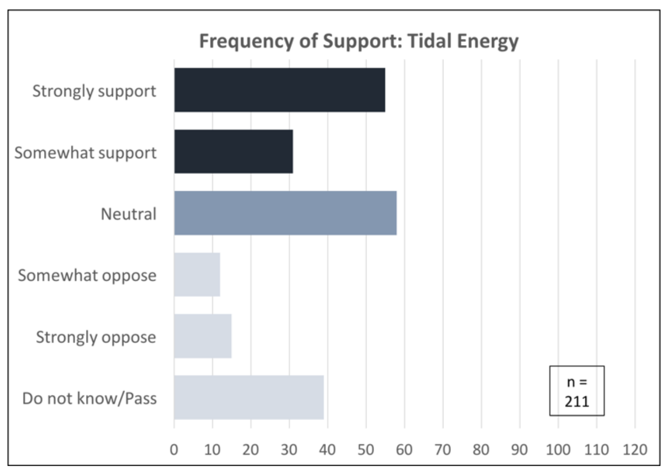

Figure 6.8: Frequency of Support for Biomass Energy

6.3.3.1 Unfamiliarity and Desire for Understanding:

The rationales given in support or opposition for marine renewables (tidal and wave) are similar, with most respondents expressing unwillingness to support novel sources of electricity-generation in which they are currently unfamiliar. This helps to explain the larger percentage of respondents who expressed neutrality, or selected 'Do Not Know' or 'Pass' in comparison to conventional renewables. As explained by one respondent "You can't make a decision on something if you don't know nothing about it". Similarly, another respondent explained "I don't really know a lot about it. I guess I'd say neutral, or do not know".

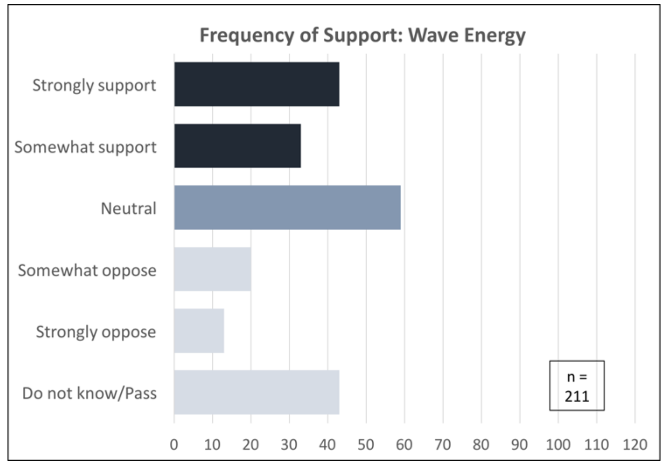

Figure 6.9: Frequency of Support for Wave Energy

In general, community-members are not strictly opposed to marine renewables, but stressed desire to become informed about their benefits and risks prior to making decisions about development. As explained by one respondent "If I understand more about tidal and wave power and all that stuff, then some of my answers might change". Similarly, another respondent stated "I'm going to pass because I've never heard of it before, and I'm not sure. I would have to find out more information before I comment". Similar sentiment exists regarding unfamiliarity and the need for community understanding for biomass power, albeit is less prevalent than tidal and wave.

Table 6.4: Primary Heat Source by Community

	Black Tickle	Cartwright	Charlottetown & Pinsent's Arm	Mary's Harbour & Lodge Bay	Norman Bay	Port Hope Simpson	St. Lewis	% of Total
Wood	11	29	26	27	6	23	30	74%
Wood-Oil	3	2	1	5	0	4	3	9%
Oil	11	3	2	1	0	2	2	10%
Electric	3	2	1	2	0	2	1	5%
Other	0	3	0	1	0	0	0	2%

Where biomass differs from marine renewables is the community's deep cultural connection and long practice with firewood harvesting. As demonstrated in **Table 6.4**, 83 percent of respondents currently use wood [or wood-and-oil mix] as their primary source of heat. Many community-members associate biomass power with firewood heating, which enhances their familiarity. As explained by one respondent "Biofuels... it's something we have in abundance, and it's kind of the way that you've always lived. It works so good, because wood heat is lovely". Similarly, another respondent stated "[Biomass] sound like it's good renewed energy, you are not wasting it… I grew up around wood stoves, I genuinely enjoy wood heat".

Previous associations were not widespread for marine renewables, however some comments did emerge regarding tidal power and observations in the media. For example, one respondent explained "I seen some stuff they're doing on the Bay of Fundy… in a couple places… they're working with it. It seems to be really environmentally friendly to me". Similarly, another respondent stated "There was something on the news yesterday about the Bay of Fundy they had to remove one, what was that about?".

6.3.3.2 Support Varies Widely by Endogeneity:

Support for marine renewables varies widely across NunatuKavut communities **[Table 6.3]**. Communities situated on the coast, where tides and waves are readily available (Cartwright, St. Lewis) - expressed higher levels of support than more inland communities where these resources are generally not as strong.

Community-members who lived on the coast often rationalized their support for marine renewables based on their strong sense of resource availability. As explained by one respondent

> "We got the strait out here, beautiful. Lots of tides going twelve hours a day. Going one way, going the other, twelve hours. If we can put something out there that's not going to interfere with the wildlife, it's a good idea".

Similarly, another respondent stated "We've got a bay, we've got the ocean, we've got waves, tides - and again, you use what you've got, or try to develop it". Conversely, community-members in more inland communities expressed hesitation in supporting marine renewables due to lack of resource availability. As explained by one respondent

> "It's not that I'm uncomfortable, if you were living somewhere coastal I think it would work fine. But here in the bays where we just get a little bay wind once in a while, I don't know if you got the currents there for it".

Similarly, another respondent stated "I don't think it would be any good here, because we're living inland, so we don't get the tide if we were living on the outside close to the ocean".

To contrast, most partner communities in the study perceived biomass as a readily available resource**.** As explained by one respondent "Here in Port Hope Simpson, Charlottetown, and Cartwright, I think this [biomass] is a very under-utilized resource". Another respondent stated "We have a readily available wood source, fuel source in our backyard, that can easily be put into some type of generating source".

The one exception would be the community of Black Tickle, which is located on the subarctic tundra Island of Ponds, and has no locally available wood supply. Likely as a result, the mean support rating for biomass power in Black Tickle is significantly lower than other partner communities, at 2.9 out of 5 **[Table 6.3].** As explained by one respondent "Biomass would be trees, and well we don't have trees. So it would be kind of hard to get energy from something that we don't have". Similarly, another respondent stated: "we live in Black Tickle, we live on a rock, we don't have wood. So you still have to go and get it… who is going to go get it for all this energy?

6.3.3.3 Threats to the Fishery, Sea Birds, and Marine Mammals:

There is some concern across partner communities regarding marine renewables and their potential implications for livelihoods and cultural activities. The fishery remains the backbone of economic activity in NunatuKavut communities and the harvesting of fish, sea birds, and marine mammals is integral for sustenance. As one respondent stated in explaining their opposition to marine renewables "we've got a lot of local fishermen that depends on the local sea area, the[y] harvest cod fish, crab". Similarly, another respondent stated "if it's going to kill off our wildlife and the plankton on top the surface of the water, they're no good to us, cause that's the food chain".

6.3.3.4 Mixed Feelings Regarding Environmental Stewardship:

Feelings were mixed across respondents regarding whether or not biomass could be considered an environmentally-friendly generation source. Respondents expressed interest in biomass power if it were to utilize waste products. For example, a key informant explained

> "Like to see biomass, because I find there's a lot of wastage. You take people [who] go in and cut wood… but not everybody takes the tree tops… any mills and stuff like that, they are only going to take what is valuable to them".

Similarly, a respondent explained "that's a good idea because it be [sic] less harsh on the environment. It's almost like you're recycling material to produce the heat that you need".

Outside of recycling waste products for power and heat, community-members expressed hesitation about environmental implications of biomass. As explained by one respondent "Look at all the smoke you're putting in the atmosphere. The more wood you burn, the more smoke going up in the atmosphere". Similarly, another respondent explained "you talk about burning [biomass] to produce energy, and you leave more carbon imprint as far as I'm concerned".

6.3.3.5 Reliability and Icing Conditions:

Similar to conventional renewables, community-members expressed some hesitation regarding marine renewables and their ability to withstand Labrador's harsh climatic conditions. Respondents explained that NunatuKavut communities are ice-bound for the majority of the year, and community-members have witnessed the damage ice and strong seas can do to wharves, stages, boats, and other marine infrastructure. As explained by one respondent "Tide, maybe, but I could see with wave, winter would affect greatly [be]cause our bays are frozen. We have heavy ice flow". Similarly, another respondent stated "I can't see it working [tidal and wave] simply because of winter. You have late fall, winter, and spring, pretty much major ice conditions".

6.3.4 Community Opposition: Hydroelectricity and Small Modular Nuclear

As demonstrated in **Figure 6.3**, small-scale hydroelectricity, large-scale hydroelectricity, and small-nuclear were the only generation sources with mean concern ratings below 3.0, at 2.9, 2.4 and 1.7 out of 5 - suggesting that community-members are not supportive of their development. We include small-scale hydroelectricity in this category, as only one community [Mary's Harbour/Lodge Bay] expressed relative support for the generation source at 3.7 out of 5 **[Table 6.3].** In addition, rationale given in support/opposition for small-hydroelectricity and large-hydroelectricity largely overlap. Frequencies of support for small hydro, large hydro, and small nuclear are demonstrated in **Figures 6.10 – 6.12.**

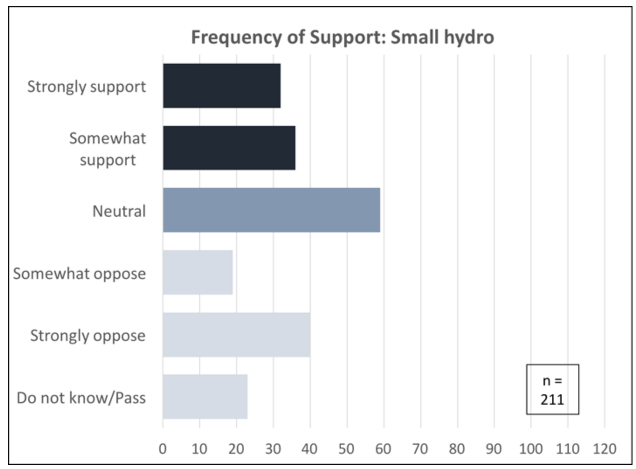

Figure 6.10: Frequency of Support for Small Hydro

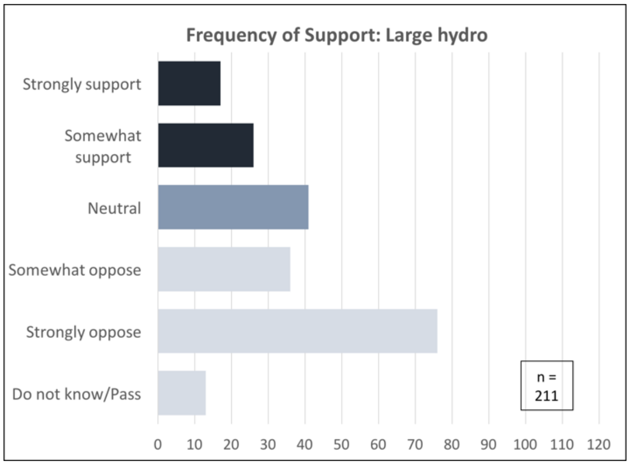

Figure 6.11: Frequency of Support for Large Hydro

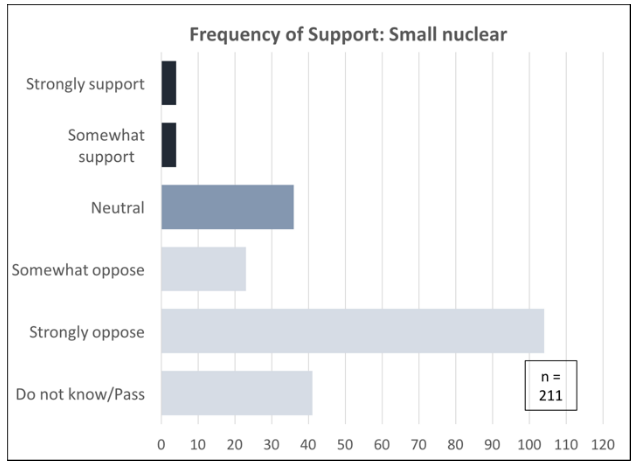

Figure 6.12: Frequency of Support for Small Nuclear

6.3.4.1 Negative Associations with Previous Projects:

Perceptions of large-scale hydroelectricity are dominated by negative associations with previous projects. Community-member views are heavily shaped by the Muskrat Falls Hydroelectric Project, and its perceived environmental, financial, and safety risks. As explained by one respondent "That's similar to Muskrat Falls - it's going to cause potential flooding of our area, and it's going to cause the poisoning of our traditional foods and all that horrible stuff". Another respondent stated "I'm just going from Muskrat Falls, how it ruined the environment. I don't think it's necessary for us to ruin Fox Harbour [St. Lewis]". Community-members also spoke to negative associations with other hydroelectric projects in Labrador. As one respondent explained

> "You drive through Churchill Falls and see what was once called the Mighty Churchill River, and it is just barren with a little trickle going to sea. It is heart-wrenching to see. So while they have tons of power and tons of money… it's just tragic to see".

There was some unfamiliarity with regards to small-nuclear power. As explained by one respondent "I'm going to go with somewhat opposed, because I don't know a hell of a lot about uranium or how it works". Similarly, another respondent stated "Just don't know enough… If I was more knowledgeable… I would probably have a better answer". Respondents who were familiar with nuclear often referred to global nuclear disasters. As explained by one respondent "the word nuclear, it's just [a] danger zone - you know the red flags pop up in my mind all the different areas in the world that have been impacted by it". Similarly, another respondent stated "I've heard some horrific stories when it comes to nuclear power".

6.3.4.2 Mixed Associations with Small-Scale Hydroelectricity:

Associations with small-scale hydroelectricity were influenced heavily by a local run-of-the-river project currently being refurbished in the partner communities of Mary's Harbour - Lodge Bay. There were predominantly positive associations with this project, partially explaining why Mary's Harbour - Lodge Bay has a higher mean support rating for small-scale hydroelectricity than any other partner community **[Table 6.3]**. As explained by one respondent "We've had a small scale mini-hydro project since 1984. It has worked… so that's why I support that, it's tried and tested". Another respondent said "Mini hydro type of thing, we actually got one in Mary's Harbour, it's pretty efficient".

Conversely, several respondents associated small-scale hydroelectricity with the Muskrat Falls project. As stated by one respondent in explaining their opposition to small hydro

> "Doing any kind of hydroelectric project on either one of the rivers, it just goes back to Nalcor and Muskrat Falls, look at the fiasco that was and still is. So, no - I definitely do not agree with hydro power".

Similarly, another respondent explained "the small… hydro dam, because for personal reasons - being Aboriginal and all, what went through with Muskrat Falls, is to me a big no".

6.3.4.3 Threats to Sustenance and Cultural Activities:

For both large-scale and small-scale hydroelectricity, respondents expressed fears regarding threats to traditional food sources. Fishing, hunting, trapping, and gathering along rivers and within watersheds remains an integral part of life for Inuit in NunatuKavut. As explained by one respondent "No [to hydroelectricity] - we got too much lovely fish in our rivers, we eat too much beautiful salmon, and trout, and char. Never - not until my dying breath". Another respondent said "Dams is hard on your river b'y…. Fish going in, trout going in, salmon going in your river. I think that dam will go through, I don't think ever a salmon will go back".

