'4RIGHT' Community Energy Planning in NunatuKavut, Labrador: Preliminary Research Findings

A report prepared for: The NunatuKavut Community Council

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1.1. Expanding NunatuKavut's *'Community Sustainability Initiative'* to the Energy Sphere

In 2017, the NunatuKavut Community Council [NCC] launched their '*Community Sustainability Initiative'* via the Department of Research, Education, and Culture. The primary objective of the initiative is to support Southern Inuit in creating a stronger future for their communities (NCC, 2013). The initiative aims to assist three pilot communities (Black Tickle, Norman Bay, and St. Lewis) build upon their strengths, and identify their assets, in order to enhance sustainability and governance. The current research project, entitled '*Community Energy Planning and Sustainability Assessment in NunatuKavut, Labrador'* seeks to extend the initiative to consider and address energy-related challenges in the pilot communities.

The primary research questions for the current project include:

1) From Southern Inuit perspectives, how does the existing energy system (including both diesel-generation and home-heating sources), affect the economic, environmental, and societal sustainability of communities?

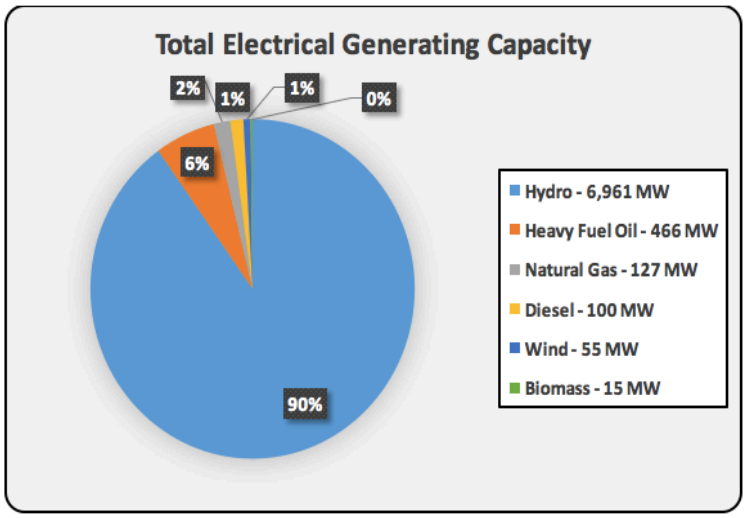
2) How can a participatory and community-based assessment of sustainable energy technologies and practices facilitate the improvement of Southern Inuit energy sustainability?

The primary goal of our research program is to develop community-driven sustainable energy actions plans for each pilot community. The action-plans will outline the impacts of existing energy systems; community member concerns; preferences for renewable energy and energy efficiency options; as well priorities for the future. This report shares preliminary findings of the research. The report is organized as follows: first, an overview of our methodology and applied community energy planning framework; second, a discussion of key energy-system concerns in each community; third, an analysis of renewable energy and energy efficiency preferences; fourth, identification of community-member priorities for future energy projects; and finally, recommendations for the future and next steps based on the analysis.

1.2. Background/Context: Electricity Generation in Newfoundland and Labrador

Newfoundland and Labrador [NL] is generally perceived as a national leader with regards to renewable energy development. Much of this is attributed to 90% of NL's electricity generation capacity being hydropower, not including the 824MW Lower Churchill Project [Muskrat Falls], currently under construction [Fig 1] (People, Power, Planet Partnership, 2018).

Figure 1: Total Electrical Generating Capacity in NL



Sources: Newfoundland & Labrador Hydro, 2015; Canadian Wind Energy Association, 2015

Off-grid electricity generation differs dramatically compared to the rest of the province. An off-grid community is defined as: (1) any community that is not connected to the provincial or national electricity grid; and (2) any permanent or long term settlement (5 years or longer), with at least 10 dwellings (NRCAN, 2011). There are 21 communities in NL which meet this criteria, 15 of which are located in Labrador. The 15 off-grid communities in Labrador are exclusively dependent on diesel-generation to meet their electricity needs [Table 1].

Table 1: Off-Grid Communities in Labrador (Karanasios & Parker, 2017)

Nr	Community name	Population 2011	Diesel plant capacity (2011) kW	Annual electricity demand (2011) MWh	Serviced by
1	Black Tickle	138	765	1,080	
2	Cartwright	516	1,485	3,933	
3	Chatlottetown	308	620	1,496	
4	Hopedale	556	1,840	2,673	NL Hydro
5	Makkovik	361	1,300	2,422	
6	Mary's Harbour	383	1,300	3,110	
7	Mud Lake	60	180	221	
8	Natuashish	931	695	No data	IPA
9	Nain	1188	2,920	2,920	
10	Norman Bay	45	No data	No data	
11	Paradise River	14	145	186	
12	Port Hope Simpson	441	1,390	2,186	NL Hydro
13	Postivlle	206	735	1,293	
14	Rigolet	306	870	2,064	
15	St. Lewis	207	695	1,923	
	Total	5,660	15,300	27,729	

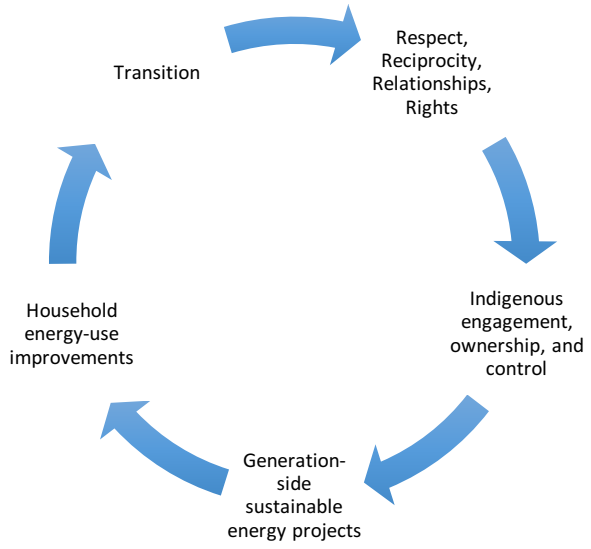
2.1. Methodology: Community Energy Planning

Previous research has established that diesel-generation poses substantial economic, environmental, and societal-challenges for off-grid communities (see: Knowles et al., 2016; Arriaga et al., 2013; Rickerson et al., 2012). While sustainable energy projects are frequently promoted to improve off-grid sustainability, we note that in the absence of meaningful Indigenous engagement, ownership, and control – sustainable energy projects may create economic, environmental, and societal tensions of their own (Rezai & Dowlatbadi, 2016; Rickerson et al., 2012). Recognizing this, we have developed a community-based energy planning approach. This approach ensures that the rights of Southern Inuit communities are respected, that community-members and relevant stakeholders are fully engaged in helping to guide their energy futures, and that any potential negative effects of projects are identified and mitigated.

2.2. The '4RIGHT' Community Energy Planning Framework

For this project, we have developed and implemented a community energy planning approach grounded in Indigenous research principles. We refer to this approach as the '4RIGHT Community Energy Planning Framework' [Fig 2].

Figure 2: '4RIGHT Community Energy Planning Framework'



4R's of Indigenous Research: We argue that community-energy planning research with and for Southern Inuit communities must be grounded in the Indigenous research principles of respect, reciprocity, relationships, and rights (Castleden et al., 2012; Kimmerer, 2011; Louis, 2007). By respect, we refer to honoring the traditions, culture, and histories of communities in energy-

related decisions. By reciprocity, we strive to ensure that NCC and the pilot communities benefit just as much from the community-energy planning process as the practitioners/researchers benefit themselves. By relationships, we refer to the notion that energy-planning research with and for Southern Inuit communities is a lifelong relationship, and that we will continue to support the communities long after the completion of the formal research period. By rights, we refer to respecting the formal regulations and protocols of the NCC throughout all aspects of our research. These principles must be maintained throughout the duration of the study, and extend beyond the life of energy planning research.

Indigenous Engagement, Ownership, and Control: Indigenous engagement, ownership, and control are integral in order to avoid the societal tensions that can be brought about by sustainable energy projects, policies, and research. For this stage of the framework, we uphold the 'OCAP' research principles. (Schnarch, 2004). As stated by the First Nations Centre (2005) "ownership, control, access, and possession, or OCAP, is self-determination applied to research" (p. 1). Ownership refers to the relationship of an Indigenous community with its cultural knowledge or data, this principle recognizes that an Indigenous community or group owns this information collectively. The principle of control asserts that Indigenous peoples are within their rights to control all aspects of research which impact them, from project conception to completion. The access principle dictates that Indigenous peoples must have access to information about themselves, regardless of where the data is stored – and that the ability to manage and make decisions regarding access to collective information is maintained. Possession or stewardship of cultural knowledge/data is a more literal mechanism for ownership to be asserted and protected.

Practically, energy-planning researchers must work directly with Indigenous peoples, governments, and key stakeholders in order to ensure social acceptance, enhance sustainability, and deepen the community benefits associated with sustainable energy projects. Integral to this framework component, is assessing community-member concerns and priorities, as well as the social acceptance of supply-side and end-use sustainable energy technologies.

Generation-side and household energy-use: The generation-side and household energy-use components of the framework refer to assessing technical and economic prefeasibility, and

pursuing the development of sustainable energy technologies. Our experience suggests that community members are most likely to support sustainable energy projects that they are familiar with/educated on. As such, we encourage incremental supply-side and end-use pilot projects, which gradually improve awareness and sustainability in the communities. For this stage of the framework, we recommended utilizing energy management software such as RETSCREEN or HOMER Pro in order to determine the feasibility of preferred-energy alternatives.

Transition: The final stage of our framework is 'Transition'. We argue that if energy-planning practitioners can maintain the 4R's associated with Indigenous research; implement processes of meaningful Indigenous engagement, ownership, and control; and evaluate the pre-feasibility of socially-preferred sustainable energy technologies; only then, may practitioners make recommendations about which energy-alternatives are most likely to succeed in the communities.

2.3.1. Methods - Data Collection

The project received ethical clearance from the NCC Research Advisory Committee, the University of Waterloo Office of Research Ethics, as well as Dalhousie University's Research Ethics Board. The project began with an NCC hosted 'Sustainable Energy Summit' on July 11th, 2018. The summit allowed for congregation of key stakeholders and community-members, review and refinement of research materials, as well as dissemination of existing plans and knowledge. The fieldwork component of this project took place from July 12th – September 1st, 2018. The researchers, along with the local Research Assistants, visited the community of Black Tickle for two weeks, St. Lewis/Fox Harbour for three weeks, and Norman Bay for one week, as well as additional trips to Goose Bay and other Southern Inuit communities to enhance context and cultural understanding of our work.

