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"That's Our Traditional Way as Indigenous Peoples": Towards a Conceptual Framework for Understanding Community Support of Sustainable Energies in NunatuKavut, Labrador

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Received: 28 June 2020; Accepted: 25 July 2020; Published: 28 July 2020

Abstract: There is a substantial body of literature in North America regarding the social acceptance of renewable energies, particularly wind energy. However, limited research focuses on the experiences of Indigenous Peoples. Furthermore, several researchers have called for a rapid transition to renewable energies in Indigenous off-grid diesel powered communities in Canada, while limited research has considered local support for this transition, which neglects the Indigenous right of free, prior, and informed consent for developments on or which affect their territories. Working in partnership with nine Indigenous off-grid communities in southeast Labrador, we assess community-member perceptions and support of sustainable energies via hybrid interviews/surveys (n = 211) and key informant interviews (n = 11). Applying directed content analysis and participatory methodologies, we find that five primary themes influence Indigenous support for sustainable energies in southeast Labrador: (1) Community familiarity and understanding; (2) association with previous projects; (3) relationships with culture and sustenance; (4) endogeneity of resources; (5) energy security impacts. The themes should be viewed as a framework for understanding community support, not a definitive recipe for reaching consent. Applying these themes, we demonstrate broad community support for conventional renewables (wind, solar), reluctance towards emerging renewables (biomass, tidal, wave) and energy storage (pumped hydro, battery), and wide opposition for hydroelectricity and small modular nuclear. We demonstrate that energy efficiency applications maintain substantially higher support than most supply-side options. Supply-side sustainable energies have the potential to perpetuate the colonial or extractive nature of resource development in Indigenous communities, while energy efficiency applications more directly facilitate energy security and protect energy sovereignty.

Keywords: Indigenous; support; acceptance; perceptions; sustainable; renewable; energy; off-grid; Canada; sovereignty

1. Introduction

Canada is a global leader in renewable energy development, which provides 17% of the country's total primary energy supply [1]. 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 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 [2]. According to these criteria, there are 258 off-grid communities throughout the country [3]. 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 [3]. As such, off-grid diesel-dependence in Canada must be thought of as an issue predominantly affecting Indigenous Peoples- and off-grid energy research, policy, and advocacy must be centered on Indigenous rights.

The province of 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 [4]. 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 [3]. The Indigenous diesel-dependent communities in NL are represented by one of the following: Nunatsiavut Government in northern Labrador (n = 5), Innu Nation in the community of Natuashish (n = 1), and the NunatuKavut Community Council (NCC) in southern Labrador (n = 8). NCC and the diesel-dependent communities they represent are the partners in this participatory research.

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 [5–8]. 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 [5,9]. From a societal perspective, diesel-generation may contribute to local health problems, reliability challenges, and can be disruptive, due to noise pollution [2,10]. Furthermore, government-controlled electrical utilities may be perceived as an imposition on the autonomy of Indigenous communities [11–13]. Given these challenges, several researchers, policy-makers, and advocates have called for a transition to renewable sources of energy in off-grid communities [14–16]. For example, the Canadian Prime Minister has pledged to "eliminate diesel from all indigenous communities by 2030" [17] and the federal government has invested over $700 million in diesel displacement initiatives [18].

Several scholars have pointed towards the necessity of community autonomy and local decision-making in ensuring equity and justice in renewable energy development [19–22]. The 92nd Call to Action by the Truth and Reconciliation Commission of Canada 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" [23], 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" [24], p. 1.

As such, we are critical of the federal government's framing of diesel displacement initiatives in off-grid communities. 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 a narrative for change has been crafted by western researchers, which may not be representative of the views of Indigenous communities.

This community-based participatory research [CBPR] is led by NCC's 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 [25–27].

Our participatory research sought to understand community-member perceptions and support of energy technologies in diesel-powered NunatuKavut communities. In all, we demonstrate how five primary themes guide Indigenous support for sustainable energies in southeast Labrador. We suggest that supply-side sustainable energies have the potential to perpetuate the exploitative nature of resource extraction in Indigenous communities, while energy efficiency applications more directly contribute to energy security and protect energy sovereignty. 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 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.

1.1. A Brief Review of the Literature

There is a vast body of research in the North American context on the social acceptance of sustainable energies, particularly wind energy, as evidenced by a recent systematic review which contained over 150 studies published since the 1980's [28]. One article title makes specific reference to the experiences of Indigenous communities of all the studies mentioned in this systematic review, [29]. It is beyond the scope of the current study to give a comprehensive overview of the differences between Indigenous and Western Knowledge systems, and we refer readers to the works of Indigenous scholars who have discussed these divergences and intersections at length [30–33]. We acknowledge that Indigenous Peoples have vastly different ways of relating to, and understanding the, world in comparison to westerners, and that due to these differences, western conceptualizations of the social acceptance of renewable energies cannot simply be imposed upon Indigenous communities, which is considered a form of cognitive imperialism [33]. As one example, Indigenous Knowledge systems often stress the interconnectedness, interdependency, and sacredness of all beings [living and non-living] on Earth [34–36]. This belief system, viewing all beings as relatives, places a higher value and respect on them—where they are viewed as gifts of creation, to be preserved for future generations [34,36,37]. This is a dramatic difference compared to western knowledge systems, where the relationship towards the Earth is generally secularized, and the Earth and its beings are perceived as under the possession and control of humans [36]. As such, we express concern about the lack of research regarding the social acceptance of renewable energy with Indigenous communities which explicitly integrates Indigenous Knowledge and perspectives. Despite this gap, there are some common themes found in the limited body of existing literature.

