Partner Community Expansion: '4RIGHT' Energy Planning in NunatuKavut, Labrador

A Preliminary Results Reported Prepared for: The NunatuKavut Community Council

Nicholas Mercer[1], Amy Hudson[2], Paul Parker[3], Debbie Martin[4], Siobhan Slade[5]

June, 2019

[1] PhD Candidate, Department of Geography and Environmental Management, University of Waterloo, n2mercer@uwaterloo.ca
[2] Manager of Research, Education and Culture, NunatuKavut Community Council
[3] Professor, School of Environment, Enterprise and Development, University of Waterloo
[4] Associate Professor, Health Promotion Division, Dalhousie University
[5] 'NATURE' Youth Council Coordinator, NunatuKavut Community Council

Table of Contents

ACKNOWLEDGEMENTS

The authors would like to express our sincere gratitude to the NunatuKavut Community Council, the Social Sciences and Humanities Research Council, the Canadian Institute of Health Research funded 'A SHARED Future' research project, the Conservation Corps of Newfoundland and Labrador, and Nunacor Development Corporation for funding this research. We would also like to thank the NATURE Youth Council for their tireless efforts and support in carrying out this research including: Abagail Poole, James Poole, Cody King-Poole, Riley Pye, Kendra Burden, Chloe Campbell, Hailey Turnbull, and Shannon Davis; as well our key collaborators Emily Beacock and Roland Kemuksigak. To the 211 community members who shared their time, knowledge, and expertise – we are forever grateful. Nakummek.

LIST OF FIGURES AND TABLES

1. Introduction:

The NunatuKavut Community Council [NCC] represents several off-grid diesel dependent Inuit communities in southeastern Labrador.

A growing body of literature documents the challenges of off-grid diesel generation (Knowles, 2016; Rickerson et al., 2012; NRCAN, 2011). While sustainable energy technologies are frequently promoted to advance off-grid sustainability, our research suggests that in the absence of community engagement, ownership, and control, sustainable energies may create economic, environmental, and societal tensions of their own. These tensions may include: project misalignment with community needs, imposition on self-determination and autonomy, job losses, issues related to local capacity, and the burden of significant upfront costs (Mercer et al., 2018; Rezaei & Dowlatabadi, 2016; Coates & Landrie-Parker, 2016; Rickerson et al., 2012).

Building upon NCC's '*Community Sustainability Initiative'* the goal of the current research is to expand beyond the initial three partner communities (Black Tickle, St. Lewis [Fox Harbour], and Norman Bay) to include six new communities in energy planning research: Port Hope Simpson, Mary's Harbour, Lodge Bay, Charlottetown, Pinsent's Arm, and Cartwright. Our research seeks to determine:

> 1) How do existing energy systems (based off diesel-fired electricity and home heat) affect the economic, environmental, and societal sustainability of communities?
>
> 2) How can a participatory and community-based assessment of sustainable energy technologies facilitate the improvement of energy sustainability in NunatuKavut Inuit communities?

The preliminary results report provides several important findings:

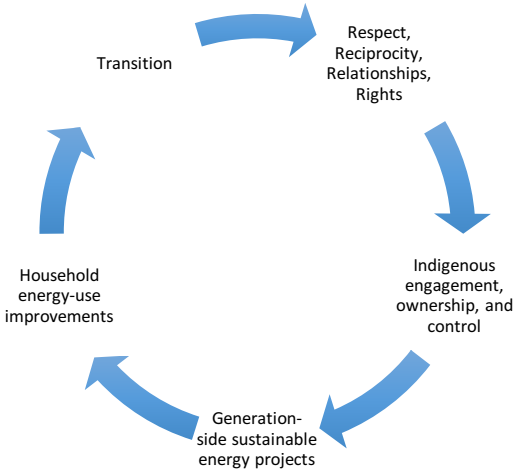
1. The main energy-related concern across NunatuKavut isolated diesel communities is projected increases in the cost of electricity and the need for rate mitigation.
2. Community-members value the positive socio-economic contributions of diesel-generation, but perceive small-scale wind and solar development as promising avenues to improve community sustainability.
3. Energy efficiency technologies maintain significantly higher social support in the communities than electricity generation options.
4. Community participants expressed deep desire to be integrally involved in energy-related decisions and to understand the risks and benefits of sustainable energy technologies prior to the advancement of any development.

2. The '4RIGHT' Community Energy Planning Framework:

Working with Inuit scholars, *A. Hudson* and *D. Martin*, we developed an approach termed the *'4RIGHT Community Energy Planning Framework'* **[Figure 1].** The approach asserts that successful sustainable energy transitions must be grounded in Indigenous worldviews of respect, reciprocity, relationships, and rights, also known as the 4Rs of Indigenous research (Castleden et al., 2012; Kimmerer, 2011).

We rely on the OCAP™ research principles, which includes Indigenous ownership, control, access, and possession of data, to assert self-determination in research (Schnarch, 2004). In addition, we uphold that a sustainable energy project must not proceed without the free, prior, and informed consent of communities (Stefanelli et al., 2018). Practically, energy planning practitioners must work at the community level to determine: energy-related needs, sustainable energy preferences, perceptions, and priorities.

Figure 1: '4RIGHT Community Energy Planning Framework'



The approach relies on social assessment of both supply-side and end-use energy options to determine community preferences and concerns. Intermittent renewable energy technologies are capable of providing 15 – 30% of the capacity in an isolated electrical system without significant integration costs (Logan & Kaplan, 2009). Other research suggests energy efficiency retrofits can displace as much as 40% of the electrical load in diesel-powered communities (Nunatsiavut Government, 2016). As such, an equitable focus needs to be placed on both *generation options* and *household energy use* to enhance the sustainability of isolated energy systems in tandem with community identified preferences and concerns.

We argue that if energy-planning researchers and practitioners can: maintain the 4 R's associated with Indigenous research; implement meaningful processes of Indigenous engagement, while following the principles associated with OCAP™; evaluate the socio-economic feasibility of supply-side and end-use energy technologies; that *only then* may practitioners make recommendations of which approaches are most likely to assist communities in transitioning to sustainable energy futures.

2.1. Operational Methods:

The primary research instrument included a hybrid community-member interview/survey. In total, we conducted 211 energy planning interviews across Black Tickle (n = 33), Fox Harbour (n = 36), Norman Bay (n = 6), Port Hope Simpson (n = 31), Mary's Harbour / Lodge Bay (n = 36), Charlottetown / Pinsent's Arm (n = 30), and Cartwright (n = 39).

The interviews aimed to determine:

1. What are the greatest energy related needs in each partner community?
2. What are preferences and concerns surrounding the future of energy?
3. How can energy be utilized more efficiently at the household level?
4. What are community priorities and visions for future development?

The secondary research instrument included key informant interviews (n = 11). We interviewed utility employees, municipal representatives, and private sector actors to gain a greater understanding of the challenges and opportunities facing off-grid energy systems in NunatuKavut.

For this preliminary results report, we rely on basic descriptive statistics to identify community-member perceptions. The final report (expected September, 2019) will include detailed analysis of interview transcripts. Preliminary results for this report underwent rigorous 'community review'. Five public events were hosted and community members had a chance to review, provide feedback, and ultimately approve results. This feedback is integrated into this preliminary findings report. In total, the public events engaged approximately 75 community members including Elders, town councils, NL Hydro employees, and the general public. Events took place in Fox Harbour (April 9th, 2019), Port Hope Simpson (April 25th), Mary's Harbour (April 29th), Charlottetown (May 9th), and Cartwright (May 21st).