Obstructing [or altering] a river is perceived as obstructing an entire way of life, and damaging the ability to transmit knowledge and cultural practice to future generations. As explained by one respondent

> "With the hydroelectricity - I'm a strong believer in keeping things the way they are, so our children, our grandchildren, our great grandchildren, nieces, nephews, mothers, fathers, whoever you like - could go back there and visit this place. If all the rivers are gone, where are they going to go? If the rivers are gone, where's the fish going to go? If the rivers are gone, the caribou, the moose, the beaver, all these wild animals that depend on the nature and beauty of Labrador will be gone, and it will be nobody's fault but our own because we want more power, we want more electricity… but they are not taking into consideration what they are losing".

6.3.4.4 Lack of Local Resources - Disinterest in Exogenous Development:

The exogenous nature of small nuclear power erodes community support. Community-members perceive importing energy resources as unnecessary, given the abundance of local renewable energies. As explained by one respondent "We don't need it, why would [we]... bring something foreign in an area, when we have lots of natural resources to give us the energy we need". Similarly, another respondent explained "I think we've got to be very cautious, and I don't think we need to go that route when we've got so many other resources".

The disposal of nuclear waste is sometimes perceived as unfairly taking advantage of Inuit territory, as opposed to making use of its natural gifts. As explained by one respondent "we got nowhere to store it… We got to put that inside a lead case probably about ten miles deep, and it's not benefitting nobody, it's just no good to us". Similarly, another respondent explained "They talked about Labrador for that, and it was kind of [like]... nobody else wants it, so they dump it here".

6.3.4.5 Environmental Destruction:

In general, community-members view hydroelectricity as an environmentally damaging source of energy. As explained by one respondent "Nothing good ever comes out of it - it's not clean energy". Of particular concern to community-members is destruction of land and the potential for methylmercury contamination from reservoir flooding. With regards to the destruction of land, one respondent stated "When it's so massive, it's bound to destroy things… you're basically tearing everything to pieces and ruining everything within miles". Similarly, another respondent stated "It's just destroying too much land… I don't like it, I don't support that". With regards to methylmercury contamination, one respondent stated "You got methylmercury effects, I wouldn't want to see them put a dam up here… the effects that's going to be over the next hundred years". Similarly, another respondent stated "Dams I think are a thing of the past… first of all, you got to flood a whole area, and then you cause all this pollution with the methylmercury".

One exception was the potential for run-of-the-river hydroelectricity, which some community-members expressed openness to as a low impact generation source. As explained by one respondent "Small scale [hydro]... Basically you don't change the … river. … you don't disturb anything, if it's done correctly". Similarly, another respondent explained "If the activity in the river still continues as always, and there's no infringement on access, people are still free to utilize the river as they traditionally did".

6.3.4.6 Dangerous, Unhealthy, Nervousness:

Small nuclear was overwhelmingly perceived as dangerous and unhealthy by respondents. As explained by one respondent "Nuclear, from what I hear about that, that can be really dangerous". Similarly, another respondent explained "It's too dangerous, so much stuff can go wrong. If we can't get a… major hydro project in check, I'd hate to see them try something nuclear with all the corners cut".

Community-members stressed that risks are enhanced in isolated communities, where response times for emergencies are frequently delayed, and fleeing danger is an impossibility. As explained by one respondent "A little small place like this, if something goes wrong, where do we run? You don't".

Similarly, another respondent explained "What would you do in a little place like this if something happened? In an isolated place… on a bad stormy day, people find out about you, it'd be all gone".

Respondents frequently suggested that hearing the word 'nuclear' alone invoked feelings of nervousness and fear. As explained by one respondent "I just don't like the word nuclear. What kind of hazard would it bring to the people?".

6.3.5 Energy Storage Technologies

Neither energy storage technology received wide public support. Pumped hydro and battery storage were given mean acceptance ratings of 3.7 and 3.2 out of 5, respectively **[Figure 6.3].** Frequencies of support for energy storage are demonstrated in **Figures 6.13 – 6.14.**

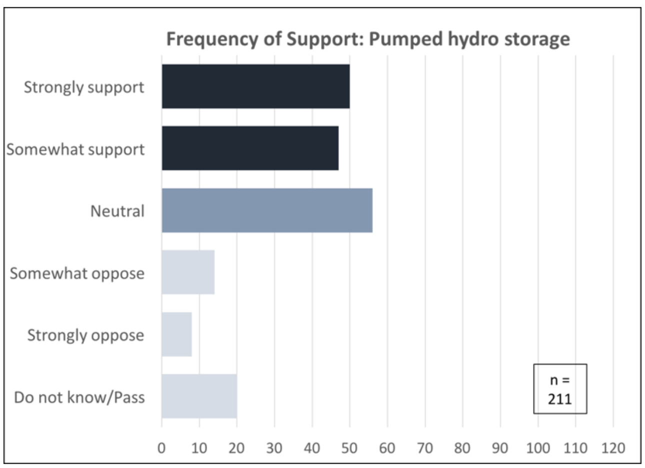

Figure 6.13: Frequency of Support for Pumped Hydro

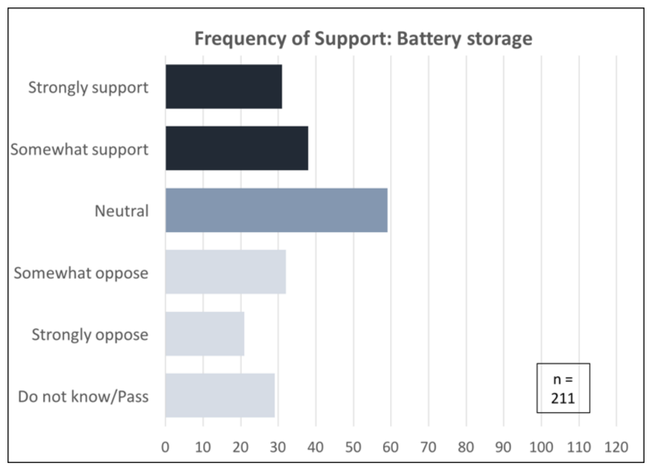

Figure 6.14: Frequency of Support for Battery Storage

6.3.5.1 Unfamiliarity:

Perceptions of energy storage technologies are shaped predominantly by unfamiliarity. With regards to pumped hydro storage, one respondent explained "don't know anything about that… what's pumped hydro storage?". Another respondent stated "I'll give you a three on that one, don't know enough about it". With regards to battery storage, one respondent stated "storing energy in batteries, I don't know how that would work". Similarly, another respondent explained "I'm going to pass on that, I don't know enough about it to be able to answer it".

Some respondents reported positive experiences with small-scale battery storage at their cabins. As explained by one respondent "Before we had electricity, my father was using a wind charger… [and] an old battery there, and it was the most wonderful thing in the world. My mother could throw out the oil lamp". Another respondent stated "[Battery storage] sounds pretty good, like we're in a cabin somewhere".

6.3.5.2 Complement Wind and Solar - Reliability in Cold Temperatures:

Respondents had mixed views on the reliability of energy storage technologies. Many respondents qualified their support for pumped hydro and battery storage as complementing and enhancing the reliability of conventional renewable energy technologies. As explained by one respondent "for when we don't have no wind and we need it - well, it is there". Another respondent explained "That sort of goes hand in hand with solar power… Without battery storage, I guess solar power isn't going to work".

Conversely, several respondents were nervous about the reliability of energy storage technologies in harsh northern environments. As explained by one respondent "For the winter, moving water, I'm not too sure. That's when we need the most electricity… I don't know how practical it would be". Similarly, another respondent stated "Batteries don't last very long… I don't see how they work in the Winter, unless they are buried 20 feet below the ground. Not batteries, it is not realistic at all". Another respondent said "Do you want to become the guinea pigs in the meantime - on a cold winter's day?".

6.3.5.3 Environmental Stewardship:

Views were mixed regarding the environmental implications of energy storage. On the supportive side, many community-members saw energy storage as a means to decrease waste electricity from renewable energy projects. As explained by one respondent "Batteries are… good… why create energy twice if you can save it". Another respondent stated "I'm not a fan of wasting anything, and if it's [energy] not going to be used, keep it for later".

Conversely, many respondents perceived batteries as environmentally destructive, and expressed particular concern about the disposal of used batteries. As explained by one respondent

> "That's not very environmentally friendly… you got to dispose of those batteries… You'd have to have a truck come up here to the hydro plant from outside for oil disposal… Battery power is really, I tend to think that would be as bad as diesel".

Another respondent stated "Lithium ion batteries… we got to take it after is used and put it in the ground to get rid of it, well we're not helping ourselves [in doing that]".

6.3.5.4 Danger and Costs:

Some respondents feared the explosive potential of batteries. As explained by one respondent "You got the danger of an exploding battery, which is unreal when you actually see one blow up. It's basically a bomb going off, and it do happen fairly regular[ly]". Similarly, another respondent stated "The only big part [challenge] I has with solar, is just the battery banks - and just knowing the danger of what a battery can do".

Some respondents worried about prohibitive costs of energy storage. As explained by one respondent "If you got to replace the batteries every two, three years - they cost a fortune from what I can hear…. I don't know if that would be worth it". Another respondent stated "Those [energy storage] sources…. Would be very expensive to set up. Would that be efficient for such a small community?".

6.3.6 Wide Support for Energy Efficiency Applications

There is widespread support for energy efficiency applications across partner NunatuKavut communities **[Figure 6.15].** Every efficiency measure tested received a mean acceptance rating of at least 4 out of 5, including: window upgrades (4.6), improved insulation (4.5), weather stripping (4.5), energy star appliances (4.4), LED lighting (4.2), and electronic/programmable thermostats (4.0). Given the heavy degree of overlap for respondent rationale across technologies, support for energy efficiency applications is explained generally, instead of separating each measure.

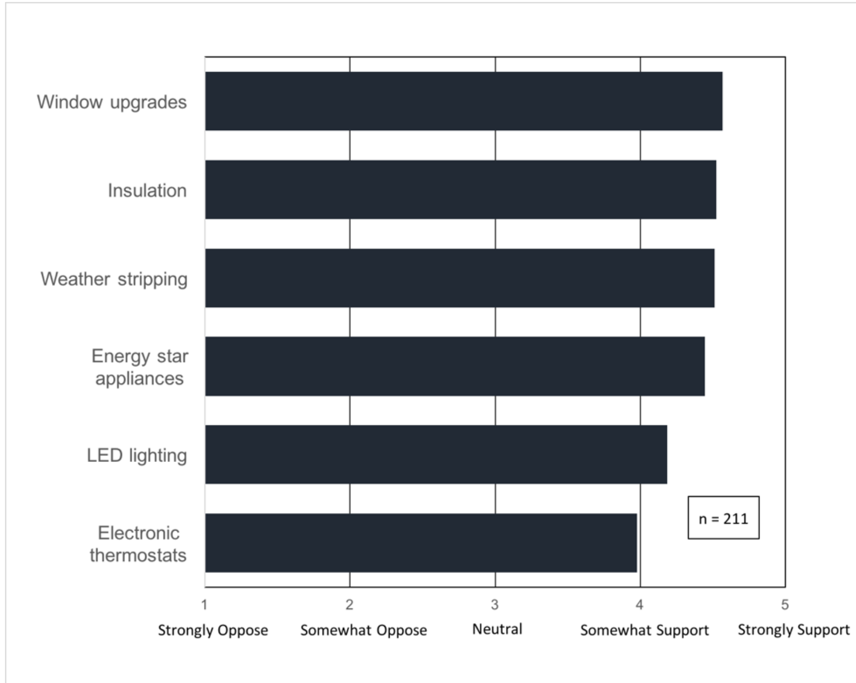

Figure 6.15: Support for Generation and Storage Technologies (Mean Survey Response)

6.3.6.1 Familiarity - Incremental and Collective Action:

Community-members are supportive of energy efficiency measures, as they have already implemented several of them and have observed their benefits first hand. As explained by one respondent “Insulation really does work… keeps the heat in and makes it cooler…. It’s all around good for both the cost of living, the upkeep of your home, and the efficiency of the power”. Similarly, another respondent explained “They really do work, like the weather-stripping and the spray foam insulation”.

Community-members expressed support for efficiency technologies which incrementally and collectively improve the sustainability of local energy systems, but did not pose major threats to the status quo. As explained by one respondent “I feel like they are smaller steps that can be taken that would help. Instead of coming in with like a big change at first, I think this could introduce people to what could be - in smaller ways". Similarly, another respondent explained "one of those things by itself you wouldn't notice a big difference. But you put it altogether, and you notice a huge difference in your consumption".

6.3.6.2 Affordability - Cost Savings:

Respondents frequently supported efficiency applications for their cost savings, both in terms of savings on electricity bills, and savings from the amount of fuel required for space heating. As explained by one respondent "It cuts down on the cost. Cuts down on the amount that we have to pay to Newfoundland and Labrador Hydro". Similarly, another respondent stated "If you're going to get savings from it… why would you not want to do that?".

Several respondents stressed that the upfront costs of energy efficiency measures compared to conventional products were a barrier to access. As explained by one respondent "Even just a little bedroom window, you are looking at almost $1,000 for a window. Whereas if you go by just the old fashioned double-pane glass, it would probably cost you about $200 - 300 for a window". Similarly, another respondent stated "I want to go home and it's nice and warm, and I think it's great ideas - but, paying for it is going to be another situation".

6.3.6.3 Retain Heat - Household Comfort:

In a harsh coastal Labrador climate, respondents were particularly supportive of measures which would help them retain heat, draft-proof their homes, and enhance comfort. As explained by one respondent

> "Because the climate we live in, we're mainly damp, cold, and if your house isn't efficient - then your loss of heat is very apparent. Weather stripping… helps seal all those leaks, same with insulation. Your basic common sense thing[s] for your home".

Similarly, another respondent explained "weather stripping your windows, and the insulation… you would have to use a lot less [fuel] as opposed to somebody with poor insulation, that would have to keep continuously reheating their house".

6.3.6.4 Environmental Stewardship:

Community-members explained that energy efficiency technologies are compatible with their way of being as Indigenous Peoples, and that they can be utilized to mitigate environmental impacts of local energy systems. As explained by one respondent "That's our traditional way too, as Indigenous people. We utilize everything, and everything had a purpose, and we don't waste. We totally utilize whatever we have, and nothing got thrown away. So why throw energy away?". Similarly, another respondent explained "I was raised like it by my grandparents… Pop always said, everything in moderation…. Why would I have all the lights on in the house when I'm sitting here, I can watch TV in the dark".

6.3.6.5 Positive Experiences with Previous Energy Efficiency Programs:

Community members often rationalize their support for energy efficiency technologies based on previous programs which have taken place in their communities. Most frequently, community-members refer to programming carried out by the consulting company Summerhill. In this program, the company hires and trains local representatives to do direct installs of energy efficiency products at no cost to homeowners. As explained by one respondent "It's something that they [Summerhill] are providing… we can just save on energy, so why not - if they are offered to you?". Similarly, another respondent explained "[NL] Hydro, that's one of the best things they have been doing - sending people around and getting people change their bulbs - they provide the bulbs". Another respondent stated "Why not let them come in and have a look? They are free after all - and any way to save a bit of money, you got to go with that".