We used a mixed-methods approach, with a semi-structured community-member interview/survey as our primary research instrument. The survey portion quantitatively assessed: (1) community member energy-related concerns, by asking respondents to rate their level of concern on each given issue from one to five (where 1 = not concerned, and 5 = extremely concerned); (2) the social acceptance of supply-side and end-use energy technologies, by asking respondents rate each

technology on a scale of one to five (where 1 = strongly opposed, 2 = somewhat opposed, 3 = neutral, 4 = somewhat support, and 5 = strongly support); and (3) community-member energy-related goals for the future, by asking respondents to rate their level of importance (where 1 = not important, and 5 = extremely important). We note that respondents were given the options of 'Do Not Know' or 'Pass' to each survey question. The interview portion qualitatively assessed the issues and topics that community-members rated most strongly (upper or lower bound of rating) in the survey component.

We also implemented key informant interviews as a secondary research instrument. The key informant interviews were designed to gather additional data on the tangible economic, environmental, and societal impacts of the existing energy-systems in NunatuKavut communities. The key informant interviews also gauged potential interest in pursuing sustainable supply-side and end-use energy technologies.

2.3.2. Research Participants

The target population for the community-member survey portion of the study included: any permanent resident of Black Tickle, St. Lewis, or Norman Bay (minimum six months' residency per year), who were above voting age in the province (18 years old). Prior to the researchers visiting the communities, our local Research Assistants distributed a recruitment letter to all permanent households. Upon the researchers visiting the communities, the local Research Assistants followed up with each household whom expressed interest in participating in the research. In total, we conducted 75 community-member surveys, including 33 in Black Tickle, 36 in St. Lewis, and 6 in Norman Bay, respectively [Table 2]. This represented approximately 33% of the target population in Black Tickle, 30% in St. Lewis, and 32% in Norman Bay, respectively (Statistics Canada, 2018).

The target population for the key informant portion of the study included experts from academia, the private sector, the community-sector (including community leaders and Elders), as well as government representatives. Key informants must have had a minimum of two-years experience working on energy-sustainability issues in Newfoundland and Labrador. While an initial list of key-informants was developed prior to the commencement of the project, most key-informants were identified as the researchers spent time in the communities, talking about energy issues. Key-informant interviews are on-going, with seven conducted interviews to date (n=7).

Table 2: Demographic Information of Participants (n = 75)

	Black Tickle	St. Lewis	Norman Bay	Percentage of Total
Sample Size (n)	33	36	6	**100%**
Gender				
Female	19	21	3	**57%**
Male	14	15	3	**43%**
Age Group				
Under 25	4	6	1	**15%**
25 - 34	6	4	0	**13%**
35 - 44	12	7	0	**25%**
45 - 54	6	9	5	**27%**
Over 54	5	10	0	**20%**
Education				
Less than Secondary	13	6	1	**27%**
Secondary	13	13	3	**39%**
University or College	3	14	0	**23%**
Other	4	3	2	**12%**
Current Profession				
Public Sector	12	8	3	**31%**
Private Sector	8	9	3	**57%**
Unemployed	9	5	0	**19%**
Other	4	14	0	**24%**
Income (vs $29,000)				
Much Less or Less	18	6	0	**32%**
Same	4	6	1	**15%**
Much More or More	9	15	2	**35%**
Prefer Not to Specify	2	9	3	**19%**
Inuit, First Nations, or Metis?				
Yes	30	31	6	**89%**
No	3	5	0	**11%**

2.3.3. Data Analysis

For the quantitative questions, we have applied basic descriptive statistics in order to understand the most pressing energy-related issues and sustainable energy preferences in NunatuKavut communities. For the qualitative data, we have used content analysis, applied to survey/key informant transcripts, which were transcribed by the research team and local research assistants. For the purpose of the preliminary report, we read 1/3rd of the transcripts for each community (11, 12, and 2, respectively) and inductively built an initial codebook, paying special attention to the key themes identified in quantitative analysis of survey data. We reviewed all of the transcripts to ensure that the codes comprehensively encompassed key themes. We then applied NVIVO version 11.1.1 qualitative analytic software to organize and manage the qualitative data. For the purpose

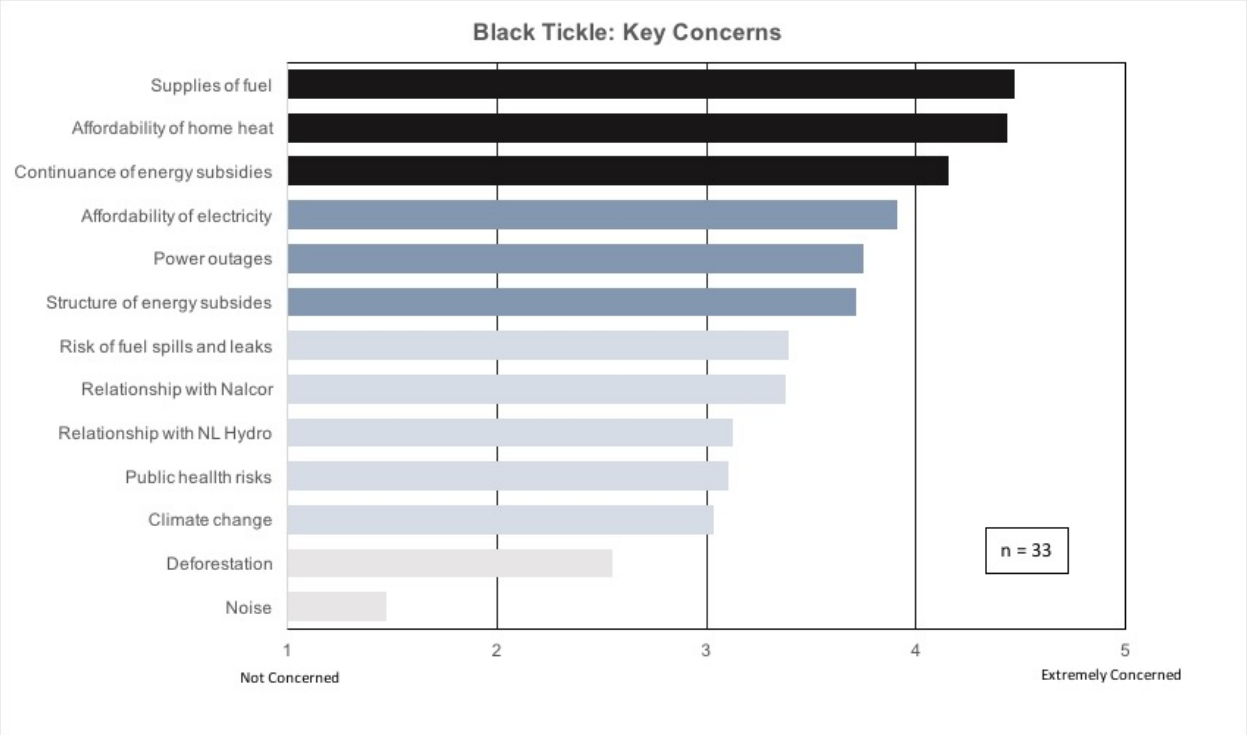
of the preliminary report, we only include some of the most important themes developed in the analysis of data. Our final report will include detailed analysis on all the survey data.

3.1: Community Member Energy-System Concerns

3.2.1. Heat Insecurity in Black Tickle

The greatest energy-system concern identified in Black Tickle was related to heat insecurity in the community [Fig 3]. We extend Weis & Illinca's (2010) definition of energy security to heating, to include both the secure supply of a heating source, as well as the price volatility of fuel sources. We note that 'supplies of fuel', 'affordability of home heat', and 'continuance of energy subsidies', were the only themes with a mean concern-rating exceeding 4.0 across our sample of 33 respondents in the community (4.5, 4.4, and 4.2, respectively). To further support this, we note that Black Tickle had the highest number of respondents (24%) whom reported living in an 'inadequately heated home', compared to St. Lewis (14%), and Norman Bay (0%), respectively.

Figure 3: Primary Energy System Concerns – Black Tickle



3.2.2. Firewood: The secure supply of heating fuel in the community is restricted across all sources: wood, furnace-oil, and electricity. Black Tickle's located on the Island of Ponds, a tundra island, as such, there is no locally available wood source. Due to this restriction, community-members

whom rely on wood [or wood and oil mix] as a primary heating source (42%) [Table 3], have to travel approximately 60-80kms (roundtrip) via snowmobile into areas such as Mussel Brook, Porcupine Bay, and Reid's Pond in order to harvest firewood. While many community-members identify firewood harvesting as an important cultural tradition, the process can be expensive (e.g. permits, gasoline, wear-and-tear on equipment), time-consuming, and emissions intensive.

Table 3: Primary Household Heating Source by Community

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

3.2.3. Fuel Security: Due to the local unavailability of firewood, many households in Black Tickle rely on furnace-oil [or wood and oil mix] (42%) [Table 3], especially in comparison to the other case-study communities (14%% in St. Lewis, and 0% in Norman Bay, respectively). This makes Black Tickle particularly vulnerable to disruptions in fuel supply, as occurred in 2015 when the sole local supplier (furnace oil and gasoline) announced that they would be discontinuing fuel storage and sales in the community. Given these circumstances, the Black Tickle Local Service District [District] has begun importing drums of furnace-oil and gasoline into the community, leading to additional heat insecurity challenges (CBC News, 2016). The provincial government provided funding of $50,000 to support the District in procuring fuel; the chair of the District, noted that they must operate strictly on a cost-recovery basis. Meaning that no profit is made by the District, and that they simply charge residents the fuel and transportation costs.

The District is only able to bring in limited supplies of fuel via freight ship in the ice-free season (Mid July – Mid December). This leads to year-round limitations, as the Local Service District has to ration available fuel supplies for community-members. Heat insecurity is exacerbated in the Winter when the freight ships cease operation and the District's fuel stockpile is exhausted (around February of each year). At this point (February – Mid April), community-members are forced to travel to the next closest community (Cartwright) via snowmobile to purchase and haul fuel back to Black Tickle, a roundtrip of approximately 200kms. This is an expensive, time-consuming, and

anxiety-inducing endeavor. Community-members must haul back a minimum of two fuel drums (108 litres each, $302 per drum in 2018) to make the trip worthwhile, as well as burn upwards of 50 litres of gasoline to retrieve the fuel. Respondents report making 2-4 trips to Cartwright per month to retrieve fuel, which costs $200-400 in gasoline alone (not accounting for maintenance/wear-and-tear expenses for snowmobiles and komatiks). Respondents noted that gasoline is also a necessity for firewood harvesting; as such, the limited-supply of gasoline year-round, and [local] unavailability in mid-winter, create additional challenges for collecting firewood.