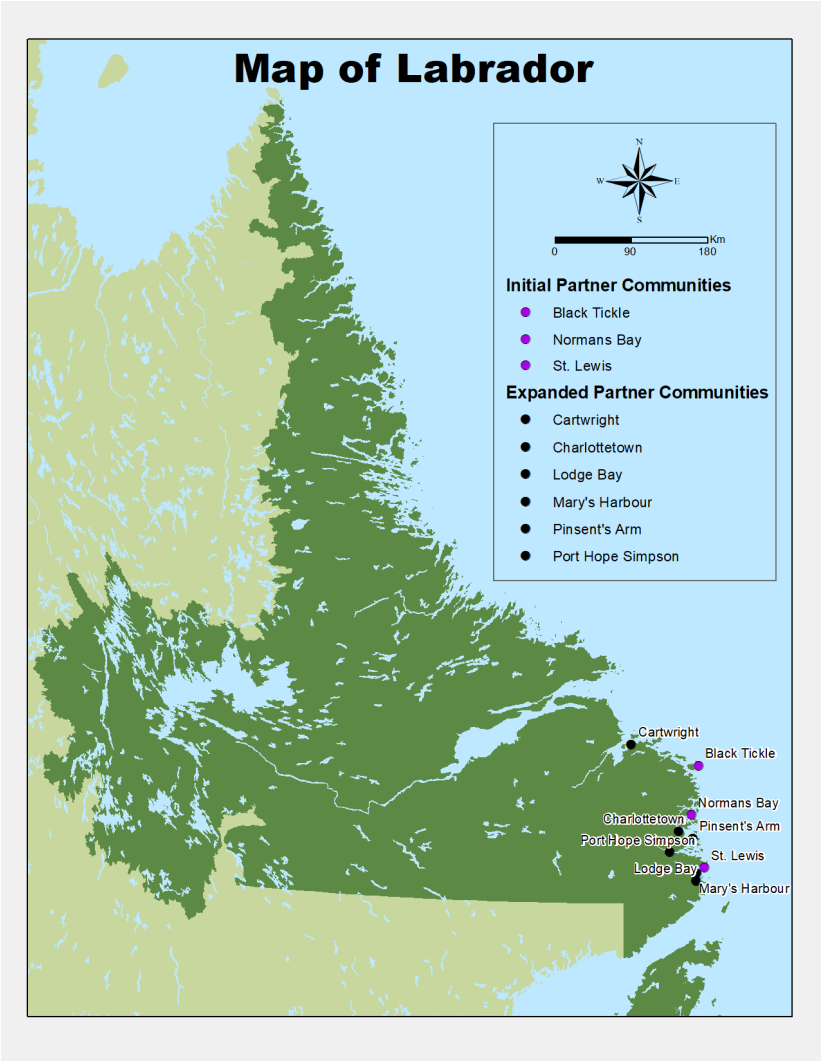

Figure 1. Map of Partner Communities.

Existing studies agree that Indigenous off-grid communities are not widely opposed to diesel-generation [7,38,39]. McDonald and Pearce examined Inuit perspectives of off-grid energy systems in Nunavut, and demonstrated a "reluctant acceptance of diesel by communities" [7], 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. 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 [38]. The results of McDowell 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 [39].

The available research suggests that Indigenous perspectives of renewable energy are guided primarily by knowledge of local natural resources [7,39,40]. 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 [7,41].

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 [7,40–43]. McDonald and Pearce demonstrate how large-scale hydroelectric development in northern Ontario and Quebec have stoked fears around methylmercury contamination in Nunavut [7]. 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 [39].

Potential impacts on wildlife and aquatic life, which are integral for sustenance in many Indigenous communities, erode support for sustainable energies [7,39]. Of particular concern is the impact of wind turbines on migratory birds [7,39], and the impacts of hydro dams on migratory fish species [7]. Some research also suggests that unfamiliarity and unawareness of costs and benefits erodes support for sustainable energies in off-grid communities [7,40].

1.2. Study Setting

Translated from Inuttittut, NunatuKavut means "Our Ancient Land", and is the traditional territory of NunatuKavut Inuit. The NunatuKavut Community Council is the governing organization which represents the rights of approximately 6000 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 [44]. 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 [27]. 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 [45–47]. 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 [48].