6.4 Discussion

To our knowledge, this study is the most extensive investigation to date of Indigenous Peoples' perceptions of sustainable energy technologies, particularly in off-grid communities. While the five themes presented - community familiarity and understanding, association with previous projects, relationship with culture and sustenance, endogeneity of resources, and security of energy - are the most common qualifiers of support or opposition to sustainable energies, the list is not all encompassing. The CARES Framework is presented as a model for understanding community support, not a definitive recipe for reaching community consent. *Community autonomy and local decision making power must remain at the core of all developments.*

As suggested by Del Rio & Burgillo (2009, 2008) procedural sustainability (i.e. local perceptions, distribution of project risks and benefits, and ultimately local acceptance) are just as important as substantive sustainability (i.e. measureable or quantifiable impacts) for the long-term continuance of renewable energy projects. Similarly, Walker & Baxter (2017b) have argued that participatory injustice (i.e. perceived unfairness in renewable energy planning processes) can spur opposition movements which threaten the long-term viability of renewable energy industries. As such, it is necessary to give serious consideration to public perceptions, and to integrate that knowledge meaningfully into decision-making, in order to ensure the sustainability of projects. While we acknowledge the differences between perceived and actual risk, we suggest that a community which lives in perpetual fear of a hydroelectric dam collapsing (regardless of technical risk), can hardly be defined as a sustainable community to live in (see: CBC News, 2018). Put alternatively, perception is reality when it comes to energy system risks. As such, our participatory research sought to privilege community-member knowledge and perceptions, and to help NCC decision-makers understand which sustainable energies are supported by community members and why. Reflecting on the CARES framework offers several important lessons for decision-makers, developers, researchers, and advocates alike working in the area of sustainable energy transitions – whom seek to minimize conflict and make harmonious decisions.

As argued by other researchers (Bryn, 2018; McDonald & Pearce, 2013), community familiarity and understanding are key to community support of sustainable energies. In this study, emerging technologies such as biomass, wave, and tidal power – as well as energy storage options like batteries and pumped hydro - were resisted as community members did not fully understand the risks and benefits associated with their development. Conversely, sustainable energies which were widely familiar to community-members, such as energy-efficiency applications deployed in people's homes, were widely accepted. This supports our earlier finding that decades of experience with existing diesel systems in off-grid communities and resultant familiarity drives community acceptance of the generation source (Mercer et al., 2019). As such, gauging initial community understandings of sustainable energies and providing information to address concerns is a compelling starting point for any potential development.

Relatedly, research has shown that associations with previous projects are key to guiding current perceptions of sustainable energies (Hobson, 2019; Coates & Landrie-Parker, 2016; McDonald & Pearce, 2013). We question whether a hydroelectric project will ever receive community consent again in Labrador, given community-member experiences with the Muskrat Falls hydroelectric project. Community-members were hesitant to support even run-of- river hydroelectricity, giving a sense of how powerful these negative associations can be. Conversely, we show that positive associations have the potential to greatly enhance community support. For instance, despite the relative scarcity of the solar resource in southeast Labrador compared to other jurisdictions (1000kWh/kW estimated for Cartwright), community-members have observed successful implementation at cabins and camps - which spurs imagination and support for what could be accomplished at the community-level (Energy Hub, 2020). Our findings suggest that successfully delivered small-scale demonstration projects, which enhance community-familiarity, strengthen understanding, build trust, and deliver tangible benefits – may be a potential pathway for energy transitions in Indigenous diesel-powered communities which maintain community support.

Sustainable energy projects must be weighed against a community's cultural values. Of particular importance is sustenance practices: any generation source which poses threats to traditional food sources is opposed. Examples are plenty, such as: hydroelectric reservoirs which contaminate wildlife and aquatic life, wave generators which restrict the navigation of boats or access to fishing grounds, wind turbines which strike down migratory birds, or solar arrays which displace berry picking grounds. A renewable energy source is not considered sustainable by community members if it diminishes their sources of life. While sustenance is most frequently referred to, knowledge transmission is of critical importance. Generation sources which restrict traditional practices and the ability to teach younger generations the ways of their ancestors are not seen as advancing the quality of life in communities.

Similar to the findings of others, we have demonstrated that knowledge of local natural resources is key to understanding the acceptance of renewable energy in Indigenous communities (see: Bryn, 2018; McDonald & Pearce, 2013; McDowell, 2012). For instance, respondents in NunatuKavut were highly supportive of wind energy, a region which has amongst strongest potential for wind development of any jurisdiction in North America (Mercer, Sabau, & Klinke, 2017). Support varies widely by resource strength (or the endogeneity of the resource): with coastal communities more supportive of marine renewables, and more sheltered communities expressing less support. Community-members desire to make use of endogenous resources for local benefit, and resist the unnecessary import of exogenous resources such as uranium or diesel fuel. While knowledge of natural resources is important, we also stress the importance of local human resources. Community-members want to have control over their own energy systems as opposed to relying on outsiders. This was demonstrated most vividly by social perceptions of gird connection. Community-members desired to make use of the physical resource available to them from Muskrat Falls transmission assets, but stressed substantial concern over the potential for local job losses at the diesel-plant and the inability to repair transmission infrastructure locally. This supports arguments of energy-deployment and local sustainability scholars (Del Rio & Burguillo, 2009, 2008; Jaramillo-Nieves & Del Rio, 2013); whom suggest that endogenous resource development, based on the use of local physical, human, and capital resources, has greater sustainability impacts than exogenous projects.

Security of energy is placed at the core of the CARES Framework. Affordability, reliability, environmental stewardship, and health/comfort are important for community support. However, community-members typically do not weigh these aspects unless sustainable energies make positive contributions to the other layers of the CARES Framework. When sustainable energies are familiar and understood by community members, maintain positive associations, are compatible with cultural values, and make use of local resources - community-members will more seriously consider security impacts. Developers can not skip over these important layers based on energy security justifications and hope to maintain community consent.

This is the first study to investigate social perceptions of energy efficiency technologies in Indigenous communities. An important finding is that efficiency applications maintain significantly higher levels of support than most supply-side options. In the partner communities, energy efficiency technologies maintain positive contributions to most layers of the CARES Framework. While the endogeneity of technologies can be questioned (virtually all are imported), the localness of benefits is profound. There is no promise with renewable energies that tangible benefits will be felt by residents. While often developed under the guise of 'sustainability', renewable energies may perpetuate the exploitative nature of resource development in Indigenous communities. It is not uncommon for outside interests to be the owners and principal beneficiaries of renewable energy projects. This is the case in one of the partner communities, where a private company signed a lucrative 15 year power purchase agreement with the local utility to displace diesel (compensated at 90 percent of the value of diesel-fuel displaced), but community-members saw no reduction in electricity prices (NL Hydro, 2018b). While some spin off benefits have been realized in the community, we suggest that these arrangements are often tilted in favour of developers over off-grid communities. If renewable energy projects are to go ahead in Indigenous communities, we argue that the majority of benefits should be felt by residents and not corporations - co-ownership, revenue sharing, rate mitigation, or other innovative measures can be deployed here.

Energy efficiency applications inverse this relationship, all but guaranteeing that community-members will save money, feel more comfortable in their homes, experience improved health outcomes, and be more energy secure. Efficiency improvements can reduce energy consumption, without posing major threats to the existing diesel-based system, which community-members have come to value and accept for its comfort, employment, and reliability (Mercer et al., 2019; McDonald & Pearce, 2013). In addition, efficiency applications help to steward the environment and are compatible with Inuit ways of being. While the energy efficiency products themselves are imported, the consultant hires and trains locals as opposed to outside crews. Respondents were highly supportive of this model of development: products at no direct cost, which reduce electricity bills, improve comfort, and protect the environment. Expanding direct install efficiency programs to include larger measures (i.e. windows, doors, insulation, more efficient forms of heat), or even small-scale renewable energies (e.g. solar panels, micro wind turbines), aligns with the desire of communities and may make meaningful socioeconomic and environmental advances.

Walker & Devine-Wright's (2008) seminal contribution argued that community renewable energy projects have two primary dimensions: process and outcome. The process dimension considers by whom a project is run by, who is involved, and who has influence (ranging from closed and institutional to open and participatory). The outcome dimension considers how the benefits of a project are spatially and socially distributed, i.e. for whom a project is for (ranging from distant and private to local and collective). The model of energy efficiency direct installs in NunatuKavut communities comes close to Walker & Devine-Wright's conceptualization of an ideal community renewable energy project - "one which is entirely driven and carried through by a group of local people and which brings collective benefits to the local community (however that may be defined) – a project that is both by and for local people" (p. 498).

As a final note, we urge extreme caution to those attempting to advance small-modular nuclear reactors as a solution to diesel dependence in off-grid communities (for example see: Government of Canada, 2020b; Blaise & Stensil, 2020; CBC News, 2019c; Canadian Small Modular Reactor Roadmap Steering Committee, 2018; Wojaszek, 2017; Wallenius et al., 2017; Moore, 2016; Coates & Landrie-Parker, 2016; Samm-Aggrey, 2016). Communities in southeast Labrador are overwhelmingly opposed to this technology, with only eight of 211 respondents expressing any level of support. For context, large-scale hydroelectricity is widely rejected, yet still supported by 44 respondents. Put alternatively, what has been described as 'cultural genocide' by Indigenous groups in Labrador (The Telegram, 2019; Vice, 2018; APTN, 2018) - has five times more support than small modular reactors. Indigenous communities must be involved meaningfully in projects from conception until completion in order for the rights of communities to be fully respected (Schnarch, 2004). As such, even advancing small-nuclear research in the face of this extreme opposition, can be seen as an imposition on the autonomy of communities.

6.5 Conclusion

Canada is typically regarded as a national leader with regards to renewable energy development. However, the same cannot be said for off-grid [predominantly Indigenous] communities in Canada, who continue to rely almost exclusively on diesel-fuel for electricity generation. While diesel-poses substantial sustainability challenges for communities, most research demonstrates acceptance of the generation source. Diesel is perceived as necessary for survival in harsh northern climates, it is comfortable and familiar to community members, and it creates valuable employment opportunities in communities where few fulltime jobs are available.

Given the importance of diesel generation, it is imperative that energy transitions maintain the free, prior, and informed consent of communities in order to avoid adverse impacts. While Canada has recognized the importance of community consent via Calls to Action under the Truth and Reconciliation Communication, and further commitments supporting the United Nations Declaration on the Rights of Indigenous Peoples, the existing state of research and policy is inadequate. For example, there is limited research to determine if energy transitions are desired in Indigenous off-grid communities and the federal government's commitment to "eliminate diesel from all indigenous communities by 2030" ignores the rights of communities (Sharma, 2019).

By partnering with Inuit communities in NunatuKavut, and giving voice to community-members themselves to explain their values guiding sustainable energy transitions, we were able to confirm and further insights on the perspectives of off-grid energy systems. Based on the expertise of community-members, we put forward the CARES Framework for understanding community support. We argue that community familiarity is key, and suggest that communities will not consent to that which they do not understand. We confirm the power of associations - the fear that has been created by projects gone awry, or the hope, optimism, and imagination generated by successful experiences. We amplify the voices of community-members who attest that development which threatens traditional food sources, or the ability to transmit knowledge to future generations, cannot be considered a sustainable source of energy. We showcase the in-depth knowledge Inuit possess of their territory, and their preference for local natural resources. Finally, we show how community-members value energy security - but only if compatible with their values and way of life.

Empowering community-members to steer their own energy futures has resulted in several preferred development pathways. We demonstrate that energy efficiency applications are given higher levels of support than supply side options. Energy efficiency technologies have the potential to confront the unjust exploitation of Indigenous resources - and ensure that community-members themselves are the principal beneficiaries of energy transitions. While broad support exists for hybrid conventional renewables such as wind and solar, we flag legitimate concerns, and remind developers that community consent can be revoked at any time.

While it is common practice to recommend future areas of research, here we urge caution. Respectful research with and for Indigenous communities must be directed by communities themselves. Instead, we encourage researchers to build meaningful relationships with communities - and to support the endeavours of communities upon invitation.

Chapter 7: Conclusions and Recommendations

Canada is typically regarded as a global leader in renewable energy development - the country is the second largest producer of hydroelectricity in the world, low carbon energy sources account for over 80 per cent of total electricity generation, and approximately 17 per cent of total primary energy is supplied by renewables. However, the electricity-generation mix differs dramatically in Canada at the off-grid scale - where 190 of 258 communities rely almost exclusively on diesel fuel for electricity generation (NRCAN, 2018). Despite the fact that Indigenous Peoples represent 4.9 percent of the population of Canada, two-thirds of off-grid communities (n = 170) identify as First Nations, Inuit, or Métis. As such, off-grid diesel-dependence in Canada must be thought of as an issue disproportionately affecting Indigenous Peoples (NRCAN, 2018; Statistics Canada, 2017).

Newfoundland and Labrador [NL], the most easterly province in Canada, mirrors the broader electricity generation pattern in the country - making the province a compelling region for case study research on off-grid energy sustainability. Large-scale hydropower currently accounts for 95 percent of provincial electricity-generation, a figure which is expected to increase to over 98 percent with the completion of the controversial Lower Churchill (Muskrat Falls) Hydroelectric Project (Canada Energy Regulator, 2019). Electricity-generation also differs dramatically in NL at the off-grid scale, where 20 of 27 communities are almost exclusively reliant on diesel generators (NRCAN, 2018). Of the 20 diesel-dependent communities in NL, 14 are Indigenous. The Indigenous diesel-dependent communities are represented by one of the following: Nunatsiavut Government in northern Labrador, Innu Nation in the community of Natuashish, and the NunatuKavut Community Council [NCC] in southern Labrador. NCC and the nine diesel-dependent Inuit communities of Cartwright, Black Tickle, Norman Bay, Charlottetown, Pinsent's Arm, Port Hope Simpson, Mary's Harbour, Lodge Bay, and St. Lewis - were the partners in this doctoral dissertation.

A significant body of academic research has asserted and demonstrated the economic, environmental, and societal challenges of diesel-fired electricity generation in off-grid communities. From an economic perspective, diesel-generation is expensive, requires significant governmental subsidies, poses load restriction challenges, and exacerbates energy insecurity (i.e. affordability and availability of energy supplies) in many regions of the country. From an environmental perspective, diesel-generation contributes to global climate change, and poses the risks of fuel spills and leaks during transportation and operation - a serious concern in many Indigenous communities, where the health of the land and environment is highly valued. From a societal perspective, crown-utility controlled diesel-generators are often perceived as an imposition on the autonomy of remote Indigenous communities, diesel emissions and spills are proven to cause concern regarding cancer and other detrimental health effects with prolonged exposure, aging assets can pose reliability challenges, and diesel-generation can be loud, noisy, and disruptive in quiet northern environments (see: Rezaei & Dowlatabadi, 2016; Arriaga et al., 2014; McDonald & Pearce, 2013). To date, most literature on the impacts of off-grid energy systems comes in the form of quantitative reporting of a limited number of economic or environmental indicators. To contrast, there has been limited research which seeks to understand the experiences and perceptions of community members themselves. Even more concerning, there is virtually no research which privileges Indigenous Knowledge and perspectives on the sustainability of off-grid energy systems in Canada - despite the fact that a large majority of off-grid communities are Indigenous.

Given the challenges associated with diesel-generation, a wide array of researchers, policymakers, and advocates have called for a rapid transition to renewable sources of energy in off-grid communities (see: Bhatarrai & Thompson, 2016; Henderson, 2013; Thomson & Duggirala, 2009). This is demonstrated most vividly by the Canadian Prime Minister's pledge to "eliminate diesel from all indigenous communities by 2030" (Nunavut News, 2019), and supported by over $700 million in federal funding initiatives. Recognizing the aggressive timeline and substantial funding available to encourage renewable energy development in off-grid communities, we point to several leading scholars in the area of Indigenous Peoples and sustainable energy development, who stress that sustainable energy transitions are only desirable when grounded in community autonomy and local decision-making. These scholars stress that forcing or coercing communities into sustainable energy transitions may result in unjust or inequitable development processes (see: Walker et al., 2019; Krupa et al., 2015). While there is a significant body of international literature related to the social acceptance of renewable energies, particularly wind energy, there is limited research which examines Indigenous perceptions and support for sustainable energy transitions - especially in off-grid communities.