Price volatility and the high-cost of fuel-sources pose challenges for the community. We note that 55% of our sample in Black Tickle (n=33) reported earning 'much less' or 'less' than $29,000 per year [Table 2]. The cost of a drum of fuel rose from $257 in 2017, to $302 in 2018, as stated by one respondent "the more the cost of home heating fuel goes up, well the less [we] can afford to have". Given that most respondents report consuming 15 – 20 drums of fuel per year ($4,530 – $6,040), this likely represents in excess of 15-20% of yearly income for the majority of our sample. The requirement to purchase fuel 'by the [65gn] drum' is a severe challenge for most community members, as stated by one respondent:

> "People here are on a fixed income. So someone on E.I. [employment insurance] … gets $400 every two weeks, and a drum of fuel is $340. It's either you buy a drum of fuel – or you eat for two weeks".

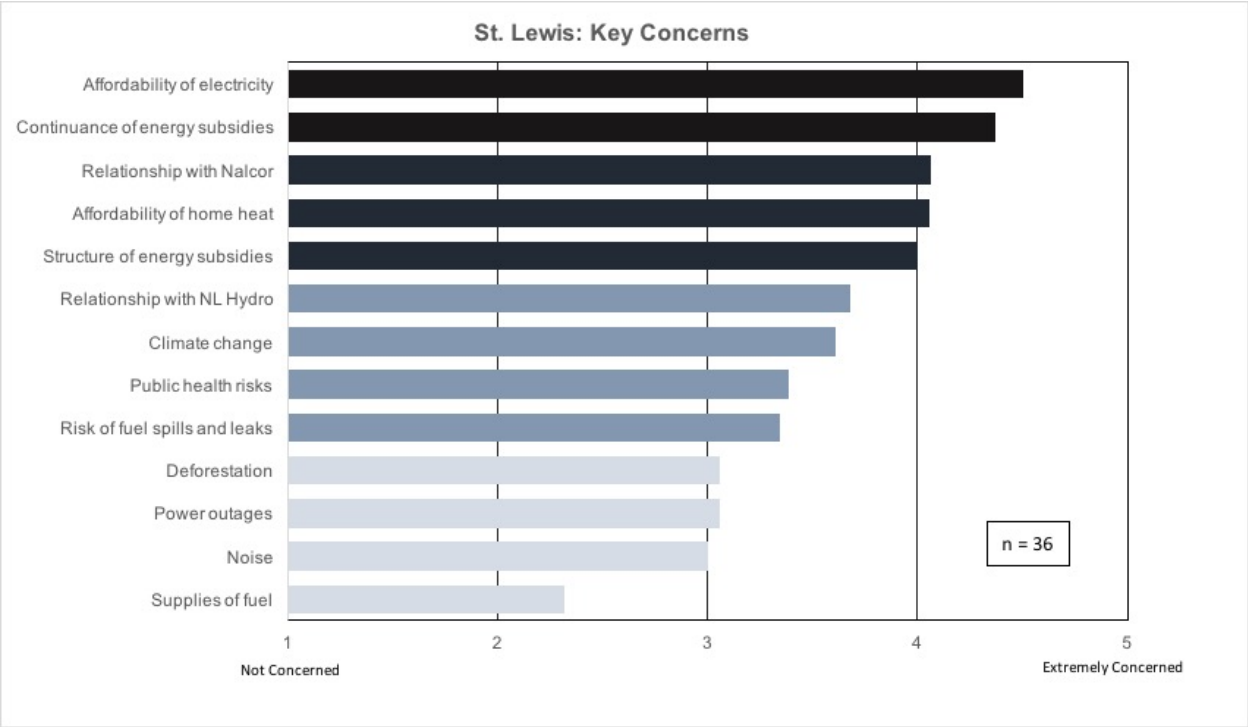
3.2.4. Electric Heat: Electric heat in Black Tickle is currently prohibitive due to existing rate-structures, high costs, and expensive upgrades required for household infrastructure. In Labrador's off-grid communities, off-grid electricity rates are structured to discourage household conversion to electric heat (Karanasios & Parker, 2017; Knowles, 2016). Beyond 1,000 kWh of household electricity consumption per month, rates increase from a base-line of $0.119/kWh to approximately $0.162/kWh, making electric heat untenable for most households. For respondents whom reported utilizing electric heat, monthly electricity bills ranged from $200 in the summer months, to $600 in the winter months. While this is generally cheaper than furnace-oil, it still represents over 10% of annual income for the majority of our sample. Furthermore, while many

respondents expressed interest in converting to electric heat, they deemed it impossible due to the significant costs associated with household electric upgrades required. As stated by one respondent "It would be expensive for me if I wanted to convert over [to electric heat]. I would probably need an upgraded panel box and new wiring, heaters...., because the wiring and stuff in this house is old".

3.3.1. Utility Dependence and Desire for Energy Autonomy: Fear of Escalating Costs, Lack of Community Consultation, Control, and Benefits

While no single issue emerged in St. Lewis as the greatest energy-system concern, we argue that the top rated concerns in the community are interdependent and manifest themselves as one overall theme. Utility dependence and desire for energy autonomy: fear over escalating costs, which is exacerbated by a lack of community consultation, control, and benefits. The highest individual concerns across 36 respondents included: (a) the affordability of electricity (mean concern rating of 4.5); (b) the continuance of energy subsidies (4.4); (c) the community's relationship with Nalcor (4.1); (d) the affordability of home heat (4.1); and (e) the structure of energy subsidies (4.0) [Figure 4].

Figure 4: Primary Energy System Concerns – St. Lewis



3.3.2. Satisfaction with Current Rates:

The majority of respondents in St. Lewis (92%), report relying on wood [or wood and oil mix] as their primary heat source [Table 3]. Relying on wood-heat allows most community-members to minimize their electricity bills. As stated by one respondent "Our hydro bills are miniscule, my bill is like 35 bucks a month.". Similarly, another respondent stated "In the summer it's not that bad, maybe 30 dollars a month". Expressing satisfaction with St. Lewis' electricity costs, one respondent stated "Our Hydro bill here, versus the Hydro bill that I would have in Newfoundland using electric heat, is like half the cost".

Conversely, those whom reported relying on electric heat (3%) expressed frustration over electricity costs. As stated by one respondent:

> "the only set heat we have is those [electric] heaters, we have five in this place, and it costs $700 a month in the winter time to keep that going…. and in the summer time, it's still like $350. When it do[es] increase, we will never survive".

Another respondent stated “electric heating would… be plus $800 a month”. Another respondent, describing electric heat stated “in the winter time you cannot get enough heat, and we even will preheat our oven and open the door [to warm the house]”.

3.3.3. Escalating Costs and Fixed Incomes: While most of the community is satisfied with current electricity rates, there is a great deal of fear in the community over escalating rates, particularly for those with fixed incomes. As stated by one respondent “We have a population of about 180; 120 adults are sixty plus, and every year they are getting older. So my concern is for those people, how are they going to manage with a fixed income?”. Another respondent stated “if the rates continue to increase… people, especially seniors, fixed income, and low income, [they] will not be able to afford”. The fear is that rate increases may force those on fixed incomes to make difficult decisions, as stated by one respondent “they’ll have to make a choice: either between heating, or eating”. Another respondent stated “I will pay my electricity this month, and I will not get my meds”.

As the population ages, it becomes increasingly difficult to access wood heat. This forces community members to convert to electric heat, rely on family members, or purchase expensive commercial firewood. As stated by one respondent “Seniors, they cannot go in to cut their wood, so they got to use electric heat”. Another respondent explained “[Person] is buying her wood out of her pension, or [Family member] is trying to get it for her…. They only get about $1,000 a month in pension, and a cord of wood is probably $500 – 600 for sure”. Similarly, one respondent stated “Some houses only have one senior. If you’re getting $1,100 a month… it comes down to… do I buy food, or do I buy fuel to heat my home, or do I want to pay somebody to cut my wood?”.

3.3.4. Lack of Control, Consultation, and Community Benefits: Community-members expressed frustration regarding a lack of control and consultation over energy-related decisions. Some community-members worry that they are exclusively dependent on one utility; as stated by one respondent: “we are a dying population here, and there is always that worry that [NL HYDRO]… they [are] going to cut us off next”.

With regards to consultation, one respondent stated:

> "We do not hear anything from them [existing utilities]. I would prefer if they got into contact…. and said: these are the plans for this year, do you have any issues with this? Is there anything we can do to help your community?... but they do not".

Another respondent, speaking to Nalcor's sanctioning of Muskrat Falls, stated: "they were bulldozing through; not listening to anybody, not listening to the environmentalists, not listening to the scientists. They were not listening to the people; it was all about profit". Another respondent stated, "I lost whole lot of respect for Nalcor and [NL] Hydro during that process [Muskrat Falls sanctioning] because I felt that we were being blatantly ignored".

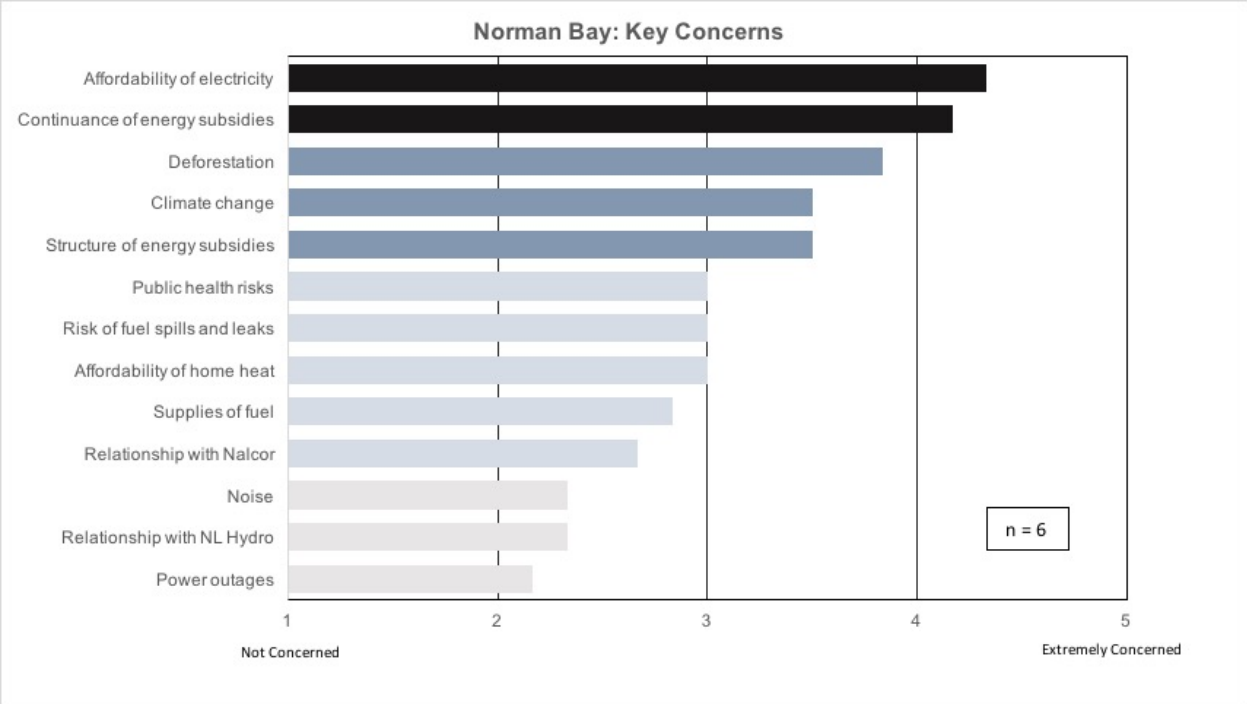
This lack of control and consultation has made community members feel as though they have not benefitted from previous energy-related decisions in the region. As stated by one respondent "If our community is on diesel power… and we have absolutely nothing to do with electricity coming from Muskrat Falls – we shouldn't have to dish out a cent for it… it is not helping me". Another respondent stated "it's ludicrous that they [Nalcor] are going to be taking the power out of Labrador to feed elsewhere, and we get nothing". Similarly, one respondent stated