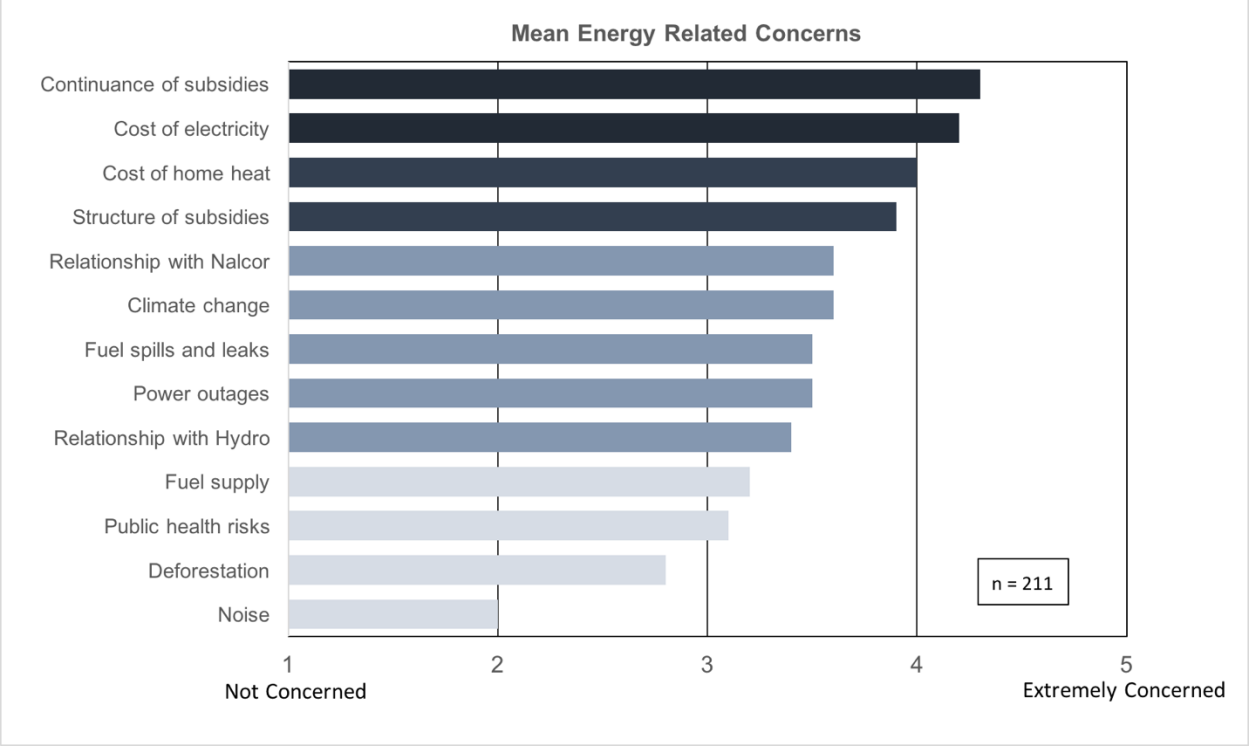
Preliminary results were also presented at a Sustainable Energy Research Forum hosted by NunatuKavut and held in Goose Bay in January 2019 and were made available to attendees at NunatuKavut's Annual General Assembly which was held in Mary's Harbour in November 2018.

3. Preliminary Results

3.1. Energy-Related Needs

The first objective of our research sought to determine the greatest energy-related needs in the partner communities. We accomplished this by asking respondents to rate several issues on a scale of one to five, where 1 = not concerned and 5 = extremely concerned. Results across all partner communities are shown in **Figure 2.**

Figure 2: Mean Energy Related Concerns in NunatuKavut Diesel-Powered Communities Communities



3.1.2. Rate Mitigation

The greatest energy-related concern which emerged across all partner communities was projected increases in the cost of electricity and the need for rate mitigation. Collectively, respondents gave 'continuance of subsidies' and the 'cost electricity' mean concern ratings of 4.3/5 and 4.2/5, respectively **[Fig 2].**

We note that 80% of respondents across all partner communities utilize wood or wood-oil mix as their primary form of heat, allowing them to minimize impacts on household electricity bills **[Table 1].** Relying on wood heat allows community-members to keep their monthly consumption under the 1,000 kilowatt hour [kWh] subsidized block of electricity, meaning electricity bills are typically no greater than $100/month.

Table 1: Primary Heating Source

Primary Heat Source (n = 211)	Percentage of Total
Wood: 152	72%
Oil: 21	10%
Wood/Oil: 17	8%
Electric: 16	8%
Other: 5	2%

As such, community concern is more related to projected increases in the cost of electricity as a result of the Lower Churchill project, than to current electricity rates. In the absence of rate mitigation measures, electricity rates for consumers on the island portion of the province are expected to rise from current rates of $0.12/kWh to $0.229/kWh by 2021 (Government of Newfoundland and Labrador, 2019). Off-grid diesel rates are heavily influenced and subsidized by the rates paid by grid-connected consumers (Newfoundland and Labrador Hydro, 2018). While a rate mitigation plan has been put forward by the provincial government for grid-connected consumers, there have been no measures announced specifically for stabilizing rates in isolated diesel communities.