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 2220 kW of installed capacity in Cartwright, 1005 kW in Black Tickle, 160 kW in Norman Bay, 1965 kW in Port Hope Simpson, and 1020 kW in St. Lewis. Local mini grids connect the adjacent communities of Charlottetown-Pinsent's Arm and Mary's Harbour-Lodge Bay, with 3160 kW and 2635 kW of installed capacity, respectively [3]. All of the partner communities have relatively small year round populations (ranging from 19 residents in Norman Bay to 427 in Cartwright) [49].

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 km 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 94 km/s, 30 km/s, and 30 km/s 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 24 km/s.

2. 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, 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 4 March–27 May 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 [50]. 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 partner 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 (Tables 1 and 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 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%

Table 1. *Cont.*

	Black Tickle	Norman Bay	St. Lewis	% of Total
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%

Table 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 (i.e., frequencies and means) with the use of Excel 15.13.1. 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 three 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 [50–53]. 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 (9 April 2019), Port Hope Simpson (25 April), Mary's Harbour (29 April), Charlottetown (9 May), and Cartwright (21 May). 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 [54,55]. 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 (6 March 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.

3. Results

The community review events and subsequent qualitative analysis demonstrate 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 2). In the following sections, we merge the quantitative support levels of community members (Figure 3) with components of the CARES Framework, to explain community member support and opposition of sustainable energy technologies.

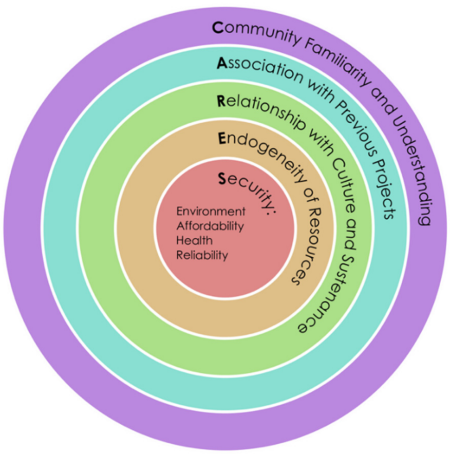

Figure 2. CARES Framework for Understanding Community Support.

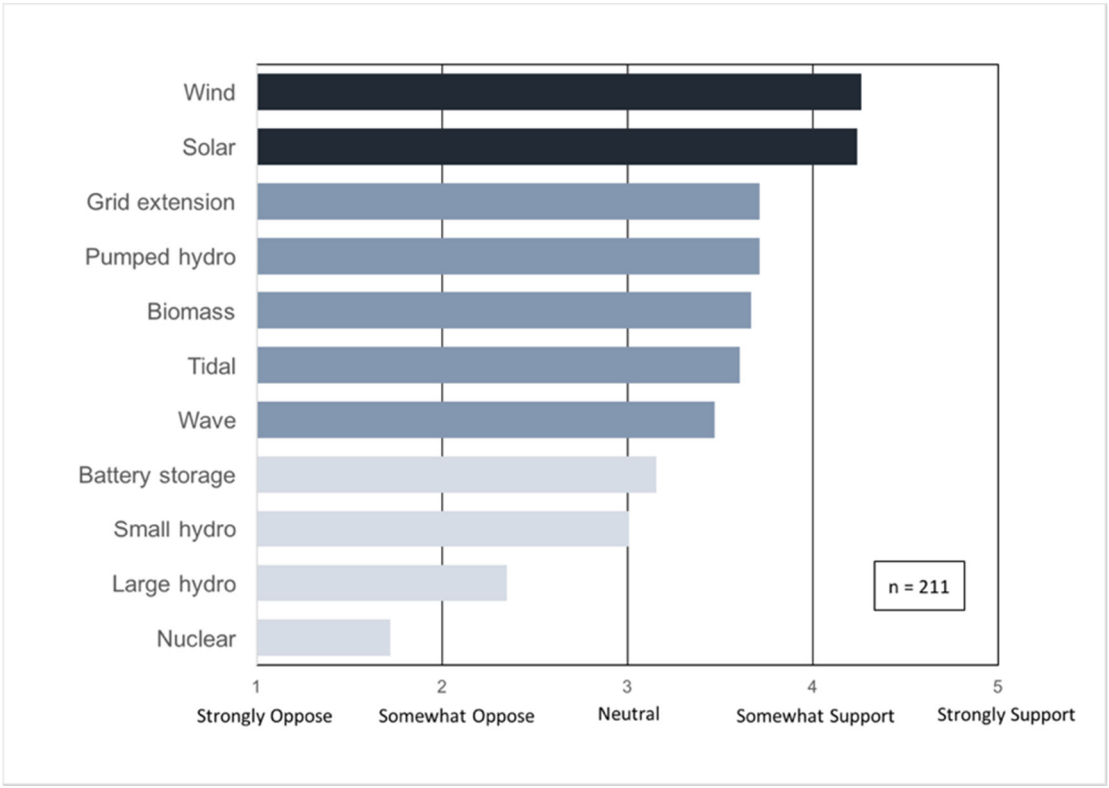

Figure 3. Mean Support by Generation Source.