> "they have this big project going on in our backyard, bypassing us, and we are sitting around deciding whether or not we are going to use wood or diesel for fuel or electricity…. At a minimum, they should distribute some of that power to the [coastal] communities, to provide us with reliable, cheap, power".

3.4.1. Norman Bay: Energy Costs, Transportation and Employment

Due to our small sample size in Norman Bay (n = 6), we rely more on the qualitative analysis of interview transcripts to identify key concerns. The affordability of electricity (4.3), and the continuance of energy subsidies (4.2) were rated as the highest individual concerns [Fig 5].

Figure 5: Primary Energy System Concerns – Norman Bay



3.4.2. Fear of Escalating Costs: All respondents in the community rely on wood-heat as means to minimize electricity bills [Table 3]. As stated by one respondent "we got easy access to wood, and we got heat that is not a big expense really". However, due to unique circumstances in the community, households have to rely on electricity in other ways. For example, as there is no municipal-water source in the community, households have to pump water from a local source. As explained by one respondent "we got hooked up to the pond down there for running water. We got to run a heat trace to the pond, and the first month our bill was almost $800. If it goes up [rates], we are ruined". Another respondent stated "not everyone can afford to dish out $700 or $800 dollars for a Hydro bill".

3.4.3. Reliable Transportation and Employment: Our qualitative analysis suggests that desire for sustainable transportation and employment are two significant concerns in Norman Bay. The existing transportation system can be unreliable, poses fuel-access challenges, is an expensive [albeit subsidized] service, and is emissions intensive. As explained by one respondent

> "one thing here is getting in and getting out [of the community], it's the big thing…. When

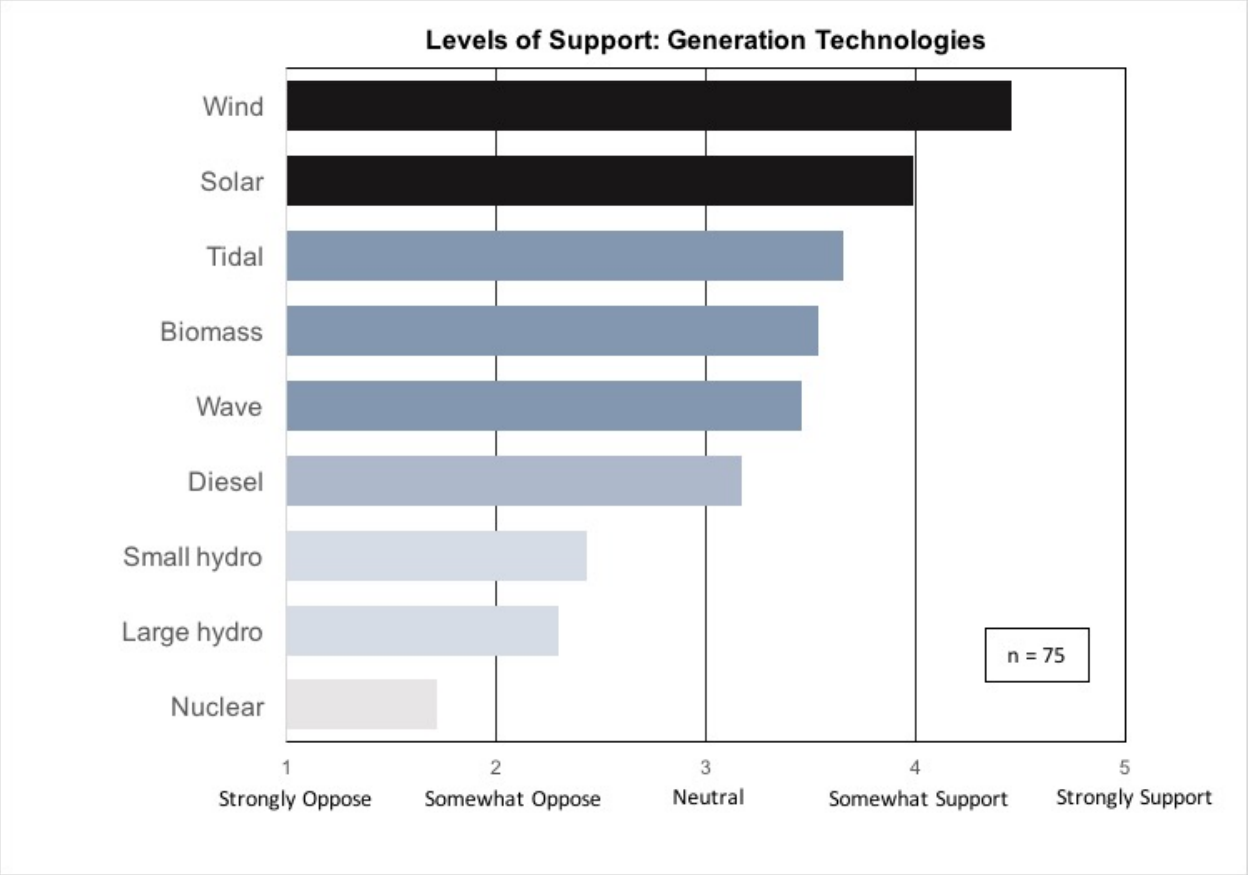
> the ferry was on, I mean it is bad for people who did not like on boats and for people who got seasick, you are gone [travelling] all day. With the helicopter on, it is quick and easy, but the ferry – she did not stop for foggy days or rain".

Another respondent stated "if there were more jobs, less people would have had to move – and if we were connected to the [Trans Labrador] highway, that would have solved a lot of [our community's] problems. Another respondent stated, "there is no work in the community, except for when you go away".

4.1. Generation Side – Social Acceptance

There are four descending categories of social acceptance for electricity-generation technologies in our pilot communities [Fig 6]: (1) conventional hybrid renewables (including wind and solar power); (2) emerging renewable energy technologies (including tidal, combined heat and power biomass, and wave power); (3) the status quo (diesel-generation); and (4) societal opposition (including hydroelectricity and nuclear-generation). We have also evaluated social-acceptance for three key energy storage technologies: grid extension, pumped hydro storage, and battery storage. This section provides the rationale for community-member support, as well as the key community-concerns which must be mitigated for each technology.

Figure 6: Social Acceptance of Electricity Generation Technologies



4.2.1. Conventional Hybrid Technologies – Wind and Solar Power

Conventional hybrid technologies refer to technologically mature renewable energy sources which

are used to displace a portion of diesel consumption in off-grid communities. Wind and solar power maintained the highest average levels of social acceptance of any generation-technologies, at 4.5 and 4.0, respectively [Fig 6]. While some concerns were identified which must be mitigated prior to the advancement of any project, respondents generally perceived hybrid conventional renewables as beneficial for their communities.

Wind energy maintains the highest level of social acceptance of any generation-side technology [Fig 7]. Of our 75 respondents, 71% strongly or somewhat supported wind energy development, 11% reported being neutral, 5% reported being strongly or somewhat opposed, and 8% responded that they 'Do Not Know'. We note that not all frequencies add up to 75 survey respondents, as a small number of respondents opted to qualitatively respond to the questions, instead of giving a survey response. Solar energy maintains the second highest level of social acceptance of any generation-side technology [Fig 8]. Of the 75 respondents, 57% strongly or somewhat supported solar energy development, 24% reported being neutral, 7%% reported being strongly or somewhat opposed, and 7% responded that they 'Do Not Know'.

Figure 7: Frequency of Support – Wind Energy

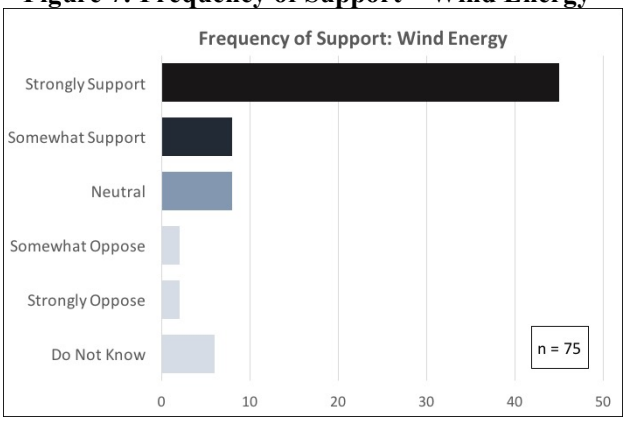
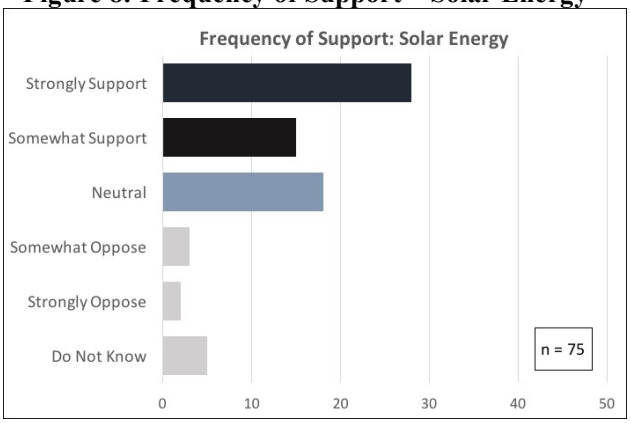


Figure 8: Frequency of Support – Solar Energy



4.2.2. Community Rationale

Capitalizing on a local resource: Respondents recognized the potential for wind and solar energy in their communities, and desired the benefits associated with the development of a local resource. As stated by one respondent "I look at our winds, and I figure we could produce enough energy for the whole world on a good day". Respondents generally believed solar had less potential than wind, but remained optimistic. As stated by one respondent "it might not be the best solar resource

in the world here, but... you could produce [solar] energy from this whole harbour". Community-members stated they had an abundance of land available for development, and that hybrid renewables would not encroach upon their homes. As stated by one respondent "we got lots of places to put [wind turbines] where it won't affect the community".