While the threat of global climate change is urgent, and action is required across all economic sectors - including electricity generation - stakeholders involved in sustainable energy transitions must recognize the right of Indigenous communities of free, prior, and informed consent for developments which have the ability to affect Indigenous territories and ways of life. Ignoring these rights addresses one set of challenges - climate action, sustainable development, etc. - and erodes others - Indigenous sovereignty, self-determination, and reconciliation. The Pan-Canadian Framework on Clean Growth and Climate Change itself reiterates the federal government's commitment to Indigenous rights "consistent with the Government of Canada's support for the United Nations Declaration on the Rights of Indigenous Peoples, including free, prior, and informed consent" (Government of Canada, 2016, p. 4).

While the two central knowledge gaps established - i.e. Indigenous Knowledge and understanding off-grid energy sustainability, as well as support and perceptions of sustainable energy transitions - inspired this research, this was not an academic or extractive exercise. This research was driven by the self-determined priorities of our Inuit partners, the NunatuKavut Community Council. This project would not have commenced or been completed without the leadership of NCC, particularly the current Director of Research, Education and Culture - Amy Hudson - and the launch of the Council's '*Community Governance and Sustainability Initiative'* [CGSI]. Working with three pilot Inuit communities in NunatuKavut, Black Tickle, Norman Bay, and St. Lewis, the initiative sought to "identify and build on community strengths and assets, to foster community engagement in creating a strong future, and to develop a sustainability plan for their community" (NCC, 2017a, p, 1). Given that all three communities are off-grid and diesel-dependent, energy challenges emerged in the CGSI as a key sustainability concern. Ultimately, the role of this research was to support NCC staff and community members in expanding the CGSI to consider and address energy-related challenges.

7.1 Understanding Off-Grid Energy Sustainability from Inuit Perspectives

Guided by energy deployment and local sustainability theory, and embracing the Indigenous guiding principle of two-eyed seeing, the initial manuscript resulting from this participatory research was entitled *"Off-grid energy sustainability in NunatuKavut, Labrador: Centering Inuit voices on heat insecurity in diesel-powered communities"*. To our knowledge, this is the first study to assess the sustainability of off-grid energy systems from the local perspective. Working in collaboration with three pilot communities - Black Tickle, Norman Bay, and St. Lewis - revealed several important findings.

Firstly, Inuit in NunatuKavut are not opposed to diesel-generation; they suggested several socio-economic benefits of existing energy systems that have not been widely reported in the existing literature. Diesel-generation creates high-paying, full-time, year round jobs in communities where limited employment is available. Community members stressed that diesel-plant employees do not just keep the lights on, but that they are the beating hearts of their communities. Due to their relatively high incomes, flexible work hours, and specialized skill sets, diesel workers often own grocery stores, harvest game, fish, and wood for those who cannot, and are leaders and volunteers in their communities. Job losses at local diesel-plants would inflict serious harm on continuity of ways of life in Indigenous remote communities. In addition, diesel is perceived as highly reliable in harsh northern climates, and community-members have decades of experience with diesel, making them familiar and comfortable with the generation source.

While diesel offers socio-economic benefits, the generation source does not come without its challenges. Community-members are extremely concerned about *exogenous* aspects of their energy system - oftentimes being forced to rely on outside maintenance crews, which may result in prolonged power outages when crews cannot travel to communities due to inclement weather. Furthermore, community-members feared environmental degradation as a result of diesel-consumption, and stressed potential implications for country foods in the case of fuel spills and leaks. In the partner community of Black Tickle, it was established that heat insecurity - i.e. access to clean, affordable, and reliable heat - has reached crisis proportions. Approximately a quarter of Black Tickle's population lives in a poorly heated home, and fuel supplies are restricted. Sustainability challenges surrounding home heating emerged most vividly in the partner community of Black Tickle. While this dissertation pays substantial attention to electricity pricing and subsidization, we do not go to the same lengths to explain the logistics of oil and firewood pricing. Again, this finding reinforces the need of community-by-community energy planning and sustainability assessment. As a great deal of focus on home heating is required for the partner community of Black Tickle, but is not as relevant for the other eight partner communities.

The results of the study established the necessity of decolonized decarbonization, which we define as sustainable energy transitions which are grounded in community autonomy and local decision-making, which recognize and protect the strengths associated with existing energy systems (e.g. employment, reliability, familiarity, resilience), and which support communities in addressing self-determined priorities (e.g. environmental degradation, exogenous aspects of energy systems, and heat insecurity).

7.2 Return to the Territory: Validating and Building on Initial Results

Given the important findings of the initial research, the NunatuKavut Community Council's Department of Research, Education and Culture invited us to expand the initial research model to six new diesel-dependent communities in the territory - Cartwright, Charlottetown, Pinsent's Arm, Port Hope Simpson, Mary's Harbour, and Lodge Bay. Doing so allowed us to support and build upon initial themes - while also establishing several new findings. A manuscript resulting from this phase of research, entitled *"Towards decolonized decarbonization: Off-grid energy sustainability in NunatuKavut, Labrador"* is in review with the journal *Energy for Sustainable Development* as of June 22nd, 2020. Again, we determined that community-members are not widely opposed to diesel-generation, and close kinship ties to diesel workers stokes fear in the community regarding radical changes to local energy systems. Diesel was perceived as necessary for survival in the new partner communities, and community-members spoke to its track record of safety and reliability.

Community-members confirm several of the impacts of diesel-generation which have been written about extensively in the literature, but add critical detail of how these impacts are experienced locally. For instance, fuel spills and leaks are a community concern, as they threaten access to country foods, force people out of their homes due to lengthy remediation periods, and worsen heat insecurity by stoking fear of furnace oil reliance. Community-members recognize their contributions to global climate change, and note the enhanced frequency and severity of extreme weather events locally, and what these changes mean for access to commercial and recreational fisheries. Power outages affect life severely, and community-members noted that replacing electronics and appliances as a result of surges is difficult or impossible in isolated regions. Exogenous aspects of energy systems again were a key concern including reliance on government subsidies, external cost pressures on electricity rates, and reliance on outside diesel maintenance and fuel spill remediation crews. A unique finding of this expanded phase of research was the distributed nature of the risks of off-grid energy systems. For example, low income earners, the elderly, women, and those with mobility or other health challenges have increased difficulty with heat insecurity, rising electricity rates, and other aspects of energy security.

After confirming initial results, mainly the socioeconomic benefits and relative community acceptance of diesel-generation, we became more critical of the federal government's approach to diesel-displacement in off-grid communities. The flagship policy instrument being the "Indigenous Off-Diesel Initiative", a title which implies a decision (to get off diesel) and ignores a community's right to free, prior, and informed consent of developments that affect their territory. We note ignorance of Labrador's colonial history; Inuit in NunatuKavut always practiced seasonal migration - after adapting to relocation and reliance on diesel-generation in year-round communities, colonial bodies are again demanding changes which may dramatically alter life in communities.

7.3 Understanding Community Support of Sustainable Energies in NunatuKavut, Labrador

There is a vast body of international literature on the social acceptance of sustainable energies, particularly wind energy. For example, a systematic review by Rand & Hoen (2017) documented hundreds of studies since the 1980's in a North American context. Of all the sources considered in this review, one title gives explicit reference to the experiences of Indigenous communities (Huesca-Pérez et al., 2016). This supports our notion that there has been limited research which privileges Indigenous acceptance, support, or perceptions of sustainable energies - especially in off-grid communities. The federal government's pledge to eliminate diesel-generation in off-grid communities is thus problematic - given the rights of communities to free, prior, and informed consent, and limited understanding if this transition is even desirable.

To our knowledge, this was one of the first studies which sought to understand Indigenous support for sustainable energies in off-grid communities. Doing so revealed several important findings. Mainly, while much of the academic and advocacy focus has been on supply-side sustainable energies, there is considerably more support for energy efficiency technologies in the partner communities. There is no guarantee that renewable energy technologies will deliver direct and tangible economic and social benefits to communities - while often developed under the guise of 'sustainability', there is a real danger that these technologies may perpetuate dispossession of Indigenous resources for western gain. Energy efficiency applications all but ensure that residents themselves benefit financially in terms of cost savings and live in warmer and more comfortable homes. In addition, the incremental nature of efficiency applications ensures that the familiarity and comfort with existing energy systems is not eroded, and retrofits allow community-members to collectively contribute to environmental goals such as emissions reductions.

The knowledge of community-members helped us put forward the 'CARES Conceptual Framework for Community Support'. We stress that this is not a recipe for reaching consent, but it may be used as a framework for decision-makers to understand community support. Inuit in NunatuKavut are unwilling to support sustainable energies which they do not understand, and expressed a deep desire to understand the risks and benefits of particular technologies prior to making decisions about development. Association with previous projects is a major influence on community support - this can be negative, such as the Muskrat Falls Hydroelectric Project which has stoked fears around all forms of hydroelectricity, or this can be positive, such as community-members themselves successfully deploying solar panels at their hunting cabins which inspires community-members to envision what could be accomplished at the community-scale. Relationship with culture and sustenance activities is key to community support, and respondents stressed that generation sources that destroy traditional food sources, or the ability to transmit knowledge to future generations, cannot be considered sustainable sources of energy. Endogeneity of physical, human, and capital resources is of utmost importance. Community-members have a deep knowledge of the natural resources available in their territory, and prefer to see the development of abundant local resources which have powered communities since time immemorial. Community-members desire to be the principal beneficiaries of resource development in their territory - maximizing benefits for locals, and keeping profits in community to the greatest extent possible. While the security of energy - i.e. affordability, reliability, environment, and human health - is often cited as justification for sustainable energy development, community-members generally only consider these benefits if a sustainable generation source is familiar, has positive associations, is compatible with culture and sustenance, and maximizes the use of local resources.

7.4 Recommendations for Policy and Research

7.4.1 For the Government of Newfoundland and Labrador:

The approach of this research contrasts with energy policy recently introduced by the Government of Newfoundland and Labrador. In April of 2019, the provincial government launched their "*Expression of Interest* [EOI] *for Renewable Energy Solutions in Isolated Diesel Communities"* (Department of Natural Resources, 2019). The EOI sought to "solicit input from the local, national, and international marketplace for potential renewable energy solutions in 14 of the province's regulated isolated diesel-powered electricity systems" (p. 1). It is important to acknowledge that Indigenous communities in northern Labrador (represented by Nunatsiavut Government) were excluded from this EOI, while all the partner communities in this doctoral research were included (Department of Natural Resources, 2019, p. 1). The EOI mentions but does not mandate community consultation, partnership, or consent. It states "submissions should include consultation and/or partnership with local communities, governments and Indigenous organizations to support their involvement, leadership and ownership of renewable energy projects or explain how the proponent intends to do so" (p. 4). Due to these non-stringent requirements, Fitzgerald & Lovekin (2018) argued that NL's EOI instrument favours an industry-led over community-led approach to development.

While the province has not yet launched their competitive Request for Proposals process as a result of the EOI, we suggest that damage has already been done by inviting local, national, and international corporations to propose "solutions" for communities without mandated community consent, ownership, or involvement. The TCPS-2 (2018) asserts that ethical research involving Indigenous Peoples requires that "world views of First Nations, Inuit and Métis peoples are represented in planning and decision making, from the earliest stages of conception and design of projects through to analysis and dissemination of results" (p. 108). Applying this insight to governance as opposed to research, the EOI process implemented by the provincial government failed to meet the standard for ethical practice by not including communities meaningfully in the conception or design of the recruitment instrument.

Insight can be gleaned from Walker & Baxter's (2017a) comparative case study of wind energy social acceptance between two Canadian provinces. In the study, support for local wind energy projects in Nova Scotia was found to be three times higher compared to Ontario and perceptions of health effects were three times lower. The authors attribute high support levels to a concerted effort by Nova Scotia policy makers to support community-owned development and the retention of local economic benefits. Conversely, projects in Ontario were subject to the 2009 Green Energy Act, which limited community involvement during planning stages, resulting in a top-down corporate-led pattern of development, wherein almost all of the province's 6,000 turbines were corporately owned outside of host communities. As the Government of Newfoundland and Labrador continues to pursue diesel displacement initiatives (e.g. Department of Natural Resources, 2019) and policymakers finalize the Request for Proposals process, attention should be given to the necessity of community consent, ownership and the retention of local economic benefit as a result of projects. According to the aforementioned study by Walker & Baxter (2017a), Nova Scotia's Community Feed-in Tariff (COMFIT) policy is one potential template for development (Department of Energy and Mines, n.d.).

7.4.2 For the Canadian Federal Government:

It is promising that the Canadian Federal Government (2016) reiterated its "support for the United Nations Declaration on the Rights of Indigenous Peoples, including free, prior, and informed consent" (p. 4) in their *Pan Canadian Framework on Clean Growth and Climate Change.* However, it is concerning that the Federal Government then goes on to establish "Reducing reliance on diesel working with Indigenous Peoples and northern and remote communities" as a priority without citing any evidence of the desirability or support for such a transition (p. 14). Existing evidence on the topic of off-grid diesel-generation supports a "reluctant acceptance of diesel energy by communities" (p. 101) (McDonald & Pearce, 2013). The findings of this doctoral dissertation support this stance, demonstrating diverse views on the acceptance of off-grid diesel-generation, and establishing several understudied socioeconomic benefits of the generation source such as community familiarity and comfort, valuable employment opportunities, reliability in harsh northern climates, and contributions to community resilience (Mercer et al., 2020).

Community support certainly exists for some sustainable energies, as demonstrated in the final manuscript in this doctoral dissertation, however; the approach of the Federal Government to diesel displacement does not always respect a community's right for free, prior, and informed consent for projects which the ability to dramatically impact their territories or ways of life. For example, the Prime

Minister's promise to "eliminate diesel from all indigenous communities by 2030" (Sharma, 2019) or the name of the flagship funding program "Indigenous Off-Diesel Initiative" which implies a decision to alter community energy systems (i.e. getting off-diesel) without community consent (Government of Canada, 2020a). In this doctoral dissertation, we establish the importance of diesel-plant operators to the survival of communities, and their tremendous volunteer and leadership efforts. We refer to one respondent whom stated the views of many "I am not in support of nothing that is going to take diesel out of this town" and encourage all to envision the reaction of community-members to the abrasive nature of federal policies and promises related to diesel displacement.

While communities may support sustainable energy transitions, diesel-displacement must be community-lead and grounded in Indigenous rights in order to avoid unjust and inequitable development processes (Walker et al., 2019; Krupa et al., 2015). We point towards devolution of funding and resource revenue sharing as a pathway for communities to pursue their own self-determined sustainability priorities (Coates & Poelzer, 2014; Irlbacher-Fox & Mulls, n.d.).

7.4.3 For Future Researchers:

While it is common practice for academics to recommend future areas of research, I urge a different path here. There is an understanding in community-based participatory research that research priorities should be guided and initiated by the communities that researchers purport to serve, to avoid imposition of a researcher's agenda (Martin et al., 2012). Instead, we encourage researchers to develop and build meaningful relationships with other First Nation, Inuit, and Métis communities, and to assist the communities in whichever ways you are asked. Such research, if desired, may broaden our understanding of community acceptance, sustainable energy transitions, and the impacts of off-grid energy systems.

Bibliography

A SHARED Future. (2019). A SHARED future. Acheiving Strength, Health, and Autonomy, through Renewable Energy Development for the future. Retrieved from http://asharedfuture.ca/

Absolon, K., & Willett, C. (2004). Aboriginal research: Berry picking and hunting in the 21st century. *First Peoples Child & Family Review*, *1*(1), 5-17.