3.1.3. Community Specific Concerns

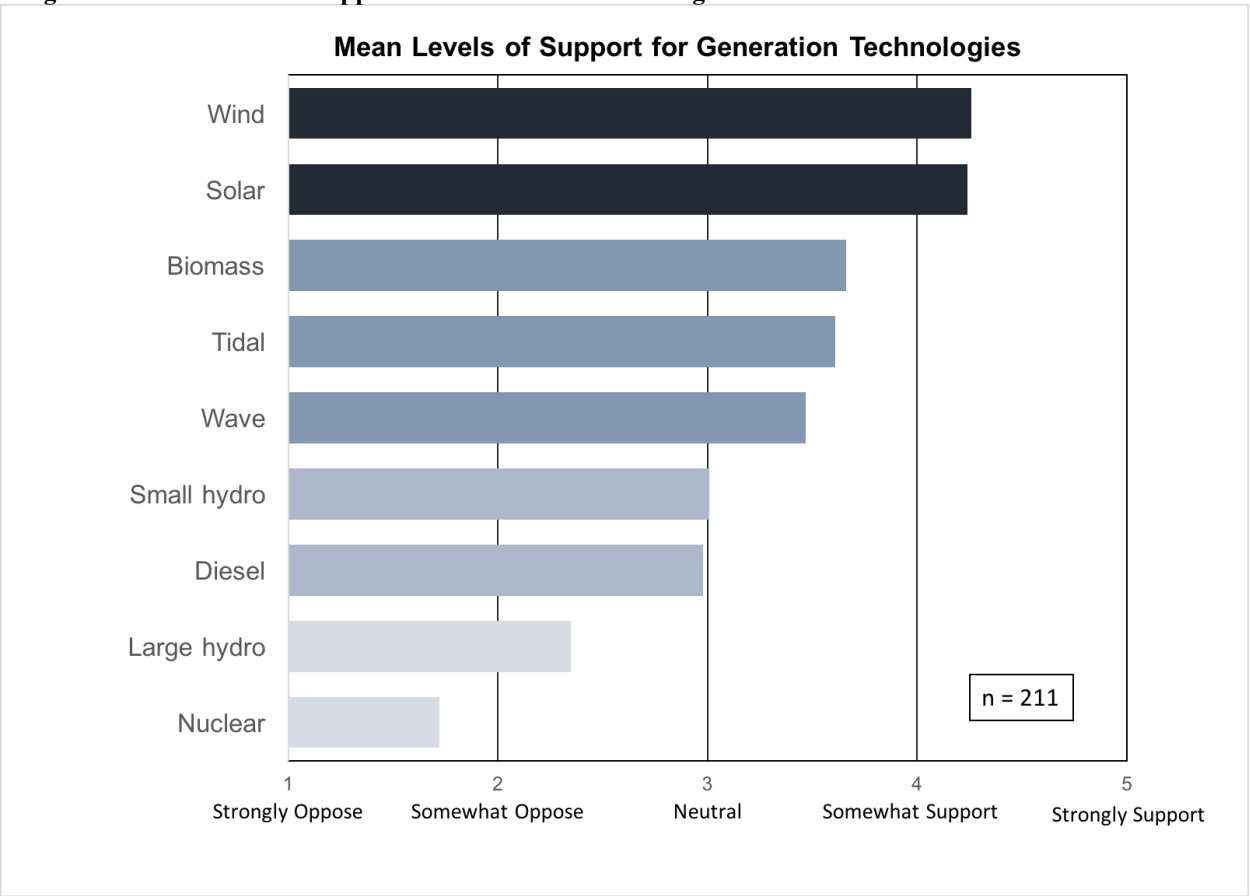
While the need for rate mitigation emerged as the greatest energy-related concern across all partner communities, we note that specific issues emerged on a community-by-community basis that will be given explicit attention in our final report. For example:

- In Mary's Harbour and Lodge Bay the risk of fuel spills and leaks emerged as a serious energy-related concern (4.1/5).
- In Cartwright local power outages were rated 4.0/5.
- In Port Hope Simpson climate change as a result of fossil fuel was rated 3.9/5
- The supply of fuel and cost of home heat were rated highly in Black Tickle (4.5/5 and 4.4/5, respectively)
- In St. Lewis the community's relationship with Nalcor was rated highly (4.1/5)
- In Norman Bay, qualitative analysis suggested a need for sustainable transportation and employment in the community (Mercer et al., 2018). We rely on qualitative data here due to the community sample size (n = 6).

3.2. The Future of Energy in NunatuKavut Communities

The second objective of our research sought to determine respondent perceptions surrounding the future of electricity generation and energy storage in NunatuKavut communities. We accomplished this by asking respondents to rate several supply-side technologies on a scale of one to five, where 1 = strongly opposed, 2 = somewhat opposed, 3 = neutral, 4 = somewhat support, and 5 = strongly support. Results across all partner communities are shown in **Figure 3.**

Figure 3: Mean Levels of Support for Generation Technologies in NunatuKavut

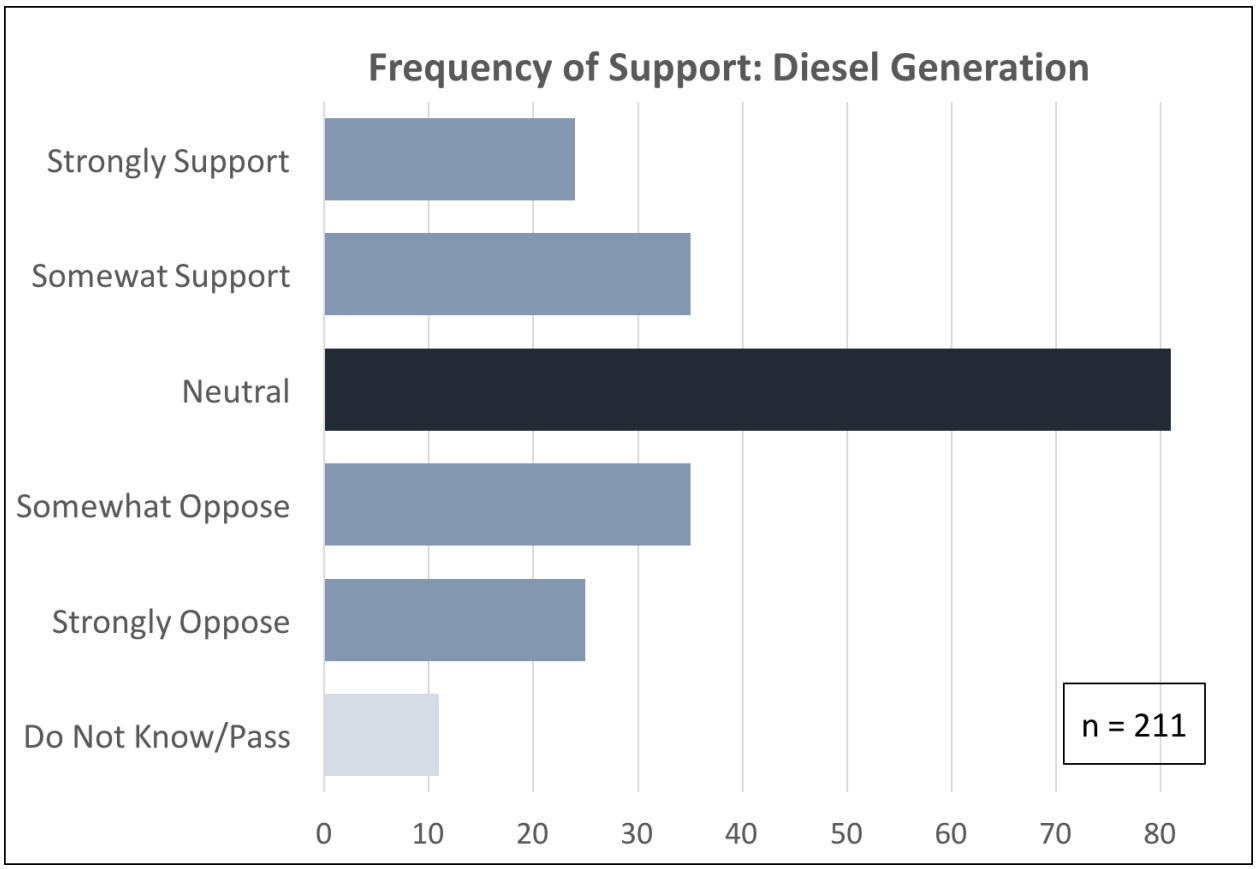


3.2.1. Positive Socio-Economic Contributions of Diesel Generation

A key finding of the research is that community members are not necessarily opposed to diesel-generation. Combined, respondents gave diesel-generation a mean acceptance rating of 3.0/5. As shown in **Figure 4,** 29% of respondents strongly or somewhat supported diesel-generation,

38% reported being neutral, 28% reported being strongly or somewhat opposed, and the remainder responded 'Do Not Know' or 'Pass'.