Respondents believed wind and solar development would bring cost-savings to the communities, by helping to reduce fuel costs. As stated by one respondent "I am guessing it would be cheaper in the long run to have [wind or solar energy development]". Another respondent stated "any source of [renewable] energy, or electricity, would be a lot better than the cost of living [based on diesel] right now".

Environmental benefits: Many respondents perceived wind and solar development as environmentally friendly compared to other alternatives, and as a means to displace diesel consumption in the communities. As stated by one respondent "[wind energy] has nothing to do with fuel, and it is just safe for the environment". Another respondent stated "if you can utilize windmills, solar panels, solar energy - why use a dam, and screw all the environment up?". Comments such as "less pollution" and "it is a less harmful impact on the environment", were common.

Community pride and independence: Respondents perceived wind and solar development as a means to foster community pride and independence. One respondent stated "they are giant windmills; they make you feel good because you know they are doing something good. If I could look up on the hill and see wind turbines, I'd be like… look at my little town". Another respondent stated "we would be completely off the grid… once you have solar, you don't need to rely on [NL] Hydro whatsoever.

Familiarity: Many respondents were supportive of solar energy in particular, as they [or acquaintances] have used the technology at their off-grid cabins. As stated by one respondent "most of the cabins in Goose Bay… they all use solar". Another respondent stated "I've seen quite a few people actually with [solar] in their cabins and stuff, it just makes sense".

4.2.3. Community Concerns

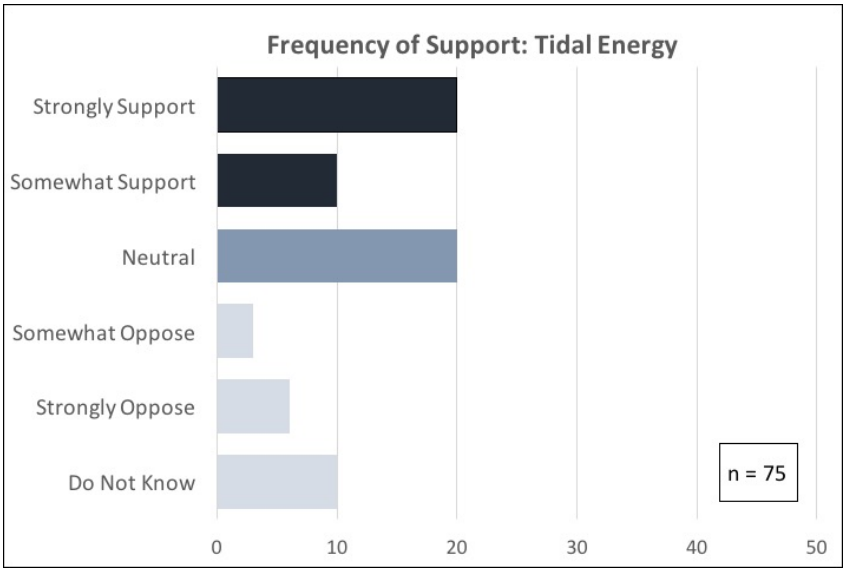
While wind and solar energy maintained high-levels of social support across all pilot communities, we note that some concerns emerged which must be mitigated prior to the advancement of any project. Some respondents questioned the reliability of wind and solar energy as intermittent sources, especially given the harsh climate in the communities. As stated by one respondent "we have a lot of wind… I don't know how it [or solar] would work come January or February month when everything is buried over. Another respondent added "Solar, I do not know with the weather-wise here the last few years… you need [sun]light to keep her going". Expressing concern about noise impacts, one respondent stated "one thing about wind turbines… the vibrations are really noisy". Another respondent raised the issue of wind turbines impacts on wildlife, stating "I do not know what damage they got to do with wildlife".

4.3.1. Emerging Renewable Energy Technologies

Emerging renewable energy technologies are novel applications which have yet to be deployed on a large-scale in off-grid communities. Tidal, combined heat and power biomass, and wave power all had similar levels of rated social-acceptance across our sample (n=75), at 3.7, 3.5, and 3.5, respectively [Fig 6]. While respondents expressed interest in these technologies, our qualitative data analysis suggests that community-members desire more education, awareness, and mitigation of concerns prior to the advancement of any project.

The distributions of support are very similar for the three emerging technologies [Fig 9]. The levels of strongly/somewhat support ranged from 40 – 45%; each technology has a high percentage of 'neutral respondents', 24 – 32%; the levels of strongly/somewhat oppose are generally low for each technology, 12% - 20%; and each has a similar low number of 'Do Not Know' respondents, ranging from 4% - 13%. Community-members typically supported emerging renewables based on similar rationales as wind and solar development, however, there is less familiarity and additional concerns associated with these technologies.

Figure 9: Frequency of Support – Tidal Energy



4.3.2. Community Concerns

Unfamiliarity: Many respondents were simply unaware of emerging renewable energy technologies, or they did not understand how they worked. For example, one respondent stated "I have never heard of it". Another respondent stated, "I have no idea how it would even work". Due to this unfamiliarity, a significant portion of our sample felt as though they were unable to make an informed decision either in support/or in opposition to the technologies.

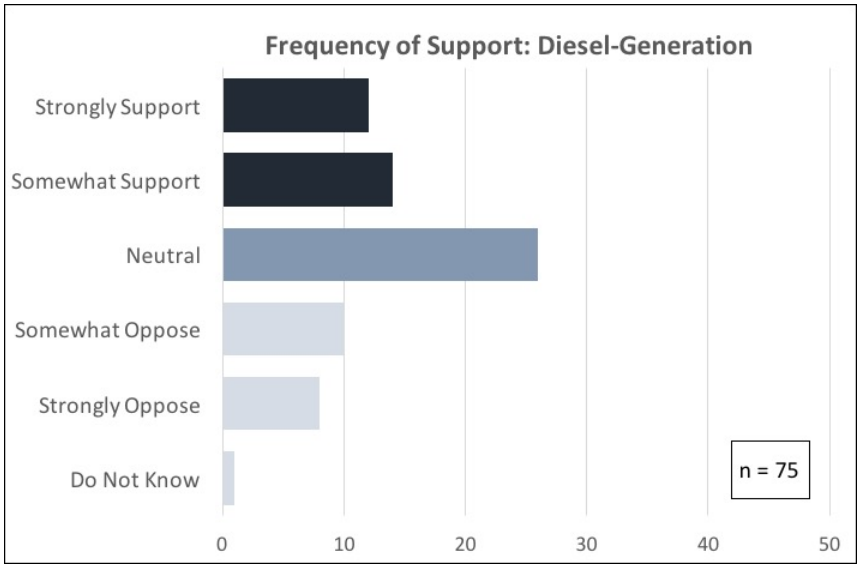
Aquatic species and livelihoods: Some respondents were uneasy regarding tidal and wave energy due to potential impacts on aquatic species and livelihoods. As stated by one respondent "I do not like seeing anything in our water damaging our fish. Being a fisherman, you can see how it [fish] is destroyed, and every little bit [of development] puts it down another notch". Another respondent stated "wouldn't that [tidal and wave energy] be bad for the fish?".

Deforestation: Some respondents were uneasy about combined-heat and power biomass due to deforestation impacts and the unavailability of local fuel sources. As stated by one respondent, "with the wood burning thing, you need reforestation projects on the go". Another respondent stated "Biomass would be trees, and we don't have trees. It would be kind of hard to get energy out of something we do not have".

4.4.1. The Status Quo: Diesel Generation

Currently, all three pilot communities (Black Tickle, St. Lewis, and Norman Bay) are exclusively dependent on diesel-fuel for electricity generation. Diesel-generation maintained a social acceptance rating of 3.2 across our entire sample (n = 75) [Fig 6]. Of our 75 respondents, 35% strongly or somewhat supported diesel-generation, 35% reported being neutral, 24% reported being strongly or somewhat opposed, and 1% responded that they 'Do Not Know' [Fig 10]. Our qualitative data analysis suggests that while respondents are interested in improving environmental aspects of their energy system, they wish to maintain the socio-economic benefits associated with diesel-generation as well.

Figure 10: Frequency of Support – Diesel Generation



4.4.2. Community Rationale

Comfort and Familiarity: Most respondents supported diesel-generation as they are familiar and comfortable with the technology. As stated by one respondent, "that's the only form of energy we have; we have to depend on diesel to get our electricity". Another respondent stated "I guess it [diesel] is just what we grew up with. It is the only thing [electricity-source] that I know". This comfort and familiarity makes community-members somewhat resistant to disrupting the existing system, as stated by one responded "The community is so reliant on what they have, our diesel plant. Even though renewables could be a wonderful thing, this is what they are used to, this is

what they know". Another respondent added "I'm old fashioned, so what works – why mess with it?".

Reliability: Community members value the reliability of the existing diesel-system. As stated by one respondent "[Diesel] seems to be working for us, we have not had any major issues… personally I think it would be just fine if it has to stay like this for the next 50 years". Another respondent stated "I think our energy system is fine, our Hydro [diesel] plant is fine, I never want to see it disappear… we had 100 – 160 kilometers of wind last winter at one point… and we did not lose power".

Employment: Community-members also support diesel-generation due to existing employment benefits. Diesel operations create two full time positions in Black Tickle, two full time positions in St. Lewis, one full time position in Norman Bay, as well as supplemental relief and maintenance positions in each community. Given the low employment available in the communities, diesel-operation and maintenance jobs are regarded as highly valuable. As stated by one respondent "It all has to do with employment… there is is not a whole lot [of work] here. So something [new] comes in…. it could be trouble".

4.3.3. Community Concerns

Fossil Fuel Consumption and Pollution: While community-members were generally comfortable with diesel-generation, and valued the reliability/employment associated with diesel-operations, respondents also recognized a need to improve the environmental impacts of the existing system. As stated by one respondent "When it comes to diesel… there is harmful effects going into the environment. We have used it for years…. but it comes at a cost". Another respondent stated "I know it is hard on the… environment".