Advanced Energy Centre (2015). Enabling a clean future for Canada's remote communities. Retrieved from http://www.marsdd.com/wp-content/uploads/2014/11/Clean-Energy-Future-for-Canada%E2%80%99s-

APTN National News. (2018). "It's cultural genocide": Labrador land protectors in court on anniversary of Muskrat Falls occupation. Retrieved from https://www.aptnnews.ca/national-news/its-cultural-genocide-labrador-land-protectors-in-court-on-anniversary-of-muskrat-falls-occupation/

Arriaga, A., Brooks, M., & Moore, N. (2017). Energy access – The Canadian context. Retrieved from http://wgsi.org/sites/wgsilive.pi.local/files/Energy_Access_Canadian_Context_Infographic_Spread-OpenAccess_Energy_Blueprint_WGSI_2017.pdf.

Arriaga, M., Cañizares, C. A., & Kazerani, M. (2014). Northern lights: Access to electricity in Canada's northern and remote communities. *IEEE Power and Energy Magazine*, *12*(4), 50-59.

Awume, O., Patrick, R., & Baijius, W. (2020). Indigenous Perspectives on Water Security in Saskatchewan, Canada. *Water*, *12*(3), 810.

Bartlett, C., Marshall, M., & Marshall, A. (2012). Two-eyed seeing and other lessons learned within a co-learning journey of bringing together indigenous and mainstream knowledges and ways of knowing. *Journal of Environmental Studies and Sciences*, *2*(4), 331-340.

Beckford, C. L., Jacobs, C., Williams, N., & Nahdee, R. (2010). Aboriginal environmental wisdom, stewardship, and sustainability: lessons from the Walpole Island First Nations, Ontario, Canada. *The journal of environmental education*, *41*(4), 239-248.

Berka, A. L., & Creamer, E. (2018). Taking stock of the local impacts of community owned renewable energy: A review and research agenda. *Renewable and Sustainable Energy Reviews*, *82*, 3400-3419.

Bernard, R. H. (2012). Social research methods: Qualitative and quantitative approaches (2nd ed.). Thousand Oaks, CA: Sage.

Bhattarai, P. R., & Thompson, S. (2016). Optimizing an off-grid electrical system in Brochet, Manitoba, Canada. *Renewable and Sustainable Energy Reviews*, *53*, 709-719.

Blaise, K., & Stensil, S. P. (2020). Small Modular Reactors in Canada: Eroding Public Oversight and Canada's Transition to Sustainable Development. In *Nuclear Non-Proliferation in International Law-Volume V* (pp. 209-234). TMC Asser Press, The Hague.

BNN Bloomberg. (2020). U.S. job cuts ease in ADP data, suggesting hope for rebound. Retrieved from https://www.bnnbloomberg.ca/u-s-job-cuts-ease-in-adp-data-suggesting-hope-for-rebound-1.1444908

Booth, A. L., & Skelton, N. W. (2011). "You spoil everything!" Indigenous peoples and the consequences of industrial development in British Columbia. *Environment, Development and Sustainability*, *13*(4), 685-702.

Boser, S. (2007). Review of participatory research power, ethics, and the IRB: Dissonance over human participants. *Qualitative Inquiry*, *13*(8), 1060-1074.

Boute, A. (2016). Off-grid renewable energy in remote Arctic areas: An analysis of the Russian Far East. *Renewable and Sustainable Energy Reviews*, 59, 1029-1037.

Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done?. *Qualitative research, 6*(1), 97-113.

Buis, A. (2019). Part 2: Selected findings of the IPCC special report on global warming. Retrieved from https://climate.nasa.gov/news/2865/a-degree-of-concern-why-global-temperatures-matter/

Bull, C. C. (1997). A Native conversation about research and scholarship. *Tribal College*, *9*(1), 17.

Bullfrog Power. (2016). Lutsel K'e Dene First Nation partners with Bullfrog Power and becomes the first independent power producer in the Northwest Territories. Retrieved from https://www.bullfrogpower.com/lutsel-ke-dene-first-nation-partners-with-bullfrog-power-and-becomes-the-first-independent-power-producer-in-the-northwest-territories/

Byrnes, L., Brown, C., Wagner, L., & Foster, J. (2016). Reviewing the viability of renewable energy in community electrification: The case of remote Western Australian communities. *Renewable and Sustainable Energy Reviews, 59*, 470-481.

Canada Energy Regulator. (2019). Canada's renewable power landscape 2016 - Energy market analysis. Retrieved from https://www.cer-rec.gc.ca/nrg/sttstc/lctrct/rprt/2016cndrnwblpwr/prvnc/nl-lb-eng.html

Canadian Nuclear Association. (2016). Small Modular Reactor Basics. Retrieved from https://cna.ca/wp-content/uploads/2014/05/Small-Modular-Reactor-Basics-CNA-2016.pdf

Canadian Small Modular Reactor Roadmap Steering Committee. (2018). A call to action: A Canadian roadmap for small modular reactors. Retrieved from https://smrroadmap.ca/wp-content/uploads/2018/11/SMRroadmap_EN_nov6_Web-1.pdf

Carbon Brief. (2019). The carbon brief profile: Canada. Retrieved from https://www.carbonbrief.org/the-carbon-brief-profile-canada

Castleden, H. (2017). Indigenous-led clean-energy projects could power reconciliation. Retrieved from https://theconversation.com/indigenous-led-clean-energy-projects-could-power-reconciliation-111903

Castleden, H., Bennett, E., Lewis, D., & Martin, D. (2017). " Put It Near the Indians": Indigenous Perspectives on Pulp Mill Contaminants in Their Traditional Territories (Pictou Landing First Nation, Canada). *Progress in community health partnerships: research, education, and action*, *11*(1), 25-33.

Castleden, H., Morgan, V. S., & Lamb, C. (2012). "I spent the first year drinking tea": Exploring Canadian university researchers' perspectives on community-based participatory research involving Indigenous peoples. *The Canadian Geographer/Le Géographe canadien*, *56*(2), 160-179.

CBC News. (2015). Truth and reconciliation commission: by the numbers. Retrieved from https://www.cbc.ca/news/indigenous/truth-and-reconciliation-commission-by-the-numbers-1.3096185

CBC News. (2016). N.L. government holds line on 90% threshold for resettlement. Retrieved from https://www.cbc.ca/news/canada/newfoundland-labrador/resettlement-policy-review-1.3873176

CBC News. (2017a). Indigenous communities embracing clean energy, creating thousands of jobs. Retrieved from https://www.cbc.ca/news/politics/first-nations-renewable-energy-projects-1.4348595

CBC News. (2017b). 'Essentially against the law' to develop wind energy in N.L., says researcher. Retrived from https://www.cbc.ca/news/canada/newfoundland-labrador/researcher-calls-for-changes-for-wind-power-1.3926183

CBC News. (2018). Unemployment still on the rise in N.L.: Stats Can. Retrieved from https://www.cbc.ca/news/canada/newfoundland-labrador/unemployment-rising-newfoundland-labrador-1.4753099

CBC News. (2019). Confronting carbon: How does Canada meet its climate targets? Retrieved from https://www.cbc.ca/news2/interactives/confronting-carbon/

CBC News. (2019a). Generators will get residents through winter after fire at Charlottetown diesel plant. Retrieved from https://www.cbc.ca/news/canada/newfoundland-labrador/charlottetown-fire-hydro-1.5313237

CBC News. (2019b). Power restored after diesel plant fire knocks out electricity to Charlottetown, Pinsent's Arm. Retrieved from https://www.cbc.ca/news/canada/newfoundland-labrador/charlottetown-diesel-hydro-fire-1.5311416

CBC News. (2019c). Group of premiers band together to develop nuclear reactor technology. Retrieved from https://www.cbc.ca/news/politics/group-of-premiers-band-together-to-develop-nuclear-reactor-technology-1.5380316

CBC News. (2019d). Things getting back on track after mess of winter weather for N.L. Retrieved from https://www.cbc.ca/news/canada/newfoundland-labrador/feb-12-weather-back-on-track-1.5015458

CBC News. (2020a). Bank of Canada holds rate steady, saying COVID-19 economic impact 'appears to have peaked'. Retrieved from https://www.cbc.ca/news/business/bank-of-canada-rate-decision-1.5596399

CBC News. (2020b). What the COVID-19 employment crisis tells us about the future of work. Retrieved from https://www.cbc.ca/news/business/covid-19-employment-crisis-recovery-employment-in-2030-1.5588285

CBC News. (2020c). With Muskrat work halted, Naclor says it can't predict when megaproject will be completed. Retrieved from https://www.cbc.ca/news/canada/newfoundland-labrador/muskrat-covid-halt-1.5517798

Cherniak, D., Dufresne, V., Keyte, L., Mallett, A., & Schott, S. (2015, September). Report on the state of alternative energy in the Arctic. Retrieved from https://curve.carleton.ca/08515c6b-3b39-4c41-ad7b-2c6306cf0379

Chicco, G., & Mancarella, P. (2009). Distributed multi-generation: A comprehensive view. *Renewable and sustainable energy reviews*, *13*(3), 535-551.

Clarke, D., Mitchell, G., Elson, A., Lambourne, T., Groves, G., & Simon, D. (2010). Describing the lands and people of south/central Labrador: Document is pursuit of reclaiming a homeland. Retrieved from https://www.ceaa.gc.ca/050/documents_staticpost/26178/45225/chap01.pdf

Clarkson, L., Morrissette, V., & Regallet, G. (1992). Our responsibility to the seventh generation: Indigenous peoples and sustainable development. Winnipeg, MB: International Institute for Sustainable Development

CNN. (2020). Covid-19 lockdowns could drop carbon emissions to their lowest level since World War II. But the change may be temporary. Retrieved from https://www.cnn.com/2020/05/19/world/carbon-emissions-coronavirus-pandemic-scn-climate-trnd/index.html

Coates, K. & Landrie-Parker, D. (2016). Northern Indigenous peoples & the prospects for nuclear energy. Retrieved from https://www.schoolofpublicpolicy.sk.ca/documents/research/archivedpublications/

Coates, K., & Poelzer,, G.. An unfinished nation: Completing the devolution revolution in Canada's North. Retrieved from https://www.macdonaldlaurier.ca/files/pdf/ArcticDevolution-final.pdf communities. Retrieved from
https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/2018/en/3c-energy-transition-in-northern-and-remote-Communities-workshop-repor-eng.pdf. communities.pdf.

Cooke, J,. & Ryan, V. (2019). Closing submission on behalf of the NunatuKavut Community Council Inc. to The Commission of Inquiry Respecting the Muskrat Falls Project (The "Inquiry"). Retrieved from https://www.muskratfallsinquiry.ca/files/NunatuKavut-Community-Council-Inc-Final-Submission.pdf

Cowell, R., Bristow, G., & Munday, M. (2011). Acceptance, acceptability and environmental justice: the role of community benefits in wind energy development. *Journal of Environmental Planning and Management, 54*(4), 539-557.

Creamer, E., Aiken, G. T., van Veelen, B., Walker, G., & Devine-Wright, P. (2019). Community renewable energy: What does it do? Walker and Devine-Wright (2008) ten years on. *Energy Research & Social Science, 57*, 101223.

Creamer, E., Eadson, W., van Veelen, B., Pinker, A., Tingey, M., Braunholtz-Speight, T., ... & Lacey-Barnacle, M. (2018). Community energy: Entanglements of community, state, and private sector. *Geography compass*, *12*(7), e12378.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Del Río, P., & Burguillo, M. (2008). Assessing the impact of renewable energy deployment on local sustainability: Towards a theoretical framework. *Renewable and sustainable energy reviews*, 12(5), 1325-1344.

Del Rio, P., & Burguillo, M. (2009). An empirical analysis of the impact of renewable energy deployment on local sustainability. *Renewable and Sustainable Energy Reviews*, *13*(6-7), 1314-1325.

Department of Energy and Mines. (n.d.). COMFIT. Retrieved from https://energy.novascotia.ca/renewables/programs-and-projects/comfit

Department of Mines and Energy. (2003). Government directs PUB to maintain status quo on rural rate subsidy. Retrieved from https://www.releases.gov.nl.ca/releases/2003/mines&en/0709n09.html

Department of Municipal Affairs and Environment. (2018). Your request for access to information under Part II of the Access to Information and Protection of Privacy Act, 2015. Retrieved from https://atipp-search.gov.nl.ca/public/atipp/requestdownload?id=7851

Department of Natural Resources. (2017). RE: Labrador ratepayers be impacted by Muskrat Falls costs. Retrieved from https://happyvalley-goosebay.com/wp-content/uploads/2016/02/June-2017-Correspondence.pdf

Department of Natural Resources. (2019, April). Provincial government seeks expressions of interest for renewable energy solutions in isolated diesel communities. Retrieved from https://www.gov.nl.ca/releases/2019/nr/0415n11/

Elliott, B., Jayatilaka, D., Brown, C., Varley, L., & Corbett, K. K. (2012). "We are not being heard": Aboriginal perspectives on traditional foods access and food security. *Journal of Environmental and Public Health*, *2012*.

Energy Hub. (2020). Solar energy maps Canada. Retrieved from https://www.energyhub.org/solar-energy-maps-canada/

Environment and Climate Change Canada. (2017). Greenhouse Gas Emissions by Canadian Economic Sector. Retrieved from https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=F60DB708

Environment and Climate Change Canada. (2019). Canada's changing climate report. Retrieved from https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR_FULLREPORT-EN-FINAL.pdf

Environmental Commissioner of Ontario. (2019). Climate pollution: Reducing my footprint. Retrieved from http://www.auditor.on.ca/en/content/reporttopics/envreports/env19/2019_ClimatePollution_ReducingMyFootprint.pdf

Fast, S., Mabee, W., Baxter, J., Christidis, T., Driver, L., Hill, S., ... & Tomkow, M. (2016). Lessons learned from Ontario wind energy disputes. *Nature Energy*, *1*(2), 15028.

Fitzgerald, E., & Lovekin, D. (2018). Renewable energy partnerships and project economics: research supporting indigenous-utility partnerships and power purchase agreements. Retrieved from Pembina Institute website: https://www.pembina.org/reports/re-partnerships-and-project-economics.pdf.

Fusch, P. I., & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. *The qualitative report*, *20*(9), 1408.

Gibson, R. B. (2010). Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making. In *Tools, Techniques and Approaches for Sustainability: collected writings in environmental assessment policy and management* (pp. 389-410).

Goedkoop, F., & Devine-Wright, P. (2016). Partnership or placation? The role of trust and justice in the shared ownership of renewable energy projects. *Energy Research & Social Science*, 17, 135-146.

Government of Alberta. (2020). Capping oil sands emissions. Retrieved from https://www.alberta.ca/climate-oilsands-emissions.aspx#:~:text=Oil%20sands%20operations%20currently%20emit,by%20facility%20or%20industry%2Dwide.

Government of Canada. (2011, August). Status or remote/off-grid communities in Canada. Retrieved from https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf

Government of Canada. (2016). Pan-Canadian framework on clean growth and climate change. Canada’s plan to address climate change and grow the economy. Retrieved from http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf

Government of Canada. (2018). Tri-Council policy statement. Ethical conduct for research involving humans. Retrieved from https://ethics.gc.ca/eng/documents/tcps2-2018-en-interactive-final.pdf

Government of Canada. (2019). Canada launches off-diesel initiative for remote indigenous communities. Retrieved from https://www.canada.ca/en/natural-resources-canada/news/2019/02/canada-launches-off-diesel-initiative-for-remote-indigenous-communities.html

Government of Canada. (2020a). Generating new opportunities: Indigenous off-diesel initiative. Retrieved from https://impact.canada.ca/en/challenges/off-diesel

Government of Canada. (2020b). Small modular reactors (SMRs) for mining: Frequently asked questions. Retrieved from https://www.nrcan.gc.ca/our-natural-resources/energy-sources-distribution/nuclear-energy-uranium/canadas-small-modular-reactor-ro/small-modular-reactors-smrs-mining-frequently-asked-questions/22698

Government of Newfoundland and Labrador. (2015). Focusing our energy: Energy plan progress report | 2015. Retrieved from https://www.gov.nl.ca/nr/files/pdf-energy-plan.pdf

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis, 11*(3), 255-274.