Figure 4: Frequency of Support for Diesel Generation in NunatuKavut Communities



Our previous research determined community-members value the positive socioeconomic contributions of the existing energy system, including: employment opportunities, reliability, and familiarity. That said, respondents also expressed deep concern about the risks of fuel spills and leaks and contributions to global climate change (Mercer et al., 2018). There is clear interest to improve environmental impacts of energy use in communities, however respondents did not want to see a project proceed if it were to diminish the positive socio-economic contributions of existing energy systems.

3.2.2. Social Acceptance of Renewable Energy Technologies

Across all nine pilot communities, there are three categories of social support for renewable energy technologies. While individual results vary on a community-by-community basis, we note that these categories remain largely representative of all partner communities. These categories include (1) community support: hybrid conventional renewables, (2) community questions: emerging renewable energy technologies, and (3) community opposition: large hydroelectric and small-nuclear.

Community Support: Hybrid Conventional Renewables

Hybrid conventional technologies refer to renewable energy sources which displace a portion of diesel-generation (15 – 30%) and have been deployed on a large scale in isolated communities. As demonstrated in **Figures 5 & 6**, technologies such as wind and solar power maintain broad social support. For wind energy, 69% of respondents were strongly or somewhat supportive of development, 17% reported being neutral, 6% reported being strongly or somewhat opposed, and the remainder responded 'Do Not Know' or 'Pass'. Similarly, for solar power, 71% reported being strongly or somewhat supportive, 17% reported being neutral, 4% reported being strongly or somewhat opposed, and the remainder responded 'Do Not Know' or 'Pass'.

Figure 5: Frequency of Support for Wind Power in NunatuKavut

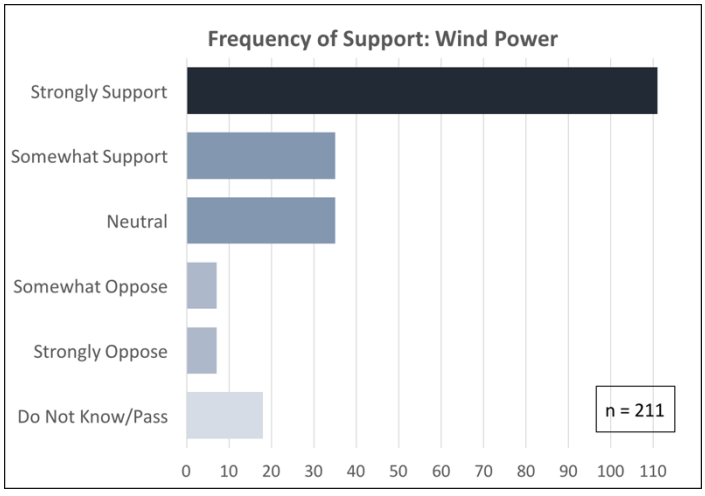
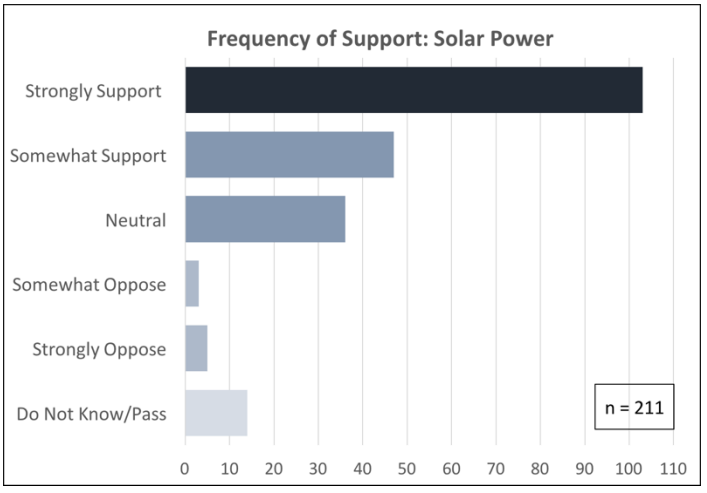


Figure 6: Frequency of Support for Solar Power in NunatuKavut



Support for hybrid conventional renewables is predicated on three primary characteristics (to be elaborated further in final report): endogeneity (localness of physical, human, and capital resources), perceived compatibility with cultural and sustenance activities, and community familiarity and understanding. While these supply-side technologies maintain broad support, we note that several concerns also emerged at the community-level which must be mitigated to maintain the consent of communities. Respondents expressed specific concern about profit/revenue from projects being exported from communities, the ability to maintain and repair projects locally, the potential for avian mortality, and noise pollution.

Community Questions: Emerging Renewable Energy Technologies

Emerging renewable energy technologies include supply-side sources which have not been deployed on a large-scale in isolated communities: mainly, biomass, tidal, wave, and run-of-river hydroelectricity. While there is some interest in these sources amongst respondents, there are significant community questions and uncertainty which must be addressed to gain the consent and support of communities. The profiles of support for emerging renewable energy technologies are shown in **Figures 7 – 10.**