Respondents also worried about future scarcity of fossil fuels. As one respondent stated "I do not think it is a good idea to continue [diesel-consumption] in the future, given the amount of fossil fuels we use as a [global] population". Another respondent stated "I have this thought that [diesel] is going to run out, and there is going to be widespread panic".

4.4.1. Societal Opposition: Hydroelectricity and Small-Nuclear

Three supply-side technologies were opposed across the pilot communities: small-scale hydroelectricity, large-scale hydroelectricity, and small-scale nuclear generation (support ratings of 2.4, 2.3, and 1.7, respectively) [Fig 6]. Small [run of the river] hydroelectric facilities had slightly more social support than large hydroelectric projects. As stated by one respondent "if we have to sacrifice another river for that, then small-scale is probably better than larger scale". Our qualitative data analysis suggests that community-members are too concerned about these technologies to proceed with a project at this time.

Of the 75 respondents, 20% strongly or somewhat supported small-scale hydroelectricity, 20% reported being neutral, 44% reported being strongly or somewhat opposed, and 9% reported they they 'Do Not Know' [Fig 11]. Similarly, for large-scale hydroelectricity, 20% were strongly or somewhat supportive, 16% were neutral, 55% were strongly or somewhat opposed, and 1% reported that they 'Do Not Know' [Fig 12].

Figure 11: Frequency of Support – Small Hydro

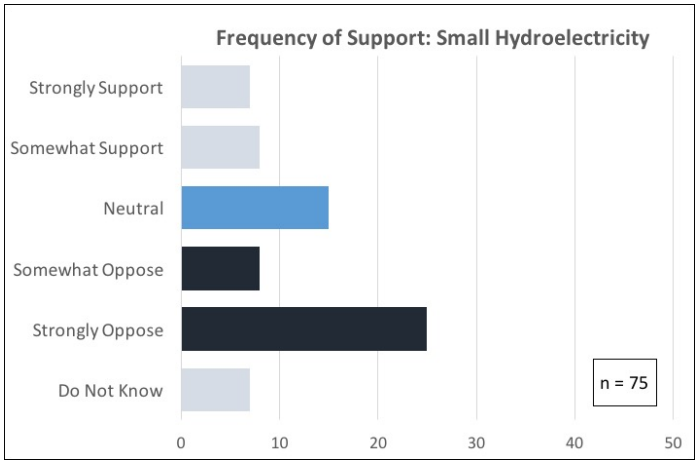
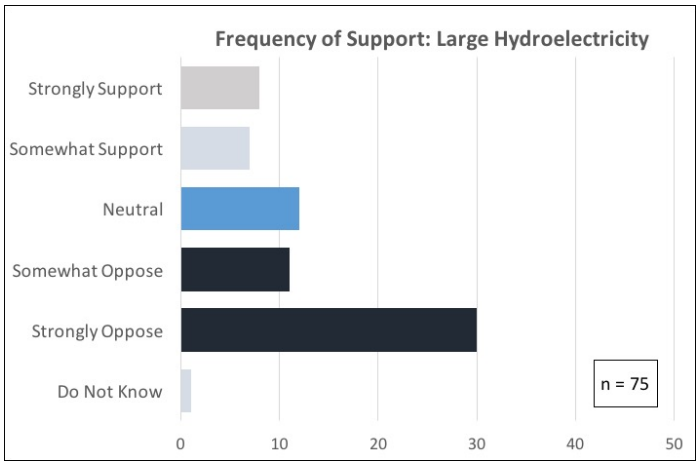
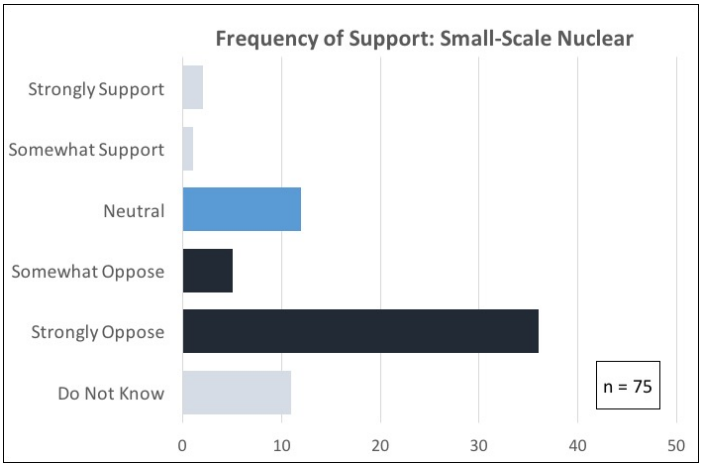


Figure 12: Frequency of Support – Large Hydro



Small-scale nuclear generation had the least social support of any electricity-generation technology. Of the 75 respondents, 4% strongly or somewhat supported small-scale nuclear generation, 16% reported being neutral, 55% were strongly or somewhat opposed, and 15% reported that they 'Do Not Know' [Fig 13].

Figure 13: Frequency of Support – Small Nuclear



4.4.2. Community Concerns

Livelihoods and Cultural Tradition: Respondents were generally nervous that both small and large-scale hydroelectric development would negatively impact livelihoods and cultural tradition in the communities. As stated by one respondent "rivers are people's livelihood, and if anything should mess with what [people] use out of the water… people would oppose". Another respondent added "people fish salmon and trout, this is people's river food… that is people's livelihood'.

As for the cultural importance of rivers, one respondent stated "the majority of our communities are very culturally [rich] communities. There is not a family… that does not live off the land in some way, shape, or form. By changing our rivers, you are going to change the way our salmon spawn". Similarly, another respondent stated "With the traditions [here]: I have always fished, my father has always fished, and my grandfather has always fished. To go and teach my son how to fly-fish, how can I if the river is dammed up?". Specific concerns included habitat-degradation and the potential for flooding associated with hydroelectricity. As stated by one respondent "There is enough going on with the habitats now, you do not need to… make it worse".

Association with Previous Hydroelectric Developments: Many respondents expressed negative associations with previous hydroelectric projects, Muskrat Falls in particular, which erode their support for any future hydroelectric development. As stated by one respondent "I am just going

from Muskrat Falls, how it ruined the environment. I do not really think it is necessary for us to ruin Fox Harbour". Another respondent, explaining their opposition, stated "what I already know about Muskrat Falls, and all the damage it caused".

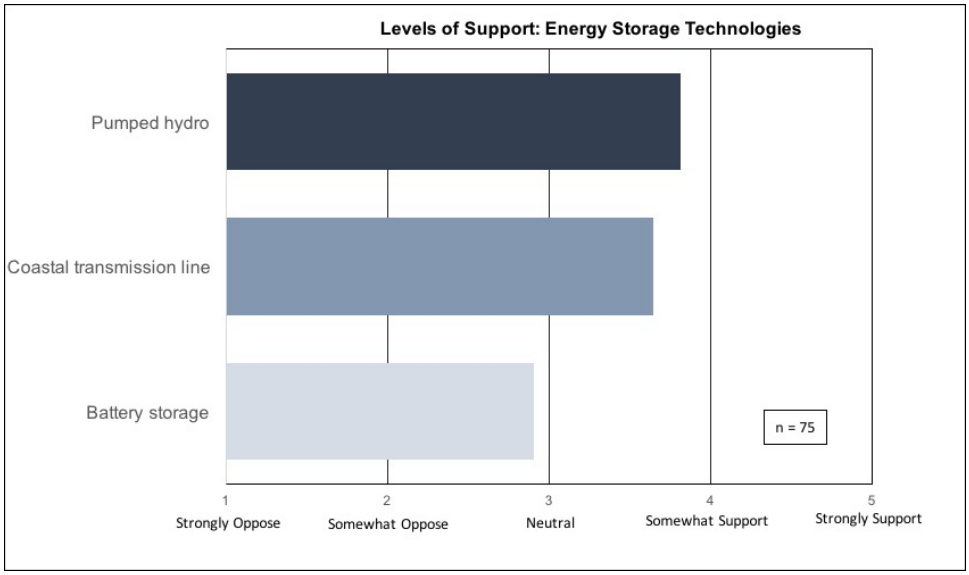
Safety and Nuclear: Respondents were extremely concerned about potential hazards associated with small-scale nuclear development. As stated by one respondent "Nuclear brings the threat of more hazards". Another respondent stated "[Nuclear] sounds really unhealthy, unsafe. Not only for the environment, [but] for people". Many respondents were uncomfortable even hearing the word 'nuclear', as one respondent stated "the word nuclear, that is a hard one for me".

Respondents associated small-scale nuclear development with previous nuclear accidents around the world. As stated by one respondents "I just think nuclear – Chernobyl. I do not know why; I just do… so much can go wrong". Another respondent stated "you hear the word nuclear and it is just a danger zone… red flags pop up in my mind [from] all the different areas in the world that have been impacted by it". Similarly, one respondent stated "nuclear… you would think of bombs, gas, and poison".

4.5.1. Energy Storage Technologies

Energy storage technologies had varying degrees of social support. Across our sample (n=75), pumped hydro, coastal transmission line (grid extension), and battery storage technologies received social support ratings of 3.8, 3.6, and 2.9, respectively [Fig 14].

Figure 14: Social Acceptance of Energy Storage Technologies



4.5.2. Pumped Hydro: Pumped hydro had the highest level of social support of any energy-storage technology. Respondents generally viewed pumped-hydro as an innovative and non-intrusive means to store excess electricity from renewable energy projects. As stated by one respondent "this is a pretty windy place… so with extra energy, and forbid we did not have any wind, then that extra [stored] energy would help". While respondents were generally supportive, some concerns were brought up. For instance, pumped hydro was sometimes viewed as prohibitively expensive for small communities. One respondent stated "those sources [pumped hydro] … would be very expensive to set up. Would that be efficient for such a small community?".

4.5.3. Coastal Transmission Line [Grid Extension]: Extending provincial grid service to our pilot communities, which would allow for greater renewable energy penetration, was the second highest-rated energy storage approach. Most community-members supported this idea, as they believed it would lead to cost-savings from a project that is already being built (Muskrat Falls transmission assets). As stated by one respondent "The infrastructure is already in place… in theory it wouldn't… take a whole lot to run a line [to our community]". Another respondent stated "if energy is as cheap [here] as Goose Bay, and if we could get it [transmission], then I would say our power bills would be cheaper. Households here would then go to electric heat, and we would not have to worry about the fuel, or wood, or gas situation".

Respondents whom opposed coastal transmission were generally worried about unreliability. As stated by one respondent “we would be without power more times than we would be with it”. Another respondent stated “because of the winds and the storms, and to be able to get someone out [to fix] the line if something happens”.