Hanrahan, M. (2000). Industrialization and the politicization of health in Labrador Métis society. *Can J Native Stud*, *20*(2), 231-50.

Hanrahan, M. (2003). Water Rights and Wrongs: Safe drinking water remains a distant hope for residents of Black Tickle and many other Indigenous people in Canada. *Alternatives Journal*, *29*(1), 31-35.

Hanrahan, M. (2008). Tracing social change among the Labrador Inuit and Inuit-Métis: What does the nutrition literature tell us?. *Food, Culture & Society*, *11*(3), 315-333.

Hanrahan, M., Sarkar, A., & Hudson, A. (2014). Exploring water insecurity in a northern indigenous community in canada: the "never-ending job" of the southern inuit of black tickle, labrador. *Arctic Anthropology*, *51*(2), 9-22.

Heerema, D., & Lovekin, D. (2019). Power shift in remote indigenous communities: A cross-Canada scan of giesel reduction and clean energy policies. Retrieved from https://www.pembina.org/reports/power-shift-indigenous-communities.pdf

Henderson, C. (2013). Aboriginal Power: Clean Energy & The Future of Canada's First Peoples. Erin, ON: Rainforest Editions.

Hobson, D. (2019). The energy trilemma of Indigenous Peoples in the Canadian arctic: A way forward. Retrieved from https://www.ie-ei.eu/Ressources/FCK/image/RECHERCHE/Theses_2019/Hobson-The_Energy_Trilemma.pdf

Huesca-Pérez, M. E., Sheinbaum-Pardo, C., & Köppel, J. (2016). Social implications of siting wind energy in a disadvantaged region–The case of the Isthmus of Tehuantepec, Mexico. *Renewable and Sustainable Energy Reviews*, *58*, 952-965.

Hydro One Remote Communities Inc. [HORCI]: Greenhouse has inventory report and action plan. Retrieved from https://www.csaregistries.ca/files/projects/4220_7970_CSR_GHGReport_20150101_20151231.pdf

Indigenous and Northern Affairs Canada. (2015). Evaluation of the ecoENERGY for Aboriginal and Northern Communities Program. https://www.aadnc-aandc.gc.ca/eng/1465235699114/1465236134726

Indigenous Clean Energy. (2016). Canada's climate change challenge. Retrieved from https://indigenouscleanenergy.com/canadas-climate-change-challenge/

Intergovernmental Panel on Climate Change. (2018). Summary for policymakers. Retrieved from https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

International Energy Agency & International Renewable Energy Agency [IRENA]. (2017). Perspectives for the energy transition: Investment needs for a low-carbon energy system. Retrieved from the IRENA website: https://www.irena.org/publications/2017/Mar/Perspectives-for-the-energy-transition-Investment-needs-for-a-low-carbon-energy-system

International Energy Agency. (2020). World energy balances. Retrieved from https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics

Irlbacher-Fox, S., & Mills, S. J. (n.d.). Devolution and resource revenue sharing in the Canadian North: Achieving fairness across generations. Retrieved from http://caid.ca/ResRevShaCanNor2007.pdf

Jaffar, A. (2015). Establishing a clean economy or strengthening Indigenous sovereignty: conflicting & complementary narratives for energy transitions (Master's thesis). Retrieved from https://atrium.lib.uoguelph.ca/xmlui/bitstream/handle/10214/9230/Jaffar_Atiya_201509_MA.pdf?sequence=1&isAllowed=y

Jaramillo-Nieves, L., & Del Río, P. (2010). Contribution of renewable energy sources to the sustainable development of islands: An overview of the literature and a research agenda. *Sustainability*, *2*(3), 783-811.

Joseph, B. (2016). Indigenous or Aboriginal: Which is correct? Retrieved from https://www.cbc.ca/news/indigenous/indigenous-aboriginal-which-is-correct-1.3771433

Karanasios, K., & Parker, P. (2016). Recent developments in renewable energy in remote Aboriginal communities, Newfoundland and Labrador, Canada. *Papers in Canadian Economic Development, 16*, 109-118.

Karanasios, K., & Parker, P. (2016b). Recent Developments in Renewable Energy in Remote Aboriginal Communities, Ontario, Canada. *Papers in Canadian Economic Development, 16,* 82-97.

Karanasios, K., & Parker, P. (2018). Tracking the transition to renewable electricity in remote indigenous communities in Canada. *Energy policy*, *118*, 169-181.

Kimmerer, R. (2011). Restoration and reciprocity: the contributions of traditional ecological knowledge. In *Human dimensions of ecological restoration* (pp. 257-276). Island Press, Washington, DC.

Knowles, J, (2016). Power shift: Electricity for Canada's Remote Communities. Retrieved from https://www.conferenceboard.ca/e-library/abstract.aspx?did=8249&AspxAutoDetectCookieSupport=1

Koster, R., Baccar, K., & Lemelin, R. H. (2012). Moving from research ON, to research WITH and FOR Indigenous communities: A critical reflection on community-based participatory research. *The Canadian Geographer/Le Géographe canadien*, *56*(2), 195-210.

Kovach, M. (2010). *Indigenous methodologies: Characteristics, conversations, and contexts*. University of Toronto Press.

Krupa, J. (2012). Identifying barriers to aboriginal renewable energy deployment in Canada. *Energy Policy*, *42*, 710-714.

Krupa, J., Galbraith, L., & Burch, S. (2015). Participatory and multi-level governance: applications to Aboriginal renewable energy projects. *Local Environment, 20*(1), 81-101.

Lavallée, L. F. (2009). Practical application of an Indigenous research framework and two qualitative Indigenous research methods: Sharing circles and Anishnaabe symbol-based reflection. *International journal of qualitative methods*, *8*(1), 21-40.

Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J., Abernethy, S., Andrew, R. M., ... & Friedlingstein, P. (2020). Temporary reduction in daily global CO 2 emissions during the COVID-19 forced confinement. *Nature Climate Change*, 1-7.

Lertzman, D. A., & Vredenburg, H. (2005). Indigenous peoples, resource extraction and sustainable development: An ethical approach. *Journal of Business Ethics*, *56*(3), 239.

Lewis, J. L., & Sheppard, S. R. (2005). Ancient values, new challenges: Indigenous spiritual perceptions of landscapes and forest management. *Society and Natural Resources*, *18*(10), 907-920.

Levac, L., McMurtry, L., Stienstra, D., Baikie, G., Hanson, C., & Mucina, D. Learning across Indigenous and western knowledge systems and intersectionality: Reconciling social science research approaches. Retrieved from https://www.criaw-icref.ca/images/userfiles/files/Learning%20Across%20Indigenous%20and%20Western%20KnowledgesFINAL.pdf

Louis, R. P. (2007). Can you hear us now? Voices from the margin: Using indigenous methodologies in geographic research. *Geographical research*, *45*(2), 130-139.

Lovekin, D. (2017). Unlocking clean energy opportunities for Indigenous communities: Federal funding will help communities develop renewable energy and transition off diesel. Retrieved from https://www.pembina.org/blog/unlocking-clean-energy-opportunities-indigenous-communities

Lovekin, D., Dronkers, B., Thibault, B. (2016). Power purchase policies for remote Indigenous communities in Canada: Research on government policies to support renewable energy projects. Retrieved from World Wildlife Fund Canada website: http://assets.wwf.ca/downloads/pembina_final_report.pdf

MacDonald, C., & Steenbeek, A. (2015). The impact of colonization and western assimilation on health and wellbeing of Canadian Aboriginal people. *International Journal of Regional and Local History*, *10*(1), 32-46.

Martin, D. H. (2012). Two-eyed seeing: a framework for understanding indigenous and non-indigenous approaches to indigenous health research. *Canadian Journal of Nursing Research Archive*, *44*(2).

Martin, D. H., Valcour, J. E., Bull, J. R., Graham, J. R., Paul, M., & Wall, D. (2012). NunatuKavut community health needs assessment: A community based research project. Retrieved from https://nunatukavut.ca/home/files/pg/ncha_web.pdf

McDonald, N. C., & Pearce, J. M. (2012). Renewable energy policies and programs in Nunavut: Perspectives from the federal and territorial governments. *Arctic*, 465-475.

McDonald, N. C., & Pearce, J. M. (2013). Community voices: Perspectives on renewable energy in Nunavut. *Arctic,* 94-104.

McDowell, J. (2012). Community energy and emissions inventory. A Kluane First Nation-Yukon Research Centre partnership project. Retrieved from https://www.yukoncollege.yk.ca/sites/default/files/inline-

Mercer, N., & Hanrahan, M. (2017). "Straight from the heavens into your bucket": domestic rainwater harvesting as a measure to improve water security in a subarctic indigenous community. *International journal of circumpolar health, 76*(1), 1312223.

Mercer, N., Hudson, A., Parker, P., Martin, D., & Slade, S. (2019). Partner community expansion: '4RIGHT' energy planning in NunatuKavut, Labrador. Retrieved from https://nunatukavut.ca/site/uploads/2019/06/phase-2-prelim-results-20190603.pdf

Mercer, N., Parker, P., Martin, D., Hudson, A. (2018). '4RIGHT' community energy planning in NunatuKavut, Labrador: Preliminary research findings. Retrieved from https://nunatukavut.ca/site/uploads/2019/06/community-energy-planning-in-nunatukavut.pdf

Mercer, N., Sabau, G., & Klinke, A. (2017). "Wind energy is not an issue for government": Barriers to wind energy development in Newfoundland and Labrador, Canada. *Energy Policy*, *108*, 673-683.

Miller, D. (2016). "Historic moment" for Nunavut at renewable energy summit. Huffington Post. Retrieved from https://www.huffingtonpost.ca/david-r-miller/nunavut-renewable-energy-summit_b_12120618.html on September 19, 2019

Mohammed, Y. S., Mustafa, M. W., & Bashir, N. (2014). Hybrid renewable energy systems for off-grid electric power: Review of substantial issues. *Renewable and Sustainable Energy Reviews,* 35, 527-539.

Nalcor Energy. (2017). Nalcor energy and its subsidiaries compensation disclosure. Retrieved from https://www.gov.nl.ca/exec/hrs/files/pdf-nalcor-and-subsidiaries-report.pdf

Nalcor Energy. (n.d.). Economic benefits development of phase one. Retrieved from https://muskratfalls.nalcorenergy.com/wp-content/uploads/2013/04/Phase1-Economic-Benefits-Apr2013.pdf

National Aeronautics and Space Administration. (2020). Overview: Weather, global warming, and climate change. Retrieved from https://climate.nasa.gov/resources/global-warming-vs-climate-change/

National Energy Board. (2017). Canada's Renewable Power Landscape: Energy Market Analysis 2017. Retrieved from https://www.neb-one.gc.ca/nrg/sttstc/lctrct/rprt/2017cndrnwblpwr/2017cndrnwblpwr-eng.pdf

National Energy Board. (2019a, January). Provincial and Territorial Energy Profiles – Newfoundland and Labrador. Retrieved from https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/nl-eng.html

National Energy Board. (2019). Canada's renewable power landscape 2016 – energy market analysis. Retrieved from https://www.cer-rec.gc.ca/nrg/sttstc/lctrct/rprt/2016cndrnwblpwr/prvnc/nl-lb-eng.html

Natural Resources Canada. (2011). Status of Remote/Off-Grid Communities in Canada. Retrieved from: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf

Natural Resources Canada. (2014). Learn the facts: Fuel consumption and C02. Retrieved from https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oee/pdf/transportation/fuel-efficient-technologies/autosmart_factsheet_6_e.pdf

Natural Resources Canada. (2018). The atlas of Canada - Remote communities energy database. Retrieved from https://atlas.gc.ca/rced-bdece/en/index.html

Natural Resources Canada. (2019). Renewable energy facts. Retrieved from https://www.nrcan.gc.ca/science-and-data/data-and-analysis/energy-data-and-analysis/energy-facts/renewable-energy-facts/20069

Newfoundland and Labrador Hydro. (2016). 2016 Generation & Consumption Data for Newfoundland and Labrador Isolated Electricity Systems. Retrieved from https://opendata.gov.nl.ca/public/opendata/page/?page-id=datasetdetails&id=681

Newfoundland and Labrador Hydro. (2017). 2017 General Rate Application: Volume II. Retrieved from http://www.pub.nf.ca/applications/NLH2017GRA/applications/NLH%202017%20General%20Rate%20Application%20-%20Volume%202%20-%202017-07-28.pdf

Newfoundland and Labrador Hydro. (2018a). 2018 generation & consumption data for Newfoundland and Labrador isolated electricity systems. Retrieved from https://neia.org/wp-content/uploads/2019/05/EOIENERGY-1.pdf

Newfoundland and Labrador Hydro. (2018b). Approval of capital expenditures supplemental to Newfoundland and Labrador Hydro's (Hydro) 2018 capital budget application. Retrieved from http://www.pub.nf.ca/applications/NLH2018Capital_SUPP_MarysHarbour/applications/From%20NLH%20%20Control%20System%20Between%20Marys%20Harbour%20Diesel%20Plant%20and%20St%20Marys%20River%20Hydro%20Plant%20-%202018-08-23.PDF

Newfoundland and Labrador Hydro. (2018c). CIMFP Exhibit P-01496. Retrieved from https://www.muskratfallsinquiry.ca/files/P-01496.pdf

Newfoundland and Labrador Hydro. (2019). Application regarding changes to customer rates effective October 1, 2019. Retrieved from http://www.pub.nf.ca/applications/NLH2019CustomerRatesOctober/application/From%20NLH%20%20-%20Application%20for%20Approval%20of%20Changes%20to%20Customer%20Rates%20Effective%20October%201,%202019%20-%202019-09-17.PDF

Newfoundland and Labrador Hydro. (2020). Current rates. Retrieved from https://nlhydro.com/electricity-rates/current-rates/

NRCAN. (2013, October). Installation of hybrid photovoltaic-diesel system in British Columbia's Nemiah Valley. Retrieved from http://www.nrcan.gc.ca/energy/renewable-electricity/solar-photovoltaic/successstories/

Nunatsiavut Government. (2016, November). Nunatsiavut Energy Security Plan. Retrieved from http://www.nunatsiavut.com/wp-content/uploads/2017/01/Nunatsiavut-Energy-Security-Plan.pdf

NunatuKavut Community Council (2017a). Why I Love Norman Bay Labrador. Retrieved from https://nunatukavut.ca/site/uploads/2019/05/why_i_love_norman_bay_booklet.pdf

NunatuKavut Community Council. (2017b). Why I love Black Tickle. Retrieved from https://nunatukavut.ca/site/uploads/2019/05/why_i_love_black_tickle_booklet.pdf

NunatuKavut Community Council. (2017c). Why I Love St. Lewis Labrador. Retrieved from https://nunatukavut.ca/site/uploads/2019/05/why_i_love_st_lewis_booklet.pdf

NunatuKavut Community Council. (2018). Canada and NunatuKavut enter into historic talks to recognize Indigenous rights and self-determination. Retrieved from http://www.nunatukavut.ca/home/blog-1155

NunatuKavut Community Council. (2019a). British-Inuit Treaty of 1765. Retrieved from https://nunatukavut.ca/about/our-governance/

NunatuKavut Community Council. (2019b). Join our NATURE youth council. Retrieved from https://nunatukavut.ca/site/uploads/2019/05/nature_youth_council_application_form-1.pdf

NunatuKavut Community Council. (2019c). Our Rights Recognition. Retrieved from https://nunatukavut.ca/about/rights-recognition/

Nunavut News. (2019). Trudeau promises to eliminate diesel during Iqaluit visit. Retrieved from https://nunavutnews.com/nunavut-news/trudeau-promises-to-eliminate-diesel-during-iqaluit-visit/

Patton, M. Q. (2002a). Two decades of developments in qualitative inquiry: A personal, experiential perspective. *Qualitative social work*, *1*(3), 261-283.