Figure 7: Frequency of Support for Tidal Power in NunatuKavut

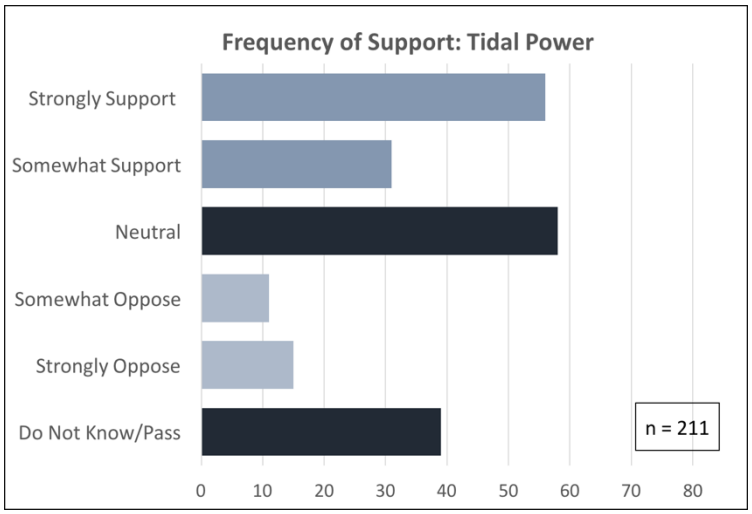


Figure 8: Frequency of Support for Wave Power in NunatuKavut

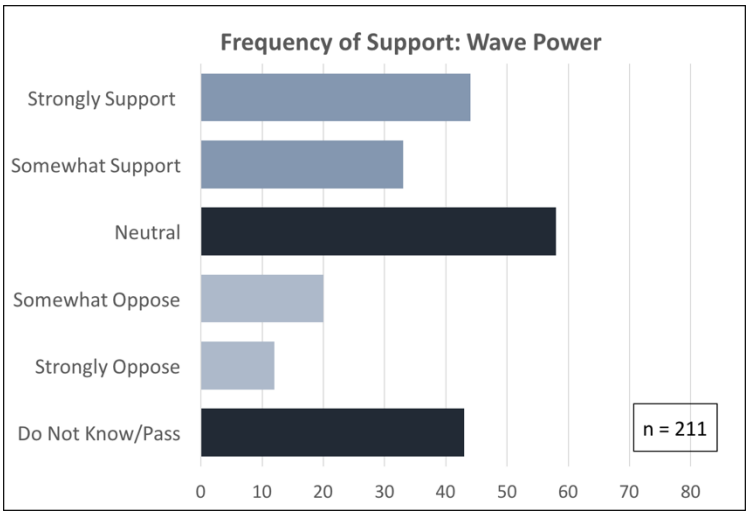


Figure 9: Frequency of Support for Small Hydro in NunatuKavut

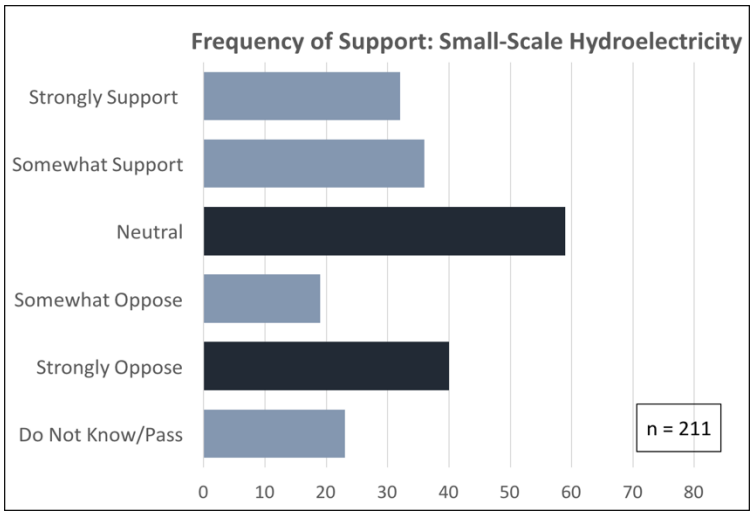
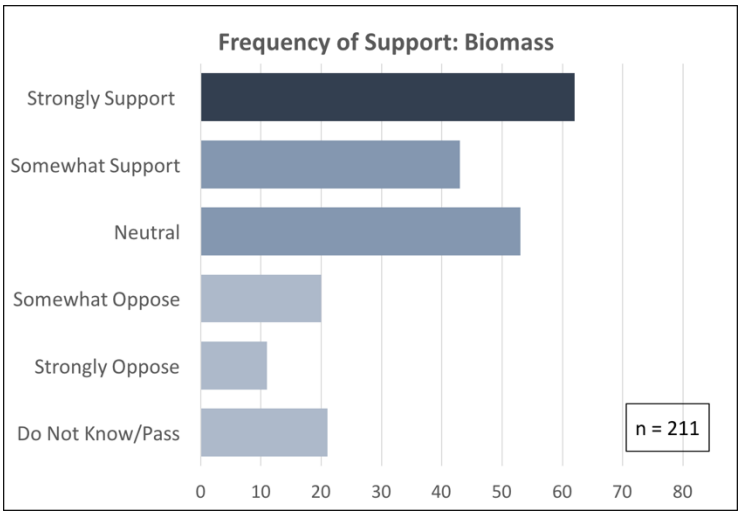


Figure 10: Frequency of Support for Biomass in NunatuKavut



The endogeneity of these resources varies on a community-by-community basis, influencing support levels. For instance, St. Lewis and Cartwright (coastal communities) maintain higher support for tidal and wave power than more inland communities such as Port Hope Simpson and Charlottetown. Likewise, Mary's Harbour and Lodge Bay, which have a 20-year history of small-scale hydroelectricity, maintained the highest level of support for this option (3.7/5); significantly higher than the other partner communities. However, communities questioned emerging renewables compatibility with cultural and sustenance activities. In addition, unfamiliarity erodes support levels for emerging renewables.

While these points will be examined closely in our final report, examples of questions surrounding each generation source included:

-Biomass: How will this impact domestic wood harvesting, traditional land use, and local ecosystems?

-Tidal and wave: How will these impact local fisheries and navigation of boats?

-Small-scale hydroelectricity: How will this affect migration of salmon, fish habitat, and spiritual attachment to rivers?

Community Opposition: Large-Scale Hydroelectricity and Small-Nuclear

Wide opposition existed regarding two supply-side energy options in the partner communities: large-scale hydroelectricity and small-modular nuclear reactors **[Figures 10 - 11].** Opposition to these generation sources is attributed to: association with previous projects, as well as perceived risks to cultural and sustenance activities.

Figure 11: Frequency of Support for Small Nuclear in NunatuKavut Communities

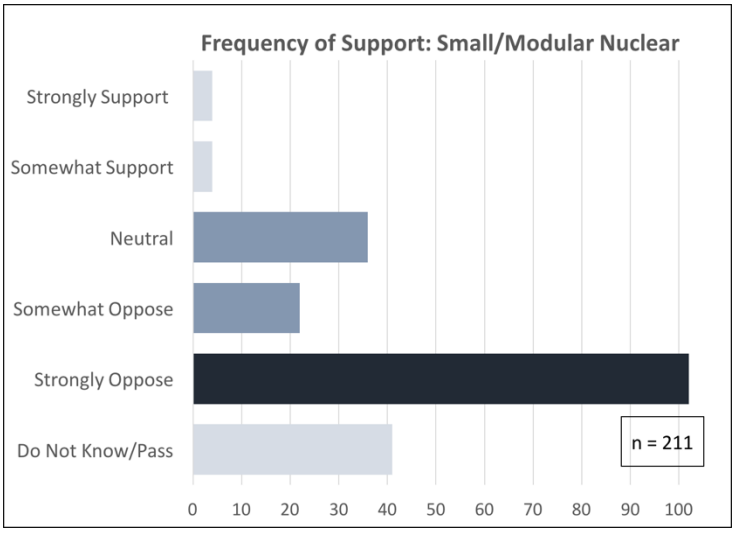
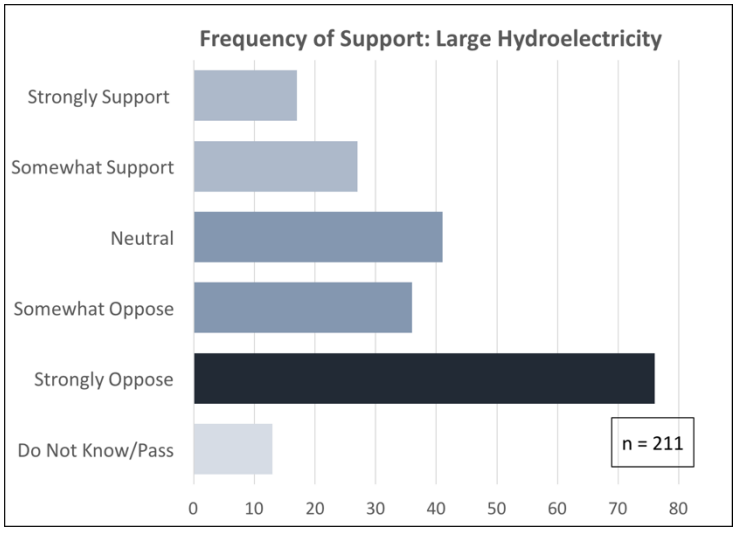