3.1. Conventional Hybrid Renewables-Wind and Solar

As demonstrated in Figure 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 4 and 5).

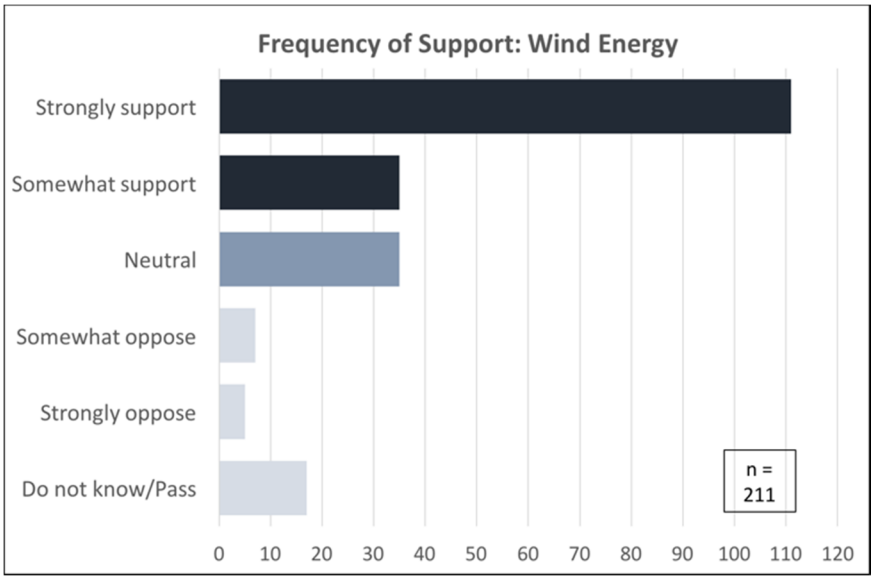

Figure 4. Frequency of Support for Wind Power.

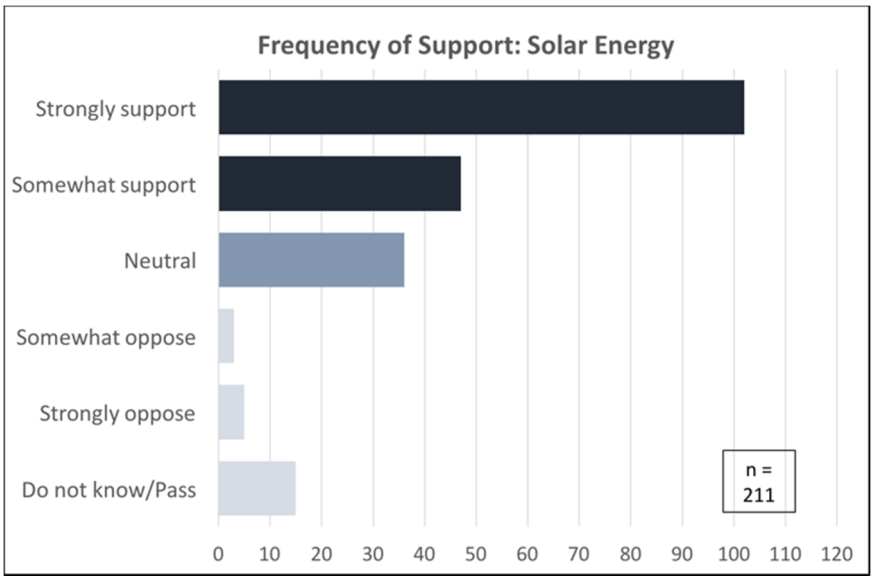

Figure 5. Frequency of Support for Solar Power.

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 3).

Table 3. Support for Generation and Storage Technologies by Community (Mean Survey Response).

	Black Tickle	St. Lewis	Norman Bay	Port Hope Simpson	Mary's Harbour/Lodge Bay	Charlottetown/ Pinsent's Arm	Cartwright
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 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".

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. Out 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".

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]".

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 a while, it will become cheaper than bringing in diesel all year long".

3.1.5. Reliability

The use of wind and solar power is sometimes resisted, due to their potential implications for the reliability of local energy systems. The ability for energy infrastructure to withstand Labrador's harsh weather conditions is of particular concern, 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".

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".

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 3). Respondent frequency of support for grid extension is demonstrated in Figure 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 traditional 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".

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".

