

# Bridging Gaps In Energy Planning for First Nation Communities

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## ABSTRACT

There is a link between energy security, economic prosperity, sustainability and sovereignty for indigenous communities in Canada. Geographically remote locations, absence of all-season roads, off-grid status, diesel dependency and lack of alternative energy access causes energy insecurities along with economic, social, and local environmental problems for the Keewaytinook Okimakanak (KO) First Nation communities in northwestern Ontario. Being free of diesel dependency and scoping sustainable energy solutions are immediate priorities. Both are key motivational factors for effective community energy planning (CEP). However, most CEP is based on top-down decision making approaches which lack effective community engagement to design culturally appropriate, community-centric energy plans. Such approaches fail to acknowledge local socio-cultural drivers as indicators of energy planning.

This article details the disconnects between theory and practice in energy planning for First Nation communities. The overarching purpose of this article is to bridge knowledge gaps regarding socio-cultural requirements, discuss the social costs in energy planning, and advance academic literature about indigenous perspectives on energy planning.

A literature review, key informant interviews and in-field observations in KO First Nation communities form the basis of our study. This article examines community insights on local energy planning to elicit drivers and determinants for a conceptual, bottom-up energy planning framework. It offers recommendations to integrate socio-cultural factors as part of a sustainable and functional energy planning approach for the KO communities. It provides justification that this process

ensures multiple benefits such as buy-in by the communities, acceptance, and readiness for CEP implementation which fosters community ownership, self-determination, pride and empowerment. The research findings are timely. There is growing interest in ensuring local energy security amidst longstanding colonial treatment and marginalization of indigenous communities in the broader context of Canada's greenhouse gas commitments.

## INTRODUCTION

Keewatinook Okimakanak (KO) First Nation\* communities are nestled in the boreal landscapes of northwestern Ontario. Among the first things that one notices when landing at one of their airports are the rows of fuel storage tanks or large tank farms with the adjacent diesel-powered generating stations. These tanks store fuel that is air-lifted or trucked at an annual cost of approximately \$1 million dollars<sup>†</sup> per community of 500 people. It is estimated that 115 liters of diesel fuel are consumed every minute in these remote First Nation communities, adversely affecting the environment, individual health and socio-economic opportunities [1]. Geographically remote locations, the absence of all-season roads, off-grid utility status, diesel dependency and non-accessibility to alternative energy sources have contributed to acute energy insecurities, and serious local environmental, social and economic concerns [2,3].

The historical context of First Nations in Canada is one of repeated assimilation, marginalization, deprivation and isolation. However, overcoming past hardships and engaging with local energy planning for self-sufficiency is high on development agendas of First Nation communities [4]. The active "voices" of the KO communities and their aspirations for community-driven energy planning are important to achieving sustainable energy solutions. We recognize and interpret energy plan-

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\*There are several terms used to describe indigenous peoples in Canada. "First Nations" are those Status Indians governed under the Indian Act and residing on federally-owned reserve lands set aside for First Nations. "Aboriginal" is the term used in section 35 of the Constitution Act, 1982 inclusive of "Indians, Inuit and Métis." "Indigenous" is commonly used in the international arenas (e.g., United Nations declarations). It is becoming more popular, is often preferred by indigenous peoples and now acknowledged by the Canadian federal government.

<sup>†</sup>All dollar values are provided in Canadian dollars.

ning in the KO communities as having multiple purposes—a planning tool defined by their interactions with the environment, their values and need for economic development plus a means of creating pathways for self-determination, pride and empowerment. Since energy planning for these communities is formative, this article draws from community motivations to demonstrate the need to include sociocultural factors as key drivers in local energy development.