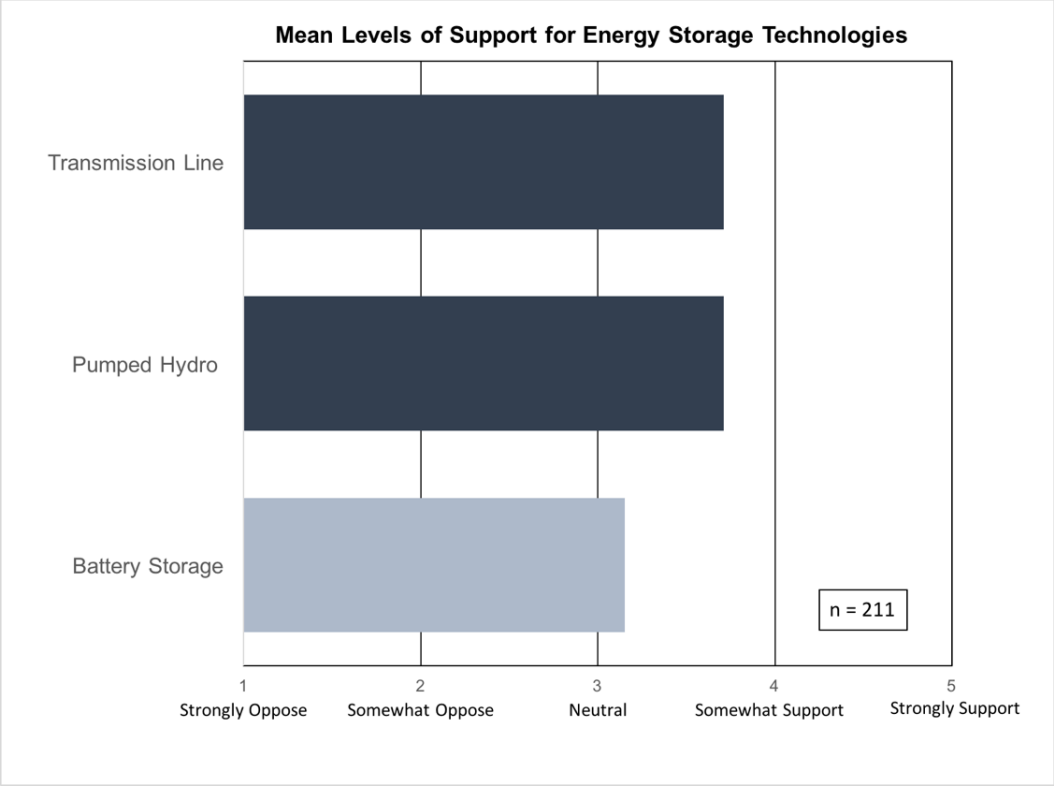
Figure 12: Frequency of Support for Large Hydro in NunatuKavut



3.2.3. Social Acceptance of Energy Storage Technologies

There are varying levels of support for energy storage technologies in NunatuKavut communities **(Figure 13).** More work needs to be done at the community level to address concerns and gain consent prior to the advancement of an energy storage project. While specific concerns will be addressed in our final report, community-members had questions related to waste [battery] disposal, performance in harsh weather conditions, perceived danger/health risks, and significant upfront costs.

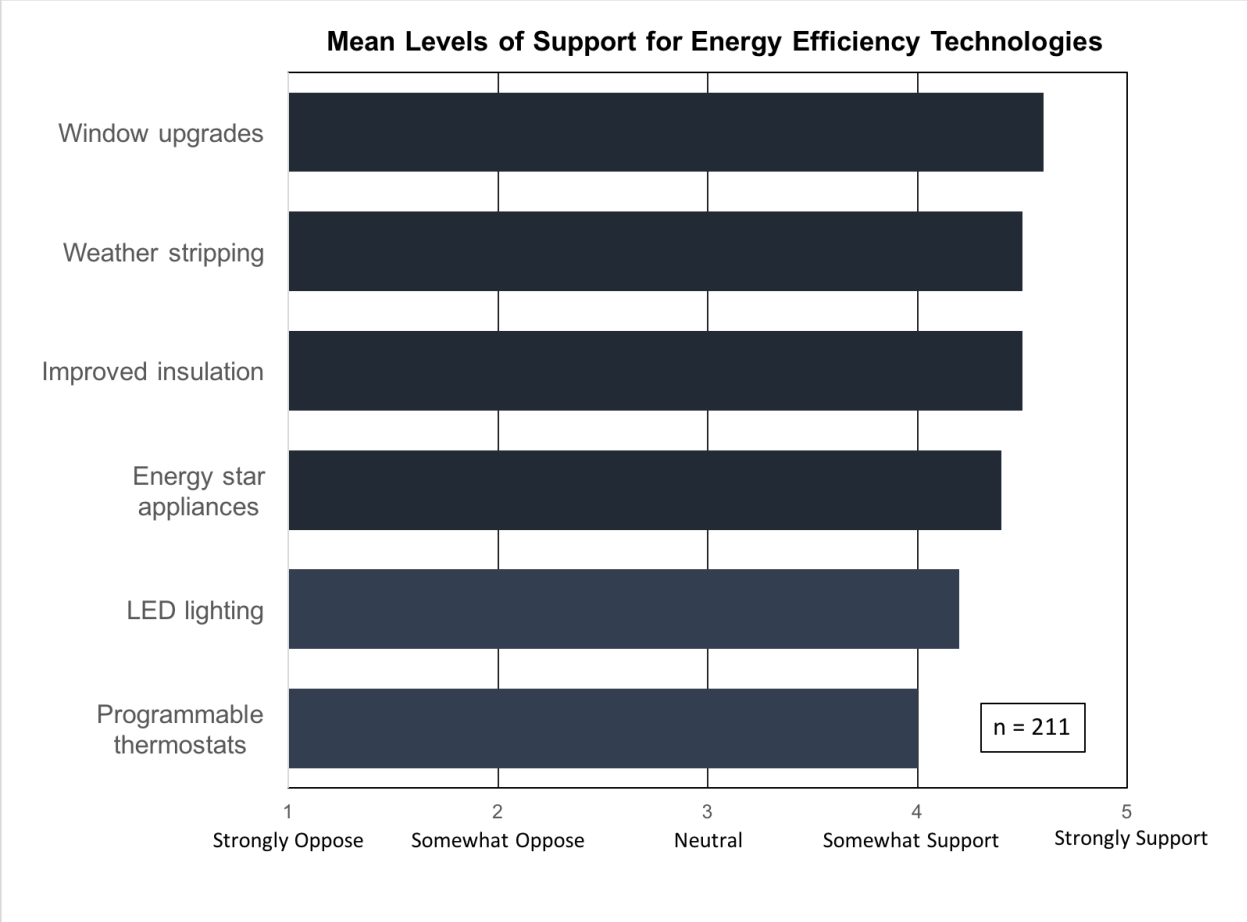
Figure 13: Mean Levels of Support for Energy Storage Technologies in NunatuKavut Communities



3.3. Social Acceptance of Household Efficiency Technologies

The third objective of our research sought to determine how to utilize energy more efficiently at the household level. Across all nine pilot communities, energy efficiency technologies maintained significantly higher levels of social support than supply-side options **[Figure 14]**. While only two supply-side technologies [wind and solar] maintained social acceptance ratings greater than 4.0/5, every energy efficiency technology we tested exceeded this rating. Preliminary analysis suggests respondents support energy efficiency technologies for four primary reasons: direct cost savings for consumers, incremental over disruptive transitions, positive relationships with industrial stakeholders, and community sense of stewardship.