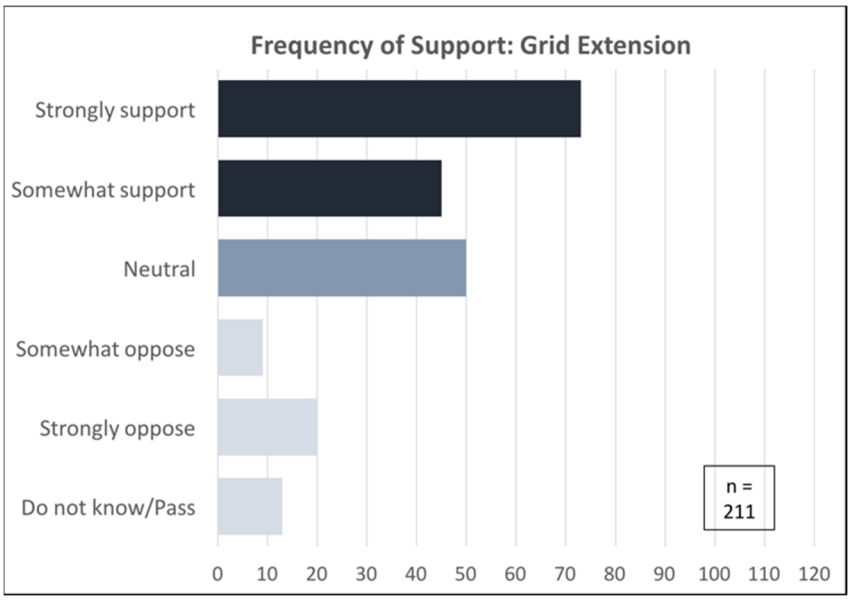

Figure 6. Frequency of Support for Grid Extension.

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".

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".

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".

3.3. Community-Hesitation: Emerging Renewables

As demonstrated in Figure 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 7–9. Where emerging renewables differ from conventional renewables is the number of respondents who express neutrality, and respondents who selected 'Do Not Know' or 'Pass'.

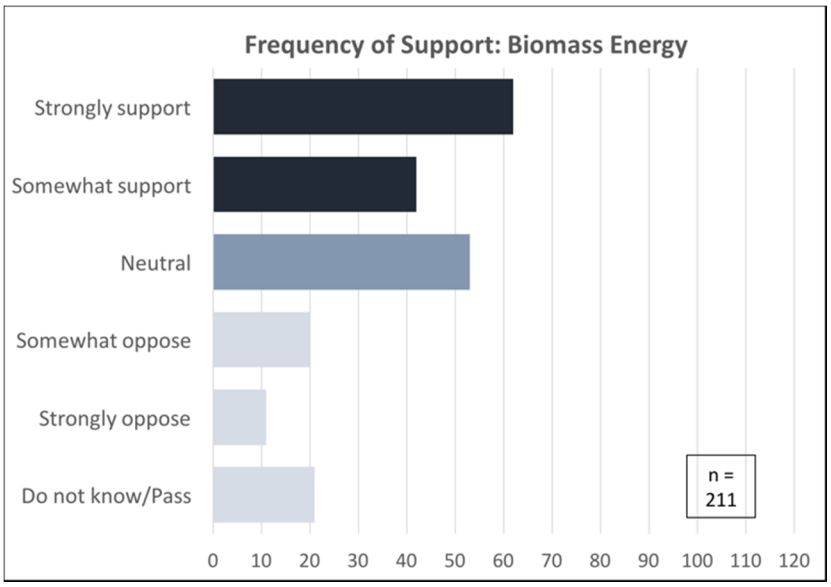

Figure 7. Frequency of Support for Biomass Energy.

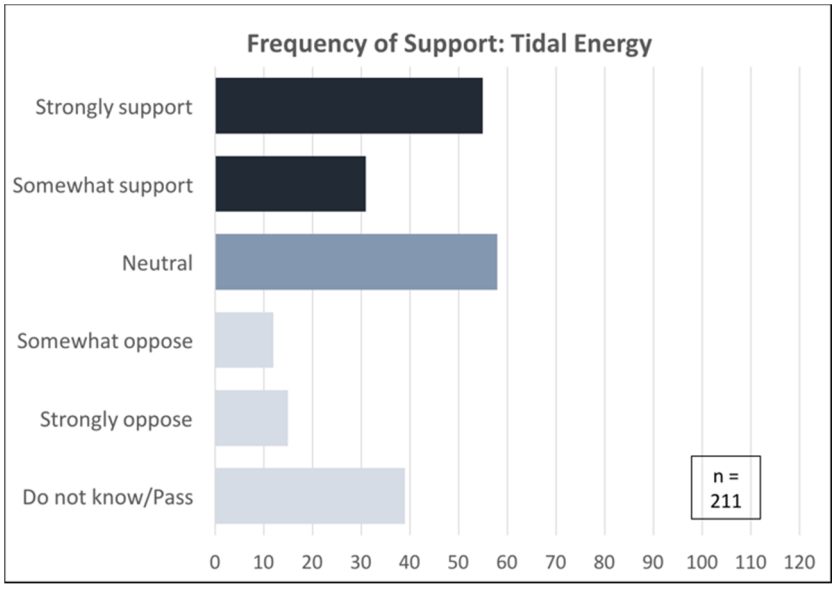

Figure 8. Frequency of Support for Tidal Energy.