The academic approach to community energy planning integrates policy, urban planning, and energy management components into a single model called community energy management [5]. In contrast, Ontario Power Authority's (OPA) generic indigenous CEP concept includes an understanding of community energy usage, identifying conservation opportunities, scoping renewable energy sources, understanding the risks and rewards, and establishing energy goals for the community [6]. Rizi lists various organizations that have contributed to the concept and practice of CEP from 1997-2010 [7]. Present-day CEP practices are more evident in a non-academic landscape and through various lenses—economic, technology, policy, renewable energy, and greenhouse gas emission reductions. St. Denis and Parker examined ten local action plans in remote, rural and urban Canada affirming that CEPs have limitations when applied in local contexts [8]. Each CEP needs to be individualized to the attributes of each local community and must therefore use unique approaches, applications, assessments and contexts. Necefer et al. note that local indigenous community contexts include socio-cultural factors—historical, cultural, artistic, and religious or sacred beliefs both in tangible attributes (e.g., land, sites, lakes, rivers, waterfalls and mountains) and in intangible forms (e.g., practices, cultural norms, representations, expressions, knowledge and skills) [9]. These deep-rooted values, identity, and the stewardship of the land need recognition, acceptance and integration into modern energy systems and development [10].

This article elicits drivers and determinants for integrated CEP using a literature review, in-field observations, community member interactions and key informant interviews. The analysis is also informed by our participation in the annual Northern Ontario First Nations Environment Conference (NOFNEC) in 2015 and 2016 that provided open dialogues. We then offer a conceptual, bottom-up framework and make recommendations to integrate socio-cultural drivers for efficient energy planning for the KO communities.

The research findings are timely as there is growing interest in ensuring local energy security amidst longstanding colonial treatment and marginalization of indigenous communities. In a broader context, it is appealing to the Canadian government's greenhouse gas reduction commitments.

## LITERATURE REVIEW

A review of both grey and academic literature was undertaken on the scope and motivations for energy planning by off-grid First Nation communities. For background and historical contexts, we approached the Keewaytinook Okimakanak Research Institute (KORI) and the Nis-hanawbe Aski Nation (NAN) for institutional reports and visited community websites. Grey literature included international, government and organizational reports and other studies.

The Web of Science database was queried for multi-disciplinary publications including areas of natural sciences, social sciences, archaeology, economics and sustainable development. The database search from 2000 to 2016 found 45 published papers relating to CEP in Canada with very few specifically addressing indigenous communities and none focused on integrating socio-cultural factors in energy planning. Diesel dependency is acknowledged by all the key informants and KO institutional and community reports. All reference to the KO communities is through non-academic documentation except for academic articles about information and communication technology [11]. The review identified substantial academic references on local energy planning for renewable energy development by First Nation communities in Canada. Sources on energy planning in urban settings were excluded since the context of this article focuses on remote communities.

A study about CEP in remote, off-grid situations provides theoretical knowledge of concepts, definitions, programs, tools and approaches in Canada. At the national level, aboriginal community energy plans in 2015 focused on improving energy efficiency, reducing electricity consumption, and assessing clean energy solutions. A total of 55 indigenous communities from remote northwestern and southern Ontario with \$3.9 million in funding benefitted from aboriginal community energy plan programs [12]. The initiative, though well-received, was a top-down program offered without sufficiently focusing on strengthening com-

munity capacities to undertake energy planning. This led to consultant dependency, hefty costs and non-functional reports. Rizi echoes that better understanding of “on the ground” needs are necessary to increase adoption and implementation of energy plans in First Nation communities [7]. There is little academic research on the effectiveness of the aboriginal community energy plan programs for the First Nation communities. This poses a knowledge gap in assessing the success of energy planning for these communities.

An analysis of ten of the first CEPs in Canadian communities included two First Nation communities, emphasizing a participatory bottom-up approach with outcomes that addressed local needs, values and resources [8]. The Hupacasath First Nation in British Columbia undertook energy planning and attributed its success to their chief. The community’s efforts led to the development of the 5.2 MW China Creek hydroelectricity project followed by a community-led energy planning process that resulted in a “green” approach to energy [13,14].