Patton, M. Q., (2002). Qualitative Research and Evaluation Methods. SAGE Publications, Inc, Thousand Oaks, CA.

Prabatha, T., Hager, J., Carneiro, B., Hewage, K., & Sadiq, R. (2020). Analyzing energy options for small-scale off-grid communities: A Canadian case study. *Journal of Cleaner Production*, *249*, 119320.

Public Health England. (2014). Cold weather plan for England 2014: Protecting health and reducing harm from cold weather. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/468722/CWP_2014withdrawn.pdf

Purdon, N., & Palleja, L. (2018, December 2). Powering the North: $1.6 billion project connects remote communities to grid. Retrieved from https://www.cbc.ca/news/canada/wataynikaneyap-power-project-kingfisher-lake-1.4922788.

QUEST. (2018, July 25). Toward A Positive Energy Future in Northern and Remote Communities. Retrieved from https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/2018/en/3c-energy-transition-in-northern-and-remote-Communities-workshop-repor-eng.pdf

Rae, C., & Bradley, F. (2012). Energy autonomy in sustainable communities—A review of key issues. *Renewable and Sustainable Energy Reviews, 16*(9), 6497-6506.

Rahman, M. M., Khan, M. M. U. H., Ullah, M. A., Zhang, X., & Kumar, A. (2016). A hybrid renewable energy system for a North American off-grid community. *Energy, 97,* 151-160.

Rand, J., & Hoen, B. (2017). Thirty years of North American wind energy acceptance research: What have we learned?. *Energy research & social science*, *29*, 135-148.

Rezaei, M., & Dowlatabadi, H. (2016). Off-grid: community energy and the pursuit of self-sufficiency in British Columbia's remote and First Nations communities. *Local Environment, 21*(7), 789-807.

Rice, B., Oakes, J. E., & Riewe, R. R. (Eds.). (2005). *Seeing the world with Aboriginal eyes: A four directional perspective on human and non-human values, cultures and relationships on Turtle Island*. Aboriginal Issues Press.

Rickerson, W., Uppal, J., Glassmire, J., Lilenthal, P., Sanders, E., Colson, C.,… & Couture, T. (2012). Renewable energies for remote areas and islands (Remote). Retrieved from http://iea-retd.org/wpcontent/uploads/2012/06/IEA-RETD-REMOTE.pdf

Rundstrom, R., & Deur, D. (1999). Reciprocal appropriation. *Geography and ethics*, 237.

Sam-Aggrey, H. (2016). Opportunities and challenges related to the deployment of small modular reactors in mines in the northern territories of canada. *CNL Nuclear Review*, *5*(1), 143-153.

Sarkar, A., Hanrahan, M., & Hudson, A. (2015). Water insecurity in Canadian Indigenous communities: some inconvenient truths. *Rural and Remote Health, 15,* 3354.

Schiffer, J. (2016). Why Aboriginal Peoples can't just "get over it": Understanding and addressing intergenerational trauma. Retrieved from https://www.heretohelp.bc.ca/why-aboriginal-peoples-cant-just-get-over-it

Schnarch, B. (2004). Ownership, control, access, and possession (OCAP) or self-determination applied to research: A critical analysis of contemporary First Nations research and some options for First Nations communities. *International Journal of Indigenous Health*, *1*(1), 80.

Schuessler, R. (2014). Energy Poverty Indicators: Conceptual Issues. Part I: The Ten-Percent Rule and Double Median/Mean Indicators. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2459404

Schultz, K. C. (2017). Leading the way to sustainability: a First Nation's case study in self-sufficiency (Doctoral dissertation, Royal Roads University, Canada).

Sharma, R. (2019). Trudeau promises to eliminate diesel during Iqaluit visit. Retrieved from https://nunavutnews.com/nunavut-news/trudeau-promises-to-eliminate-diesel-during-iqaluit-visit/

Sherwani, A. F., & Usmani, J. A. (2010). Life cycle assessment of solar PV based electricity generation systems: A review. *Renewable and Sustainable Energy Reviews, 14*(1), 540-544.

Skinner, K., Hanning, R. M., Desjardins, E., & Tsuji, L. J. (2013). Giving voice to food insecurity in a remote indigenous community in subarctic Ontario, Canada: traditional ways, ways to cope, ways forward. *BMC Public Health*, *13*(1), 427.

Smith, L. T. (1999). Decolonizing methodologies: Research and Indigenous Peoples. London, UK: Zed Books

Smith, L. T. (2013). *Decolonizing methodologies: Research and indigenous peoples*. Zed Books Ltd.

Snively, G., & Williams, L. (2016). Knowing home: Braiding Indigenous science with Western science. Victoria, BC: Pressbooks.

Sovacool, B. K., Axsen, J., & Sorrell, S. (2018). Promoting novelty, rigor, and style in energy social science: towards codes of practice for appropriate methods and research design. *Energy Research & Social Science*, *45*, 12-42.

Statistics Canada. (2016). Census profile - 2016, census. Retrieved from https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/search-recherche/lst/resultsresultats.cfm?Lang=E&TABID=1&G=1&Geo1=&Code1=&Geo2=&Code2=&GEOCODE=10&type=0

Statistics Canada. (2017). Aboriginal peoples in Canada: Key results from the 2016 Census. Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/171025/dq171025a-eng.htm

Statistics Canada. (2019a). Aboriginal peoples in Canada: Key results from the 2016 census. Retrieved from https://www150.statcan.gc.ca/n1/daily-quotidien/171025/dq171025a-eng.htm

Statistics Canada. (2019b). Monthly average retail prices for gasoline and fuel oil, by geography. Retrieved from https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1810000101#timeframe

Statistics Canada. (2019c). Census profile, 2016 census. Retrieved from https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=DPL&Code1=100263&Geo2=PR&Code2=10&SearchText=Black%20Tickle-Domino&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=100263&TABID=1&type=0

Stefanelli, R. D., Walker, C., Kornelsen, D., Lewis, D., Martin, D. H., Masuda, J., ... & Castleden, H. (2019). Renewable energy and energy autonomy: how Indigenous peoples in Canada are shaping an energy future. *Environmental Reviews*, *27*(1), 95-105.

Steinhauer, E. (2002). Thoughts on an Indigenous research methodology. *Canadian Journal of Native Education*, *26*(2), 69.

Stevenson, M. G. (1996). Indigenous knowledge in environmental assessment. Arctic, 278-291.

Stopp, M. (2002). Reconsidering Inuit presence in southern Labrador. Études/Inuit/Studies, 26(2), 71-106.

Synapse. (2019). Phase 2 report on Muskrat Falls project rate mitigation. Retrieved from http://www.pub.nf.ca/2018ratemitigation/report/Synapse%20Energy%20Economics%20Inc.%20-%20Phase%20Two%20Report%20-%20September%203,%202019.pdf

Take Charge. (n.d.). Isolated systems energy efficiency program. Retrieved from https://takechargenl.ca/residential/rebate-programs/isolated-systems-energy-efficiency-program/

The Independent. (2018). Building sustainable energy from the ground up in Newfoundland and Labrador. Retrieved from https://theindependent.ca/2018/12/12/building-sustainable-energy-from-the-ground-up-in-newfoundland-and-labrador/

The Labradorian. (2017, September). Woodward's to stop fuel service in Black Tickle. Retrieved from https://www.thelabradorian.ca/business/woodwards-to-stop-fuel-service-in-black-tickle-26866/

The Star. (2018). Canada produces more greenhouse gas emissions than any other G20 country, new report says. Retrieved from https://www.thestar.com/news/canada/2018/11/14/canada-produces-most-greenhouse-gas-emissions-than-any-other-g20-country-new-report-says.html

The Telegram. (2019). United Nations calls for methyl mercury mitigation at Muskrat Falls. Retrieved from https://www.thetelegram.com/news/local/united-nations-calls-for-methyl-mercury-mitigation-at-muskrat-falls-320088/

The Telegram. (2020). First Muskrat Falls payment of $200 million due in December. Retrieved from https://www.google.ca/search?sxsrf=ALeKk01Kb5rQNvxx5VihY-dByfhcUJD_ZQ%3A1591216672127&source=hp&ei=IArYXtjABYLjgwfCu52IAw&q=First+Muskrat+Falls+payment+of+%24200+million+due+in+December&oq=First+Muskrat+Falls+payment+of+%24200+million+due+in+December&gs_lcp=CgZwc3ktYWIQA1CHG1iHG2CBImgAcAB4AIABswKIAbMCkgEDMy0xmAEAoAECoAEBqgEHZ3dzLXdpeg&sclient=psyab&ved=0ahUKEwjY0ICEwObpAhWC8eAKHcJdBzEQ4dUDCAk&uact=5

Thompson, S., & Duggirala, B. (2009). The feasibility of renewable energies at an off-grid community in Canada. *Renewable and Sustainable Energy Reviews, 13*(9), 2740-2745.

Touchette, Y., Gass, P., & Echeverria, D. (2017, April). Costing energy and fossil fuel subsidies in Nunavut: A mapping exercise. IISD report. Retrieved from http://assets.wwf.ca/downloads/costing_fossil_fuel_subsidies_in_nunavut.pdf?_ga=2.123841474.9960317.1591297947-1357153083.1591297947

Trewn, H. (2019). How bundling power can help remote Arctic communities transition to clean energy: By teaming up and diversifying sources, far-flung villages can attract crucial investment. Retrieved from https://nunatsiaq.com/stories/article/how-bundling-power-can-help-remote-arctic-communities-transition-to-clean-energy/

Truth and Reconciliation Commision of Canada. (2015). Truth and reconciliation commission of Canada: Calls to action. Retrieved from http://trc.ca/assets/pdf/Calls_to_Action_English2.pdf

Turner, N. J., & Clifton, H. (2009). "It's so different today": Climate change and indigenous lifeways in British Columbia, Canada. *Global Environmental Change*, *19*(2), 180-190.

UN Environment Programme. (2019). Emissions gap report 2019. Retrieved from https://www.unenvironment.org/resources/emissions-gap-report-2019

United Nations Human Rights Office of the High Commissioner. (2013). Free, prior and informed consent of Indigenous Peoples. Retrieved from https://www.ohchr.org/Documents/Issues/ipeoples/freepriorandinformedconsent.pdf

Uprety, Y., Asselin, H., Bergeron, Y., Doyon, F., & Boucher, J. F. (2012). Contribution of traditional knowledge to ecological restoration: practices and applications. *Ecoscience*, *19*(3), 225-237.

Van-Vilet, V. (2009). Off-Grid Communities Initiative. Retrieved from https://www.pembina.org/reports/winddiesel-1-daniel-van-vliet.pdf

Vice, J. (2012). Municipalities can benefit from renewable energy. *Municipal World, 122*(1), 17 – 18.

Vice. (2018). How activists are resisting a megadam that threatens 'cultural genocide'. Retrieved from https://www.vice.com/en_us/article/j5zbpx/how-activists-are-resisting-a-megadam-that-threatens-cultural-genocide

Walker, C., & Baxter, J. (2017a). "It's easy to throw rocks at a corporation": wind energy development and distributive justice in Canada. *Journal of Environmental Policy & Planning*, *19*(6), 754-768.

Walker, C., & Baxter, J. (2017b). Procedural justice in Canadian wind energy development: a comparison of community-based and technocratic siting processes. *Energy research & social science*, *29*, 160-169.

Walker, C., Alexander, A., Doucette, M. B., Lewis, D., Neufeld, H. T., Martin, D., ... & Castleden, H. (2019). Are the pens working for justice? News media coverage of renewable energy involving Indigenous Peoples in Canada. *Energy Research & Social Science, 57*, 101230.

Walker, G., & Devine-Wright, P. (2008). Community renewable energy: What should it mean?. *Energy policy*, *36*(2), 497-500.

Wallenius, J., Qvist, S., Mickus, I., Bortot, S., Ejenstam, J., & Szakalos, P. (2017). SEALER: a small lead-cooled reactor for power production in the Canadian Arctic.

Warren, D. (2018, August). A business case analysis of alternative energy generation in off-grid, diesel powered communities in Labrador. Retrieved From https://drive.google.com/file/d/1V3iCeUJew1cb4BTmeeeQjzKEPUxcC2i-/view?ts=5b746539.

Weber-Pillwax, C. (2001). What is Indigenous research?. *Canadian Journal of Native Education*, *25*(2), 166.

Weis, T. M., & Ilinca, A. (2008). The utility of energy storage to improve the economics of wind–diesel power plants in Canada. *Renewable energy, 33*(7), 1544-1557.

Weis, T. M., & Ilinca, A. (2010). Assessing the potential for a wind power incentive for remote villages in Canada. *Energy Policy, 38*(10), 5504-5511.

Wilson, S. (2007). Guest editorial: what is an Indigenist research paradigm?. *Canadian Journal of Native Education*, *30*(2), 193.

Wojtaszek, D. T. (2017). Potential off-grid markets for SMRS in Canada. *CNL Nuclear Review*, *8*(2), 87-96.

World Wildlife Fund. (n.d.). The true cost of fuel in the Arctic: Power purchase policies, diesel subsidies and renewable energy. http://assets.wwf.ca/downloads/pembina_final_report.pdf

Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy policy*, *35*(5), 2683-2691.

Wyse, S. M., & Hoicka, C. E. (2019). "By and for local people": assessing the connection between local energy plans and community energy. *Local Environment*, 1-18.

Zhang, Y., Wildemuth, B.M., 2009. Qualitative analysis of content. In: Wildemuth, B. (Ed.), Applications of social Research Methods to Questions in Information and Library Science. Libraries Unlimited, Westport CT, 222–231.

Appendix A: Community-Member Interview-Survey Instrument

Community Member Household Survey/Interview: Energy Planning & Sustainability Assessment in NunatuKavut, Labrador

Name of Researcher: Nicholas Mercer
Survey Code:
Date: ____________________

Description: This research project is in partnership with the NunatuKavut Community Council. The primary objective of this survey is to gather community-member perceptions and concerns surrounding the impacts of diesel-generation and home heating systems in NunatuKavut communities. Additionally, we seek to identify community preferences and motivations for future sustainable energy options.

1. Please state your level of concern regarding the following impacts related to electricity-generation and home heating in the community (Where 1 = not concerned, and 5 = extremely concerned).

1.1. Are you concerned about the affordability of electricity bills?

1 2 3 4 5 Do Not Know No Response

1.2. Are you concerned about the affordability of home heating?

1 2 3 4 5 Do Not Know No Response

1.3. Are you concerned that existing energy subsidies may not continue in the future?

1 2 3 4 5 Do Not Know No Response

1.4. Are you concerned about the structure of energy subsidies? (1,000 kWh)

1 2 3 4 5 Do Not Know No Response

1.5. Are you concerned about power outages?

1 2 3 4 5 Do Not Know No Response

1.6. Are you concerned about access to supplies of home heating fuel?

1 2 3 4 5 Do Not Know No Response

1.7. Are you concerned about climate change as a result of fossil fuel use?

1 2 3 4 5 Do Not Know No Response

1.8. Are you concerned about the risk of fuel spills and leaks?

1 2 3 4 5 Do Not Know No Response

1.9. Are you concerned about deforestation associated with firewood harvesting?

1 2 3 4 5 Do Not Know No Response

1.10. Are you concerned about public health risks from energy use?

1 2 3 4 5 Do Not Know No Response

1.11. Are you concerned about the community's relationship with Nalcor?

1 2 3 4 5 Do Not Know No Response

1.12. Are you concerned about the community's relationship with Newfoundland and Labrador Hydro?

1 2 3 4 5 Do Not Know No Response

1.13. Are you concerned about noise associated with the diesel plant?

1 2 3 4 5 Do Not Know No Response

1.14. For the issues that you are most concerned about, why do you feel this way?

1.14. Do you have any other concerns related to community energy systems that you would like to discuss?

2) Please state your level of support or opposition for the following electricity-generation technologies in your community (1 = strongly oppose, 2 = somewhat oppose, 3 = neutral, 4 = somewhat support, and 5 = strongly support):

2.1. Wind power:

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

No Response

2.2. Solar power:

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.3. Tidal power:

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.4. Wave power

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.5. Small-scale hydroelectricity (run of the river / no reservoir)

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.6. Large-scale hydroelectricity (with reservoir)

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.7. Combined heat and power biomass

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.8. Diesel-generation

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.9. Small-scale nuclear energy

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.10. Coastal Transmission Line (Connection to Provincial Electricity Grid)

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.11. Battery Storage

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.12. Pumped Hydro Storage

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

2.10. For the electricity-generation options you most oppose; why do you feel this way?

Probe questions: What are your main concerns surrounding these technologies?