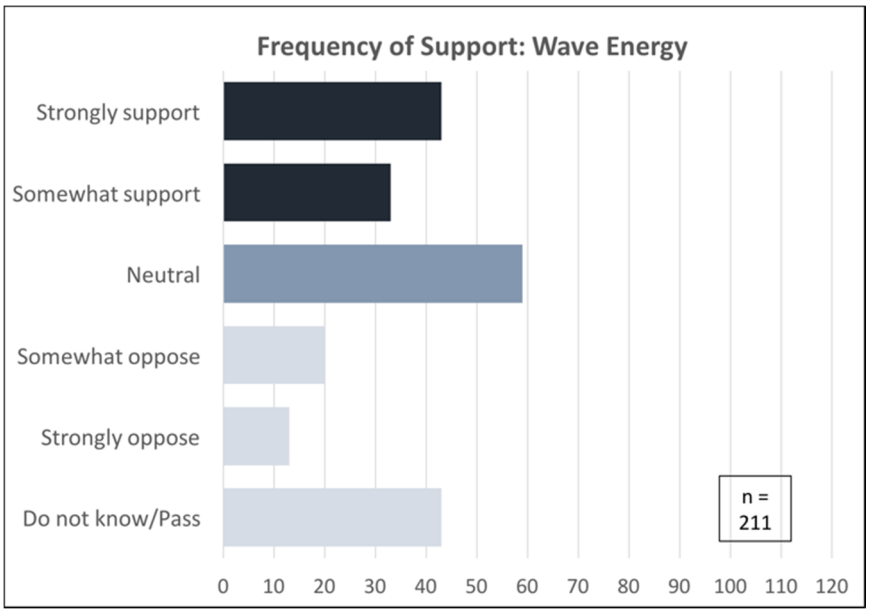

Figure 9. Frequency of Support for Wave Energy.

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".

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.

Where biomass differs from marine renewables is the community's deep cultural connection and long practice with firewood harvesting. As demonstrated in Table 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?".

Table 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%

3.3.2. Support Varies Widely by Endogeneity

Support for marine renewables varies widely across NunatuKavut communities (Table 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 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?

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".

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".

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".

3.4. Community Opposition: Hydroelectricity and Small Modular Nuclear

As demonstrated in Figure 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 3). In addition, rationale given in support/opposition for small-hydroelectricity and large-hydroelectricity largely overlap. The frequencies of support for small hydro, large hydro, and small nuclear are demonstrated in Figures 10–12.

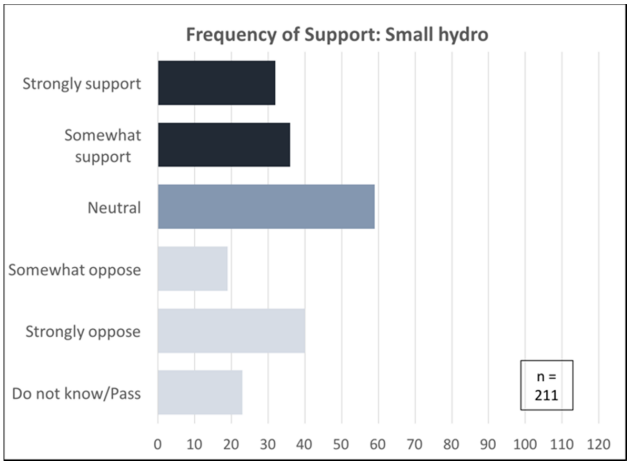

Figure 10. Frequency of Support for Small Hydro.

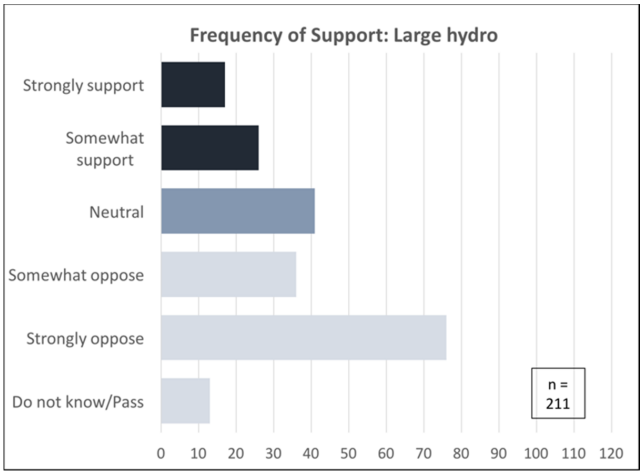

Figure 11. Frequency of Support for Large Hydro.