Figure 14: Mean Levels of Support for Energy Efficiency Technologies in NunatuKavut



Direct Cost Savings for Consumers: An advantage of energy efficiency technologies is that they provide direct relief on electricity bills. Conversely, while a renewable energy project may result in fuel savings for utilities, there is no guarantee that a project would lead to direct cost savings for consumers.

Incremental vs. Disruptive Transitions***:*** Our research demonstrates that community members value the positive socio-economic contributions of existing energy systems, such as: employment, reliability, and familiarity. Energy efficiency technologies are perceived as incremental steps that can be taken to improve community energy use, while also maintaining the positive characteristics of the existing system.

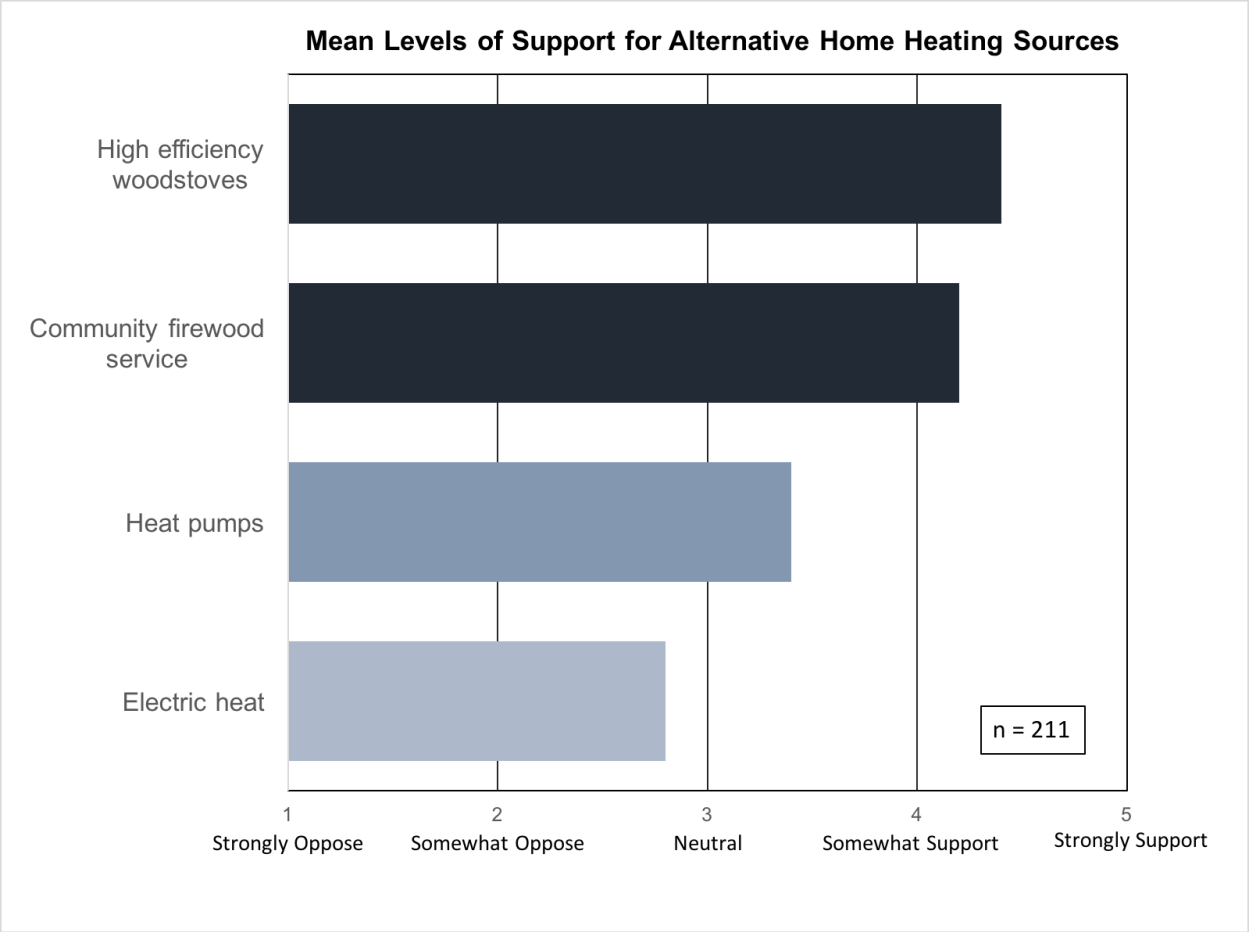
Positive Relationship with Industrial Stakeholders***:*** Newfoundland and Labrador Hydro, through consultant Summerhill, have a history of energy efficiency programming in isolated NunatuKavut communities. These programs typically include rebates and direct installation of energy efficiency products. These products, received at little to no cost for consumers, help to lower costs and improve energy use in the communities. Respondents highly valued this approach to energy transitions and supported the work of the existing stakeholders.

Sense of Stewardship: In general, NunatuKavut Inuit communities have a deep respect and profound appreciation for the land and natural environment. Energy efficiency technologies are perceived as steps that can be taken to protect the Earth.

3.3.1. Social Acceptance of Alternative Home Heating Sources

Only two alternative methods of home heating maintained broad support in the partner communities: a community-oriented firewood service, and high efficiency woodstoves/furnaces **(Figure 15).** Community members had significant questions regarding electric heat and heat pumps, including: quality of heat, costs, as well as the ability to maintain and repair equipment.

Figure 15: Mean Levels of Support for Alternative Heating Sources in NunatuKavut Communities