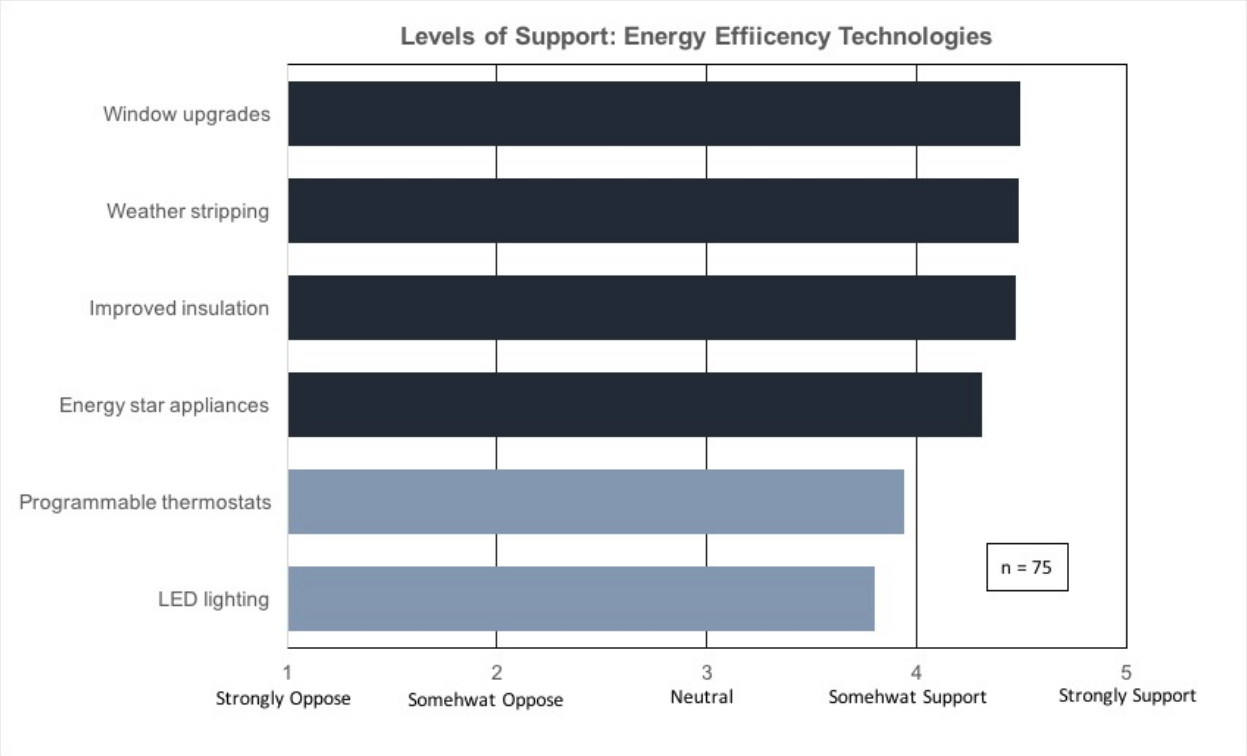
4.5.4 Battery Storage:

Batteries were the only energy-storage technology for which community-members, on average, were somewhat opposed (mean = 2.91). Our qualitative analysis suggests that more education, awareness, and mitigation of concerns is required prior to the advancement of a battery-storage project. The main concerns were related to the cost and safety of battery storage technology. As stated by one respondent “the amount of batteries that you would have to have on hand [and the associated expense] to run an entire community, even this small, would be massive”. As for concerns around the safety of battery-storage, one respondent stated “[batteries] sound really unhealthy, unsafe. Not only for the environment, for the people”. Another respondent stated “[batteries are capable] of explosion, you know, explosive [material]”.

5.1.1. Household Energy Use and Efficiency – Social Acceptance

In general, we note that energy efficiency technologies have significantly higher levels of social support than most supply-side energy options. For instance, all energy-efficiency applications had mean support ratings exceeding 3.8, whereas only two supply-side technologies exceeded this threshold [Fig 6, Fig 15]. Instead of visiting each technology individually, we have developed three primary themes which describe social support for energy efficiency applications, including: cost savings via energy conservation, preference for incremental versus disruptive change, and positive experiences with previous energy efficiency programs in the communities.

Figure 15: Social Acceptance of Energy Efficiency Technologies



5.1.2. Older Homes: Costs Savings via Energy Conservation***:*** Many of the homes in Black Tickle, St. Lewis, and Norman Bay, are older homes, and respondents recognized the potential of upgrading/improving energy use. As stated by one respondent "the windows in the house are really old. A lot of heat escapes through it, and a lot of air comes in… same with the door". Similarly, another respondent stated "nothing has been done with this house in terms of insulation since I

moved into it, and I've been living here for… at least 20 years".

Most respondents supported energy efficiency applications as they recognized the costs savings associated with consuming less electricity. As stated by one respondent "[energy efficiency] cuts down on the amount of electricity that your house burns, less the power plant has got to produce, and the less your power bill is going to be at the end of the month". Similarly, another respondent stated "it just makes common sense to use less [electricity]. It might be a little bit more expensive to start off; but in the long run, it is going to pay off". Offering a specific example, one respondent stated "my power bills… with conventional lighting, used to be close to $200 a month. Since I replaced everything with LED lighting… I have never gotten one since that's over $40 a month"

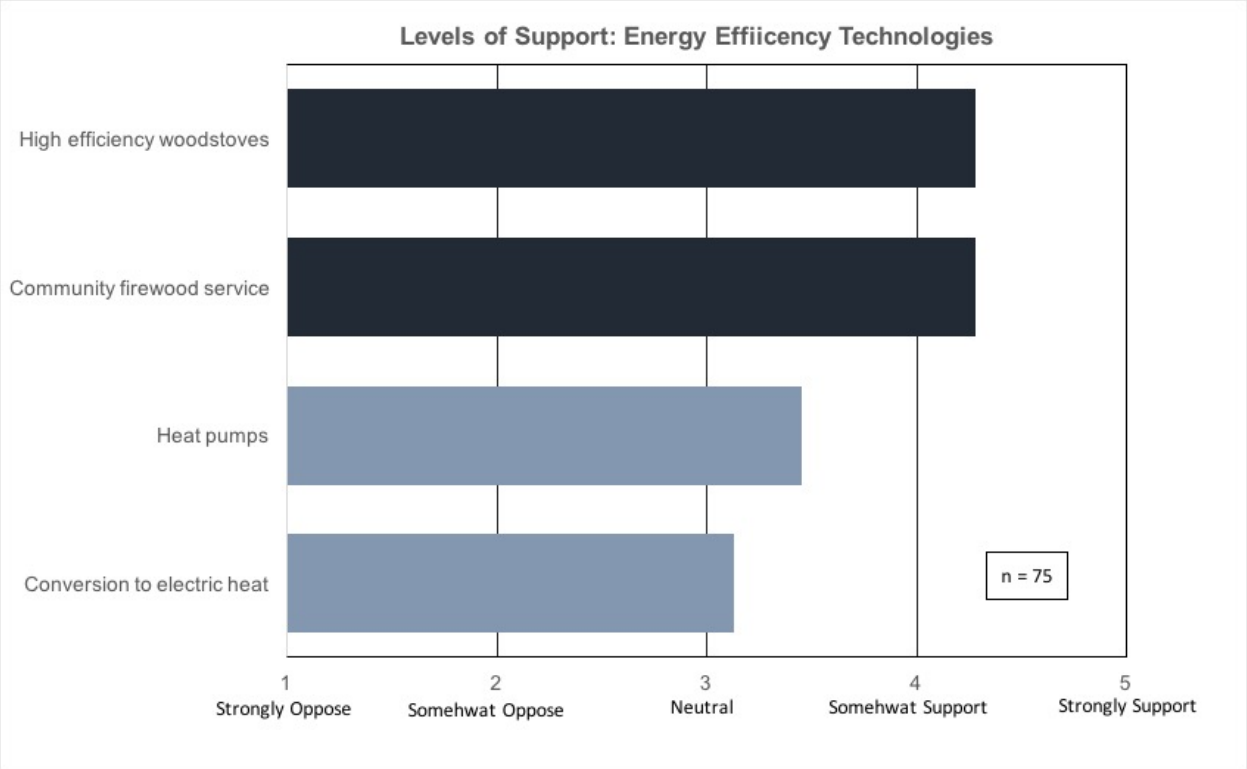
5.1.3. Incremental vs. Disruptive Change: Respondents generally supported energy efficiency technologies, as it allowed them to take steps to improve economic and environmental aspects of energy-use, without any major disruptions to the existing system. As explained by one respondent "I feel like they [energy efficiency technologies] are smaller steps that can be taken that would help. Instead of coming in with a big change at first… this could introduce people to what could be, in smaller ways". Similarly, another respondent stated "we are very small in terms of our footprint, but I do believe we can do something… if I can use energy efficient light bulbs, I will. If I can insulate my house so I'm not losing as much heat and wasting energy, then I will".

5.1.4. Positive Experience with Energy Efficiency Programs: Respondents generally expressed positive experiences with previous energy efficiency programs in the communities, which made them more supportive and optimistic for future programming. As explained by one respond "[NL] Hydro offers through Summerhill, the Take Charge Program here almost every year. As far as I know, every household takes part in the program". Another respondent explained "NL Hydro, that is one of the best things they have been doing: sending people around and getting people to change their bulbs – they provide the bulbs". Likewise, some respondents had positive experience with energy-efficiency applications in their professional lives. As explained by one respondent "From what I see on the [fishing] boats, it is [LED lighting] a really big difference when you are using batteries… they do not take so much energy".

5.2.1. Alternative Heating Sources – Social Support

For this project, we assessed social support for four key alternative home-heating approaches, including: implementing a community firewood service, high efficiency wood stoves, heat pumps, and converting homes to electric heat [Fig 16]. For the preliminary report, we examine the most preferred alternative heating sources – including high efficiency woodstoves, and the establishment of a community firewood service.

Figure 16: Social Acceptance of Alternative Heating Technologies



5.2.2. Improving Firewood Use:

Improving firewood consumption in the community, by implementing a community-firewood service, and converting to high efficiency woodstoves, received the highest amounts of social support for alternative heating approaches (mean ratings of 4.3, and 4.3, respectively).