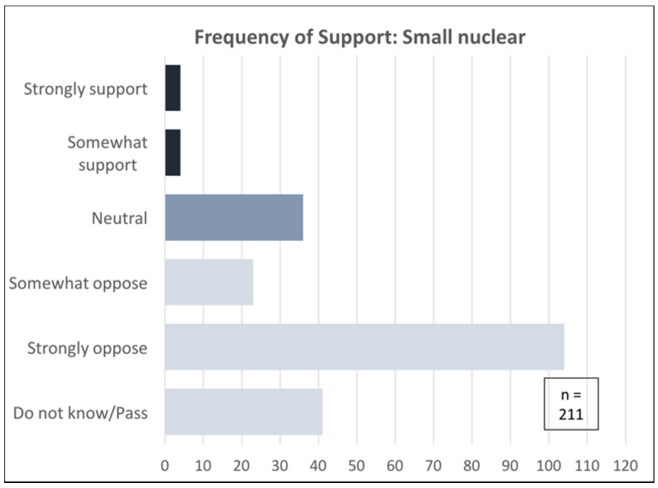

Figure 12. Frequency of Support for Small Nuclear.

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".

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 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".

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".

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".

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".

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?".

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 3). Frequencies of support for energy storage are demonstrated in Figures 13 and 14.

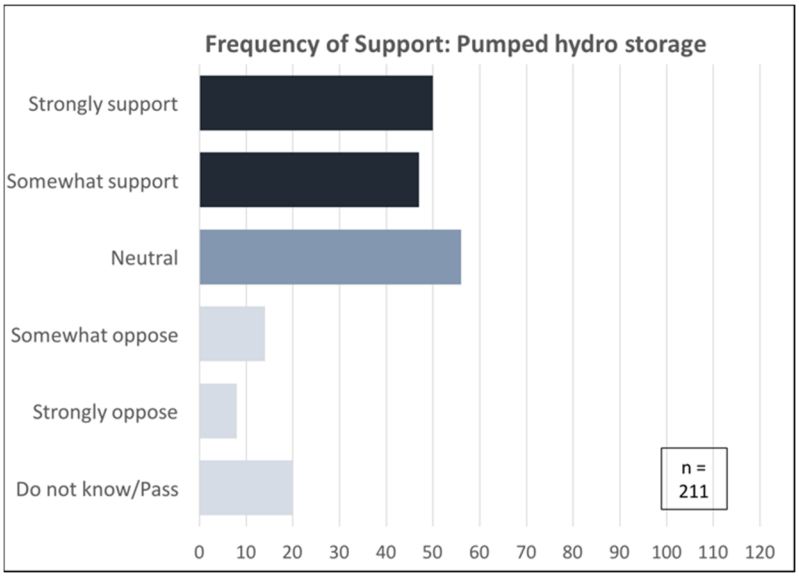

Figure 13. Frequency of Support for Pumped Hydro.

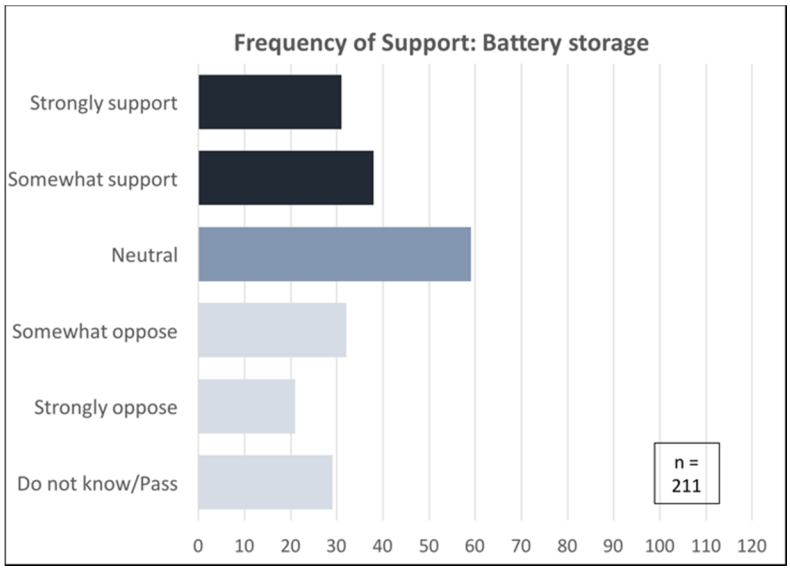

Figure 14. Frequency of Support for Battery Storage.

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".

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?".

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]".

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?".

3.6. Wide Support for Energy Efficiency Applications

There is widespread support for energy efficiency applications across partner NunatuKavut communities (Figure 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.