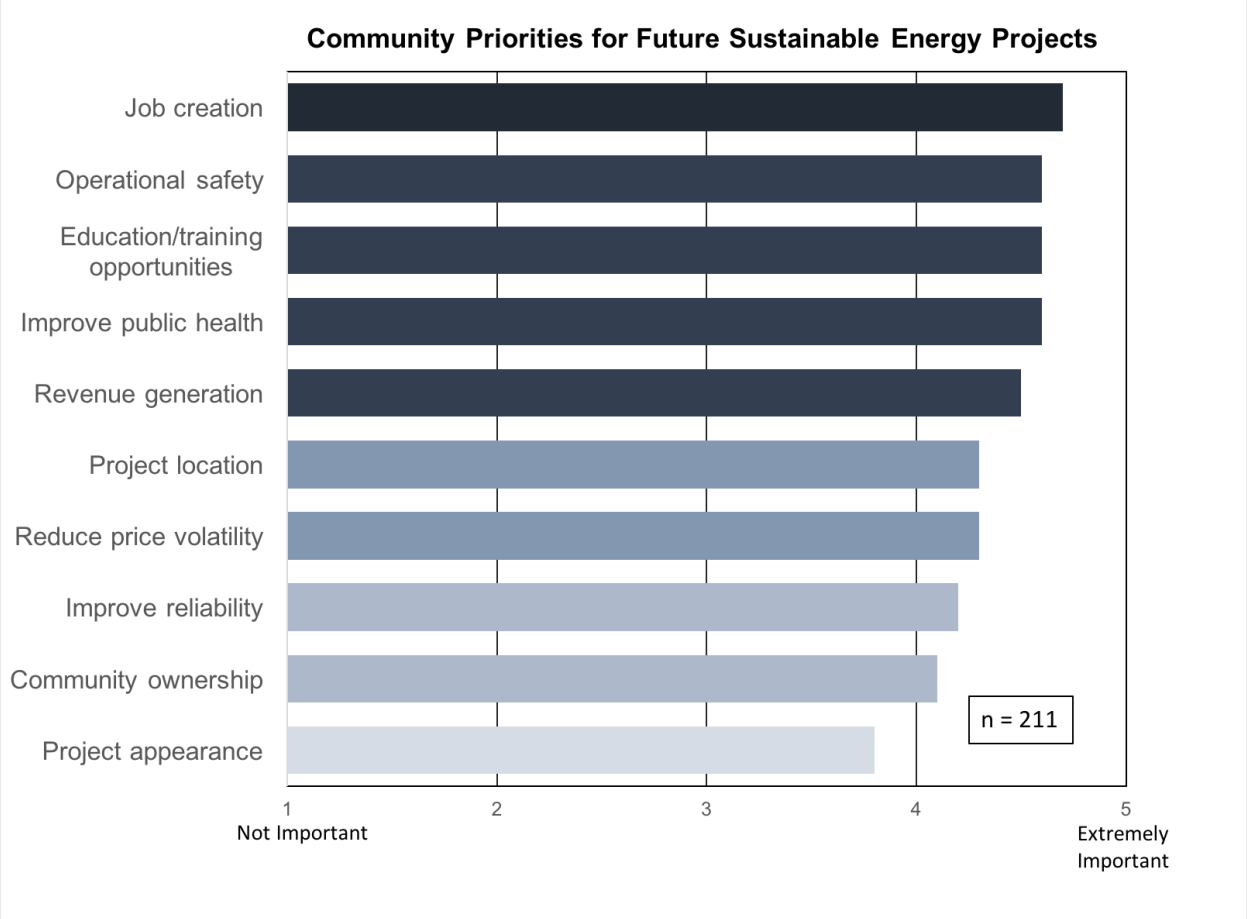


Respondents were deeply attached to wood as their primary form of heat. Wood harvesting is an integral part of the culture in NunatuKavut communities, is a relatively inexpensive and accessible form of heat, and is a high quality heat in a southeastern coastal Labrador climate. However, respondents also expressed interest in improving wood use: by improving access via a community oriented service, by cutting down on wood consumption and improving local air quality via high efficiency stoves, and by improving environmental footprints via replanting.

3.4. Community Visions and Priorities for Sustainable Energy Futures

The final objective of our research sought to determine respondent's visions, motivations, and priorities surrounding the development of sustainable energy technologies in NunatuKavut communities. We accomplished this by asking respondents to rate several issues on a scale of one to five, where 1 = not important and 5 = extremely important **[Figure 16].** All variables were rated highly (in excess of 3.8/5). As such, deeper qualitative analysis is needed in the final report to determine community member motivations and priorities surrounding future developments.

Figure 16: Mean Priorities Resulting from Future Sustainable Energy Projects in NunatuKavut Communities



4. Conclusion

Previous research has established that diesel-generation poses significant economic, environmental, and societal challenges for off-grid communities. However, sustainable energy technologies should not be considered a perfect solution for advancing community sustainability. In the absence of Indigenous engagement, that adheres to the 4Rs and OCAP™, these technologies may create community tensions of their own.

Working with Indigenous scholars, we developed an approach which allows us to identify and understand community needs and build social cohesion and consent surrounding sustainable energy technologies. This approach demonstrates the importance of conducting energy planning research on a community-by-community basis: as the needs, preferences, and priorities of one community often differ from adjacent communities. For example, the need for fuel security in Black Tickle vs. the desire for distribution improvements in Cartwright. Similarly, the relative social acceptance of run-of-the-river hydroelectricity in Mary's Harbour vs. the tension reported in other partner communities.

Our research demonstrates a desire for the development of conventional hybrid renewable energy resources in NunatuKavut communities. Small-scale wind and solar projects are perceived as a way to improve environmental aspects of energy use (mainly the risks of fuel spills and greenhouse gas emissions), while also maintaining the positive socio-economic contributions of existing diesel systems, such as: employment, reliability, and familiarity.

While there is interest in these sources, developers must work to address a number of concerns to maintain community consent, including:

1. Preventing export of profit from communities

2. Ensure the ability to maintain and repair projects locally

2. Mitigating impacts on avian mortality and noise pollution

3. Maintaining reliability in harsh weather conditions

While there is some interest in emerging renewable energy technologies such as biomass, tidal, wave, and small-scale hydroelectricity, community-members had significant questions that they wanted resolved prior to the advancement of these types of developments.

An important takeaway from the research is that energy efficiency technologies maintain higher levels of social support than supply-side energy options. This support is attributed to:

1. Direct cost savings for consumers

2. Incremental transitions

3. Positive relationships with existing stakeholders

4. Community sense of stewardship

Expanded energy efficiency programming is a priority for partner communities. In addition, respondents are largely satisfied with wood heat, but perceive a community-oriented firewood service and high efficiency woodstoves as measures which can offer immediate improvements to socio-economic and environmental aspects of wood use.

We note that everything contained in this report should be considered preliminary. Our final report (expected September, 2019) will involve rigorous qualitative analysis of 211 community-member energy planning interviews, as well as 11 key informant interviews. This analysis will lead to deeper understanding of community-by-community needs, preferences, and priorities for the future of sustainable energy development.

References

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.

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

Government of Newfoundland and Labrador. (2019, April). Protecting You from the Cost Impacts of Muskrat Falls. Retrieved from https://www.gov.nl.ca/nr/muskratfallsframework/files/Framework.pdf

Kimmerer, R. (2011). Restoration and reciprocity: the contributions of traditional ecological knowledge. In Human Dimensions of Ecological Restoration (pp. 257-276). Island Press/Center for Resource Economics.

Knowles, J. (2016). Power shift: Electricity for Canada’s remote communities. Retrieved from http://www.conferenceboard.ca/e-library/abstract.aspx?did=8249icngd-publications/icngd-reports/Small%20Nuclear-Final%20Version%204%20June.pdf

Logan, J., & Kaplan, S. M. (2009). Wind power in the United States: Technology, economic, and policy issues. In C. N. Osphey (Ed.), Wind power: Technology, economics and policies (pp. 1-46). New York, NY: Nova Science Publishers.

Mercer, N., Parker, P., Martin, D., & Hudson, A. (2018). ‘4RIGHT’ Community Energy Planning in NunatuKavut, Labrador. Retrieved from http://www.nunatukavut.ca/home/files/pg/community_energy_planning_in_nunatukavut_.pdf

Natural Resources 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

Newfoundland and Labrador Hydro. (2018, November). Evidence on Customer Rates. Retrieved from http://www.pub.nf.ca/applications/NLH2017GRA/applications/From%20NLH%20-%202018%20Cost%20Deferral%20and%20Interim%20Rates%20Application%20-%20Revision%202%20-%202018-11-14.PDF

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

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.

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

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.

Stefanelli, R. D., Walker, C., Kornelsen, D., Lewis, D., Martin, D. H., Masuda, J., ... & Castleden, H. (2018). Renewable energy and energy autonomy: how Indigenous peoples in Canada are shaping an energy future. *Environmental Reviews*, *27*(1), 95-105.