Comfort with Wood Heat - Improving Consumption: Most respondents were comfortable and

satisfied with wood heat, and perceived wood-harvesting as an important cultural tradition. As stated by one respondent "This is how our community always lived like". Another respondent stated "A lot of people burn wood, and I find wood heat a lot better anyway". Respondents were interested in high efficiency woodstoves, as it would allow them to maintain an important tradition, and decrease their wood consumption simultaneously. As explained by one respondent "it would only burn a fraction of the wood, it would lower the cost of getting firewood, it is kind of like a win-win, both ways". Another respondent stated "anything that burns less, lasts longer, and gives more heat – just makes common sense".

Improving Wood Access: A community-firewood service is perceived as a means to improve access to firewood in the community, particularly for seniors. As explained by one respondent "there is a lot of elderly people in the community. My grandfather, he does not go in the woods anymore – because he is old, and can't do it. [Community firewood service] would benefit the elders in the community". Similarly, another respondent stated "an excellent idea for people who can't… get their own wood. That is a good idea for seniors". Another respondent stated "All of the Elders in the community, I wanted to see some sort of co-op put in place that could bring them their winter's wood… they are all 90…. And can not get their wood themselves".

Community-members perceive commercial firewood as prohibitively expensive, and believe a community-oriented system may help decrease costs. As stated by one respondent

> "some people do not have the money to buy their wood… commercially, as opposed to someone who might [be able to buy] five or six cord…. If it is there for the community to take, I mean everyone [would] have equal opportunity, they will have a means to heat their homes".

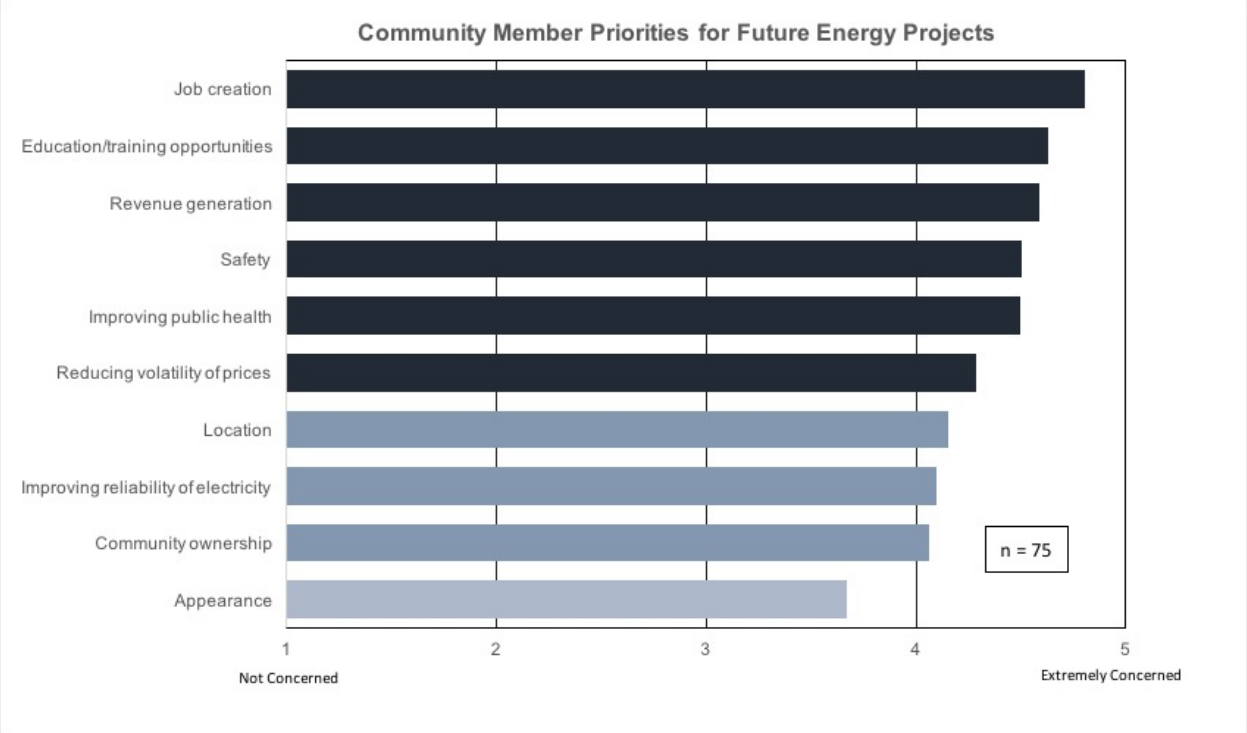
Rewarding Employment Potential: A community-firewood service is also seen as a way to generate meaningful employment opportunities in the pilot communities. As explained by one respondent "If someone was able to be a wood harvester, that would give someone [insurable] hours and employment". Another respondent, expressing interest in meaningful employment opportunities, stated 'they [community-members] grew up cutting wood, so it is something they

know how to do, and they enjoy doing. So [they] would be getting paid for something they like to do".

6. Community Energy Priorities for the Future

The final portion of our community-member survey, sought to identify priorities for future sustainable energy projects in the communities. While all variables were rated relatively high, we note that job creation as a result of energy projects, relevant educational and training opportunities, as well as revenue generation for the communities, were the highest rated priorities (4.8, 4.6, and 4.6, respectively).

Figure 17: Community Priorities for Future Energy Projects



6.1.1. Job Creation as a Result of Energy Projects

6.1.2. Lack of Local Employment: Most respondents lamented that there was a lack of employment opportunities in their communities, and they viewed sustainable energy projects as a means to create work. As explained by one respondent "this little community has nothing anymore, and any kind of employment opportunity… is obviously a bonus". Another respondent stated "there is not a whole lot of employment – unless… you went away and got an education. If that [sustainable energy] could create jobs, that would be great".

6.1.3. Sustainable Energy to Retain and Return Families: Sustainable energy projects were perceived as a means to retain and return families to the communities via employment opportunities. As for staying in the community, one respondent stated "I am a young person in the community with a young family… I would like to live here with my son, and raise my son here the way I was raised, but I can not if there is [sic] no jobs". Another respondent stated "if there was [sic] more jobs in the community, people would not have to leave". As for returning families to the community, one respondent stated "if there was… more [sustainable energy] jobs created, it would bring more people home, put more families back together, put more kids in school". Similarly, another respondent stated "If there was more [sustainable energy] jobs here, it would probably bring back more people to home".

6.2.1. Relevant Educational and Training Opportunities

6.2.2. Empowering Community Members to Guide and Participate in Sustainable Energy Transitions:

Educational and training opportunities were regarded as necessary to empower community-members to guide and participate in sustainable energy transitions. Community-members desire understanding of the risks and benefits associated with sustainable energy technologies, in order to make informed decisions. As stated by one respondent "if something is going to be put in our community, then the community as a whole needs to know everything they can about it". Another respondent stated "[we need to have] information about it [energy projects]: what is going on with it, what it can do, what health problems it can create/cannot create, or [how it can] help".

Respondents argued that increasing education and awareness was integral to improving the social acceptance of energy projects. As explained by one respondent

> "If you did not know what it [a sustainable energy project] was about, you'd probably say we do not want that in our community. But… if you had the training and the education… it would be the best thing that would ever happen to Black Tickle".

Similarly, another respondent stated "If you do not know what something is… most times, they are going to say no, we do not want it". Another respondent added "if you give them the education on it, and… all the information that they need, it would make them more susceptible to what you are trying to do".

6.2.2. Training Locals to Fix and Maintain Sustainable Energy Projects

Community-members also expressed a desire for training programs which would allow them to fix and maintain local sustainable energy projects. As explained by one respondent "if you do education or training here it would be great, because… people would be more experienced, which would help for jobs". Similarly, another respondent stated "if you haven't got the right training, you are not going to be doing any good at the [sustainable energy] job".

6.3.1. Community Revenue Generation as a Result of Energy Projects

6.3.2. Infrastructure Upgrades and Community Independence: Community-members saw potential in sustainable energy projects to generate revenue, which could be re-invested into community infrastructure. As explained by one respondent "if the town had these projects and could make money from them… it would enhance the towns ability to do more things". Another respondent stated "any and all money that comes in, you could use that, you could build up the community". Offering specific examples, one respondent explained:

> "It would be the only revenue that our community has. It would help us pay for things that our community does not have, such as water and sewer, a decent garbage disposal site, upgrade to our road, basically everything that everybody else has in the province that we do not".

Community-members also saw revenue-generation as a means to develop community-independence. As explained by one respondent "The less we got to depend on the government the better. At least it would be something we could call ours, and if we are able to sustain it to create jobs to grow our community, I'm all for it".

7. Recommendations for Next Steps

Reflecting the principles of community-based participatory research, we note that research partnerships are most likely to succeed when researchers are guided by the needs and priorities of community partners (Castelden et al., 2012). As such, we sought to determine the greatest energy-system concerns and priorities of community-members in our research, including: heat insecurity in Black Tickle, utility dependence and desire for energy autonomy in St. Lewis; and desire for reliable transportation and employment in Norman Bay. Furthermore, our analysis demonstrated that familiarity/understanding was key to ensure social acceptance of sustainable energy projects. As such, moving into the implementation phase of our research, we recommend pilot-projects based on our analysis, to incrementally improve familiarity/energy sustainability in the communities.

Potential Pilot Projects:

- In general, community-members expressed higher levels of social acceptance for energy efficiency technologies than supply-side energy options. While some small-scale energy efficiency work has been done in the communities, we recommend the expansion of energy efficiency retrofits to improve household heating (i.e. improving residential insulation, window upgrades, weather stripping windows and doors, etc.). This would be particularly beneficial in Black Tickle.

- Respondents across all three pilot communities are open to hybrid-conventional renewable energy technologies (wind and solar). However, in Black Tickle, we note that only a small portion of households rely on electric heat. As such, assisting homes in converting to electric heat would be helpful, prior to the advancement of a renewable energy project. This would also decrease anxiety over fuel and wood access.

- St. Lewis is likely the ideal pilot community for a demonstration renewable energy project. Community-members expressed a high degree of social acceptance for wind and solar energy technologies, and a desire for more control over their energy system.

- Education and awareness workshops on renewable energy, and energy efficiency technologies, would be beneficial in all three pilot communities. Residents expressed a desire to understand the risks and benefits of sustainable energy technologies, as well as technical training in order to gain employment and fix/maintain projects. Further education/awareness is desired in the areas of: energy efficiency, hybrid conventional renewables (wind and solar), and emerging renewable energy technologies (tidal, wave, combined heat-and-power biomass).

- Wood-heat is the most preferred heating alternative across all three-pilot communities, and many respondents supported wood-harvesting as an important cultural tradition. Two measures which respondents supported included: (1) transitioning to high efficiency woodstoves, and (2) establishing a community firewood service. Pilot projects in these areas would also contribute to the community priorities of job creation and revenue generation for the communities.

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