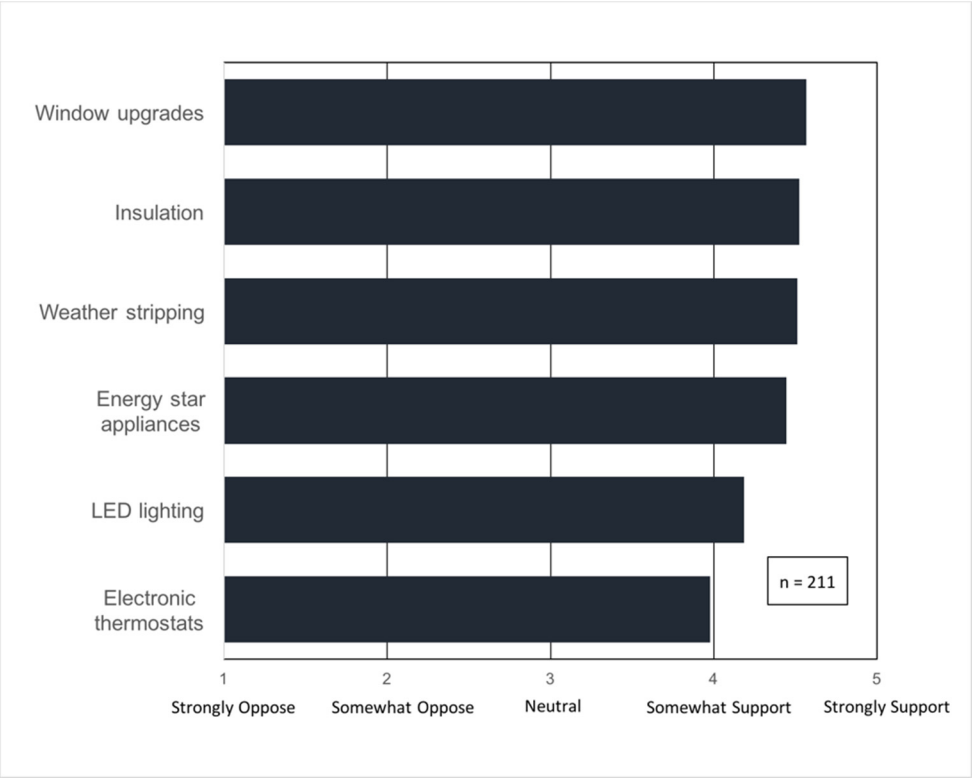

Figure 15. Support for Energy Efficiency Technologies (Mean Survey Response).

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".

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 $1000 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".

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".

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".

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".

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, being 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 and Burgillo, 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 success of renewable energy

projects [56,57]. Similarly, Walker and Baxter 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 [58]. 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 continuance 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, can hardly be defined as a sustainable community to live in [59]. Put differently, 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 who seek to respect community rights, minimize conflict, and make harmonious decisions.

As argued by other researchers [7,40] 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 [38]. 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 [7,41,42]. 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 (1000 kWh/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 [60]. 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 [7,39,40]. 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 [61]. 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. This supports arguments of energy-deployment and local sustainability scholars [56,57,62], 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 cannot skip over these important layers, based on energy security justifications, and must maintain community consent.

This is the first study that investigates social perceptions of energy efficiency technologies in Indigenous communities. The efficiency applications have been found to maintain significantly higher levels of support than most supply-side options. In 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 that tangible benefits of renewable energies will be experienced 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 [63]. 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, that is, 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 [7,38]. 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 and Devine-Wright's seminal contribution argued that community renewable energy projects have two primary dimensions: process and outcome [64]. 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 and 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" [64], p. 498. This model of efficiency upgrades is non-exploitative or controlling, and poses little risk to the sovereignty of the community's energy systems [65].

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 [41,66–71]. 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. In other words, what has been described as 'cultural genocide' by Indigenous Peoples in Labrador [72–74] 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 [75]. 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.

5. Conclusions

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, that 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 waged employment is sometimes limited.

Given the importance of diesel generation, and the rights that Indigenous Peoples possess, 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 when they are not fully informed on a projects risks and benefits. We confirm the power of associations, the fear that has arisen from projects gone awry, or the hope, optimism, and imagination generated by successful experiences. We amplify the voices of community-members who attest that developments, which threaten 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.

Author Contributions: Conceptualization, N.M.; A.H.; D.M.; P.P.; methodology, N.M.; A.H.; D.M.; P.P.; formal analysis, N.M.; writing—original draft preparation, N.M.; writing—review and editing, N.M.; A.H.; D.M.; P.P.; supervision, A.H.; D.M.; P.P.; project administration, A.H.; D.M.; P.P.; funding acquisition, N.M.; A.H.; D.M.; P.P. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Social Sciences Humanities Research Council of Canada, grant number SSHRC892-2017-2101.

Acknowledgments: First and foremost, we thank the 211 community members and 11 key informants who let us into their home and shared a cup of tea with us in the process of interviewing. Your knowledge is truly a gift, and we are forever grateful. Nakummek. To Siobhan Slade, thank you for your dedication, commitment, and friendship. This research would not have been possible without you. To the students who supported this project—Nicole Blinn, Emily Beacock, Jade Zavarella, Kaylia Little, and Olivia Paxton-Beesley, we sincerely thank you for your support. To the entire NATURE Youth Council—it was such a pleasure to share this experience with you. Thank you for your help. To three anonymous peer reviewers, thank you for your comments and thoughtful critique.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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