2.11. For the electricity-generation options you most support; why do you feel this way?

Probe questions: Why are you supportive of these technologies?

3) Please state your level of support or opposition for the following energy-efficiency/home-heating technologies in your community (1 = strongly oppose, 2 = somewhat oppose, 3 = neutral, 4 = somewhat support, and 5 = strongly support):

3.1. Communal public firewood service

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.2. High efficiency woodstoves

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.3. Conversion to electric heat

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.4. Ground/air source heat pumps

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.5. Improved insulation of basement walls, ceilings, attics

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.6. Electronic/programmable thermostats

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.7. Conversion to LED lighting

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.8. Weather stripping for windows and doors

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.9. Window upgrades (double/triple-glazed windows)

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.10. Conversion to energy star appliances (washer, dryer, fridge, freezer, etc.)

Strongly Oppose Somewhat Oppose Neutral Somewhat Support Strongly Support

Do Not Know No Response

3.13. For the energy efficiency/home heating technologies you most oppose; why do you feel this way?

Probe questions: What are your main concerns surrounding these technologies?

3.14. For the energy efficiency/home heating technologies you most support; why do you feel this way?

Probe questions: Why are you supportive of these technologies?

4. What is the importance of each factor regarding future sustainable energy projects in your Community? (1 = not important, 5 = extremely important).

~~***4.1. Financial savings as a result of projects***~~

~~1 2 3 4 5 No Response~~

4.2. Reducing the sudden changes (ups and downs) of energy prices

1 2 3 4 5 Do Not Know No Response

~~***4.3. Reductions in energy subsidies provided by government***~~

~~1 2 3 4 5 No Response~~

4.4. Improved reliability in access to electricity (energy autonomy)

1 2 3 4 5 Do Not Know No Response

~~***4.5. Improved access to home heating fuel***~~

~~1 2 3 4 5 No Response~~

4.6. Revenue generation for the community

1 2 3 4 5 Do Not Know No Response

4.7. Job creation as a result of projects

1 2 3 4 5 Do Not Know No Response

~~***4.8. Reductions of greenhouse gas emissions***~~

~~1 2 3 4 5 No Response~~

~~***4.9. Environmental protection (lowered risks of fuel spills and leaks)***~~

~~1 2 3 4 5 No Response~~

4.10. Improvements in public health outcomes

1 2 3 4 5 Do Not Know No Response

4.11. Community ownership of energy projects

1 2 3 4 5 Do Not Know No Response

4.12. Educational/training opportunities for community members

1 2 3 4 5 Do Not Know No Response

~~***4.13. Levels of noise associated with generation-plants***~~

~~1 2 3 4 5 No Response~~

4.14. Operational safety of generation-plants

1 2 3 4 5 Do Not Know No Response

4.15. Appearance of generation-plants

1 2 3 4 5 Do Not Know No Response

4.16. Location of generation-plants

1 2 3 4 5 Do Not Know No Response

4.17. For the sustainable energy project factors that you identified as being most important; why do you feel this way?

5. Does Your Family Have a Cabin or Camp Located Outside of Your Community?

Yes No No Response

If yes, how is your cabin/camp currently powered and heated? How often do you live at your cabin on an annual basis? Have you observed any environmental impacts of energy-use at your cabin (e.g. fuel spills, deforestation, etc.)? What are some measures that could be taken to improve energy sustainability at your cabin (renewable energy or energy efficiency technologies)?

---

5. Demographic questions

5.1. Please circle your gender:

Male   Female   Other:__________

5.2. Please circle your age group:

Under 25   25 – 34   35 – 44   45 – 54   Over 54

5.3. Please circle your highest level of education:

Elementary   Secondary   University Graduate   College Diploma
Other:__________

5.4. Please circle your current profession:

Student   Public Sector:__________   Private Sector:_________

Self-Employed:__________   Unemployed:__________   Other:__________

5.5. Census data in your region suggests median income for 2015 was $28,608. In relation to this, how would you describe your personal income?

Much Less   Less   Same   More   Much More   Prefer Not to Specify

5.6. Do you identify yourself as Inuit, First Nations, or Métis?

Yes   No   Prefer Not to Specify

5.7. What is your primary household heating source?

Oil Furnace   Wood Stove   Electric   Other:__________

5.8. Is your home adequately heated?

Yes   No   Prefer Not to Specify

If no, how many days or weeks per year is your home inadequately heated/when does this most frequently occur?

___

___

Thank you for your time,

SSHRC Engage Research Team

Appendix B: Key Informant Interview Questionnaire

Key Informant Interview Questionnaire: Energy Planning & Sustainability Assessment in NunatuKavut, Labrador

Name of Interviewer: Nicholas Mercer
Name of Key Informant: ____________________
Interview Location and Date: ____________________

Description: This research project is in partnership with the NunatuKavut Community Council. The primary objective of this interview is to gather information which contributes to the understanding of how diesel-fired electricity generation and home heating-sources contribute to economic, environmental, social, and cultural outcomes for case-study communities (Black Tickle, Norman's Bay, and St. Lewis). The results will be used to enhance understanding of off-grid energy sustainability, and to inform ongoing 'energy planning' processes in NunatuKavut.

1. Please describe how diesel-generation and existing home-heating sources have benefitted the community to date?

Probe questions: How many jobs have been created as a result of the existing energy system (diesel plant, firewood harvesters, transportation of fuels, sales)? Have educational or training opportunities been provided to workers? Does the existing system stimulate additional financial benefits for the local economy (e.g. maintenance visits)? Is the existing system perceived as reliable?

____
____
____
____
____
____
____
____

2. Please describe the cost structure of electricity-generation and home heating sources in NunatuKavut communities. How do these costs affect community members?

Probe questions: What is the cost of diesel-generation per kilowatt hour [kWh]? What are average yearly expenditures on electricity and home heating respectively? What portion of yearly income does this represent? What costs are associated with home heating (e.g. furnace replacement, fuel for collecting firewood?) Are current energy bills affordable for

all/most households? How much fuel does the utility purchase annually – at what cost per liter?

3. Please describe current subsidy programs that reduce the cost of energy systems in NunatuKavut communities. Discuss any socio-economic implications of these subsidies.

Probe questions: What subsidy programs are currently in place (local, regional, national level)? How does cross-subsidization from grid-connected consumers affect ratepayers? What impacts do subsidies have on community members, local businesses, or governmental entities? (I.e. Do volume-based subsidies discourage the use of electric heating? Does differential pricing for commercial/governmental entities affect their willingness to operate in the community?). Do the communities view subsidies for private businesses as fair?

4. Please describe any energy security challenges in the communities – including interruptions to the supply of electricity, the secure availability of fuel, as well as the stability or volatility of fuel prices.

Probe questions: How often do interruptions occur each year and for how long? Where is diesel fuel currently sourced? How is fuel transported to the communities? Is there access to secure sources of fuel each year? Are there any complications which affect fuel availability?

5. Do the communities have adequate generation capacity to meet household and community economic needs? Have the communities experienced 'load-restrictions' in the last decade? If so, how did this impact the communities?

Probe questions: Has peak demand in the communities reached over 75% of generation capacity, or other critical thresholds? Did this result in the restriction of new construction or electrical connections? If yes, how did this affect the local economy or quality of life?

6. Are there any environmental or public health concerns surrounding emissions into the air from the diesel plant or household heating sources?

Probe questions: What are the primary emissions from the plant and what are their impacts (C02, sulphur dioxide, nitrous oxides, smoke/particulate matter)? Can you provide data on plant emissions? Have there been reported episodes related to health? Are there any deforestation or other impacts associated with firewood harvesting?

7. Have there been any instances of fuel spills or leaks in the communities associated with diesel-fuel or home heating sources? If so, what were the community impacts?

Probe questions: Where/when did the spills or leaks occur? How much fuel spilled? Are spills or leaks more common with transportation, transfer or storage of the fuel? Was a cleanup of the contaminated area undertaken? What were the costs associated with spills

and cleanups? Are there instances of home-heating oil spills? Do they occur at the same stages (transportation, transfer, storage) as diesel experiences? How do spills or leaks affect the communities?

8. Who holds primary decision-making authority regarding electricity-generation and home heating assets in the communities (i.e. diesel plants, storage tanks)?

Probe questions: Is this consistent or at odds with political/governance goals of the NunatuKavut Community Council? Are the communities consulted on energy related decisions? Is there any conflict surrounding energy-governance in the communities?

9. Have community members expressed concerns related to noise pollution?

Probe questions: What is the level of noise emitted from the plant? Have there been any community complaints?

10. Do you see interest for renewable energy development in the communities? If so, what are the main prospects (i.e. potential sources, benefits) and challenges (i.e. technical, economic, political)?

Probe questions: What is the feasibility of solar/wind/marine sources of electricity in the communities? Is there interest in batteries or other forms of energy storage? Could renewable energy development improve societal outcomes? What are the main barriers to renewable energy? Have you worked with the existing utilities regarding renewables?

11. Do you see interest for enhanced energy efficiency for home-heating or energy use in the communities? If so, what improvements can be made – what barriers are impeding progress?

Probe Questions: Are there alternative sources available for home heating? Are there technical or social measures that can be taken to improve household energy efficiency (added insulation, triple glazed windows, high efficiency shower heads/faucets, etc.)? How would these measures impact the communities?

12. Are there any other issues related to diesel-generation, renewable energy, or household energy use that you would like to discuss?

Probe question: Are there any other comments that you would like to make?

Appendix C: Key Informant Recruitment Letter

(*To be placed on UWaterloo letterhead upon ethics clearance)

Dear [Potential Participant's Name],

My name is Nicholas Mercer, and I am a doctoral student within the Department of Geography and Environmental Management at the University of Waterloo. I am currently working on data collection for my thesis entitled "Energy Sustainability Assessment & Planning in NunatuKavut Communities". I am conducting my thesis research under the supervision of Dr. Paul Parker, Professor and Associate Dean, Strategic Initiatives. Amy Hudson, Manager of Research, Education and Culture with the NunatuKavut Community Council, as well Debbie Martin, Associate Professor School of Health and Human Performance, Dalhousie University – are also collaborating/providing guidance for this research. Given your expertise in this area, I am writing to request a research interview for my project.

The vast majority of Newfoundland and Labrador's 22 off-grid communities remain reliant on diesel-fuel for electricity generation. Combined, these communities consume approximately 15 million litres of diesel-fuel per year. The communities rely predominantly on oil-furnaces and firewood for space-heating. While a growing body of literature has focused on energy sustainability in other off-grid Canadian jurisdictions, there is limited evidence available on this topic in Newfoundland and Labrador.

Working in collaboration with the NunatuKavut Community Council, the primary objective of my research is to assess stakeholder perspectives regarding the economic, environmental, social, and cultural impacts of diesel-generation and home-heating sources in three case-study Labrador communities: Black Tickle-Domino, St. Lewis, and Norman's Bay. A secondary objective of the current research is to explore preferences and potential for sustainable energy futures in each case study community – including renewable energy projects, and energy efficiency technologies. To accomplish these objectives, I will conduct semi-structured/open-ended expert interviews; these interviews will explore impacts of diesel-generation and the potential for more sustainable energy sources. Interviews will last approximately 30 – 60 minutes.

Data collection for this project will take place between May – November, 2018. Interviews will take place in-person/or via telephone depending on availability. If you are willing to participate in this research, a list of interview questions will be sent to you prior to the interview date. With your permission, I wish to record the expert interviews, but hand-writing your responses is also an option. The information you provide will be handled as confidentially as possible. The information you provide will be used for academic and research purposes; additionally, results will be presented to policymakers within the federal, provincial, and local government. A free and informed consent form will be sent to you prior to the interview, your signature will be obtained prior to the beginning of the interview.

If you are willing to participate in this project, please confirm your availability for an interview by responding to this email at n2mercer@uwaterloo.ca. If you have any questions or concerns, I can be reached at 1(709)660-6425. If you have any additional inquires, you can also contact my supervisor Dr. Parker via email at pparker@uwaterloo.ca, or by telephone at 1(519)888-4567, ext. 32791.

I look forward to meeting you. Thank you for your support,

Nicholas Mercer

Appendix D: Community Member Recruitment Letter

Dear Community Member,

My name is Nicholas Mercer, and I am a doctoral student within the Department of Geography and Environmental Management at the University of Waterloo. I am currently working on data collection for my thesis entitled "Energy Sustainability Assessment & Planning in NunatuKavut Communities". I am conducting my thesis research under the supervision of Dr. Paul Parker, Professor and Associate Dean, Strategic Initiatives. Amy Hudson, Manager of Research, Education and Culture with the NunatuKavut Community Council, as well Debbie Martin, Associate Professor School of Health and Human Performance, Dalhousie University – are also collaborating/providing guidance for this research.

I am writing to let you know that I will be conducting fieldwork in your community from March 1 – May 30, 2019. We are hoping to speak to community members regarding their concerns, preferences, and visions for sustainable energy futures.

The vast majority of Newfoundland and Labrador's 22 off-grid communities remain reliant on diesel-fuel for electricity generation. Combined, these communities consume approximately 15 million litres of diesel-fuel per year. The communities rely predominantly on oil-furnaces and firewood for space-heating. While a growing body of literature has focused on energy sustainability in other off-grid Canadian jurisdictions, there is limited evidence available in Newfoundland and Labrador.

Working in collaboration with the NunatuKavut Community Council, the primary objective of my research is to assess community-member perspectives regarding the economic, environmental, social, and cultural impacts of diesel-generation and home-heating sources in case-study Labrador communities: Black Tickle-Domino, St. Lewis, Norman's Bay, Cartwright, Port Hope Simpson, Mary's Harbour, Lodge Bay, Charlottetown, and Pinsent's Arm. A secondary objective of the current research is to explore preferences and potential for sustainable energy futures in each case study community – including renewable energy projects, and energy efficiency technologies. To accomplish these objectives, we are carrying out community-member surveys; these surveys will explore community concerns surrounding the existing energy system, and preferences for sustainable energy futures. The survey will be completed in person, and will take approximately 30 minutes to complete.

With your permission, I wish to record the community-member surveys, but hand-writing your responses is also an option. The information you provide will be handled as confidentially as possible. The information you provide will be used for academic and research purposes; additionally, results will be presented to policymakers within the federal, provincial, and local government. A free and informed consent form will be sent to you prior to the survey, your signature will be obtained prior to the beginning of the survey.

If you have any questions or concerns, I can be reached via email at n2mercer@uwaterloo.ca, or via phone at 1(709)660-6425.If you have any additional inquires, you can also contact my supervisor Dr. Parker via email at pparker@uwaterloo.ca, or by telephone at 1(519)888-4567, ext. 32791.

I sincerely thank you for your time and support,

Nicholas Mercer