An example of bottom-up energy planning is provided by the Tli-cho (Dogrib) people in Wha Ti, Northwest Territories, who developed their energy plan by assessing their energy use. This exercise involved the entire community including tribal elders, youth committees and the local government, subsequently leading to a successful project [15]. The desire for community self-sufficiency was identified as a primary motivation for developing energy projects in the First Nation communities in British Columbia [16].

The NRCan’s guide and the Artic Energy Alliance’s toolkit both recognize the role of community members, not local governments, as key initiators of CEP [17,18]. Local or community level energy planning is both desirable and useful. Lerch noted that when local people are engaged, they invest in the outcomes, thus making community energy initiatives more than just plans [19]. This engagement is important because indigenous communities aspire to become more resilient and free of top-down, institution-driven systems. They take pride in embracing innovation and integrating development in their ways of life. Energy security is critical to their aspirations for self-determination and sovereignty. It is also necessary to enhance the capacities and capabilities of indigenous peoples in Canada [20].

Field observations and reviews suggest that interrelated and interdependent factors in CEP have favorable impacts when socio-cultural factors are considered; for which the central element must be based on

the fundamental and underlying philosophy of indigenous people that all things—animals, the elements, people and nature—are connected, instructive and illustrative [21]. Elias emphasized that economic development needs must consider cultural consequences [22]. Aboriginal Affairs and Northern Development Canada (AANDC) in its Comprehensive Community Planning Handbook for First Nations in British Columbia indicate that celebrating traditions and cultures are important factors in planning processes [23].

Academic literature, references and documentation concerning off-grid energy planning integration in the indigenous context is limited. This leads to a gap in understanding and acknowledging socio-cultural drivers as measurable and potential motivational factors for indigenous energy planning. In a broader context, indicators and targets to integrate cultural factors are omitted in well-intentioned development programs and policies [24]. The effects of “culture” were not included in the elaboration of the millennium development goals [24,25]. Such oversights may be due to the subjective nature of “culture” [26]. Evidence suggests that First Nation communities that are firmly grounded in their culture and secure in the legitimacy of their traditions and social institutions are happier and more economically successful [27]. Tangible and intangible cultural forms can drive sustainable development and serve as powerful socio-economic resources [25]. The Mackenzie Valley Pipeline project guidelines strongly suggests making cultural impact assessments an integral, consistently applied and transparent part of community development planning [28].

The KO communities are presently in the formative stages of CEP, carving their energy development paths, and transforming energy plans into practice [2]. Their endeavors for energy security reflect self-determination and empowerment. Using community insights, we draw upon drivers and determinants for integrated CEP arguing for a conceptual, bottom-up framework. Our recommendations include integrating socio-cultural drivers as part of a sustainable and functional energy planning approach for the KO communities.

## BACKGROUND & CONTEXT

### **Keewatinook Okimakanak First Nation Communities**

We focused on the energy situation of the Keewatinook Okima-

kanak (Northern Chiefs Council in Oji-Cree language) First Nation communities in northwestern Ontario as representative of remote indigenous communities in northern Ontario. The six communities under the KO tribal council are Deer Lake, Fort Severn, Keewaywin, McDowell Lake, North Spirit Lake and Poplar Hill. These First Nations comprise a population ranging from 60 in McDowell Lake to almost 1,000 in Deer Lake located over an area of 300,000 square kilometers [2]. The geographic locations of the KO communities are shown in Figure 1.



Figure 1. Keewaytinook Okimakanak First Nations [2].

### Electrification in Remote First Nation Communities

The present dire electrification situation and the motivations for sustainable energy planning are next considered in the historical context of northern First Nations communities.

As stated in the Constitution Act, 1982, section 35, electrification in northern First Nations was long considered the responsibility of the federal government. Ontario's First Nation communities were electrified, mostly in the 1960s and 1970s, through "electrification agreements" between the Province of Ontario and the federal government [29]. The responsibility for providing electricity was shared, with capital costs for generation and distribution equipment provided by the federal

government with ongoing operation, maintenance, and equipment replacement provided by Ontario Hydro [30]. Some First Nations chose to independently operate and maintain their electricity systems [31]. Both federal and provincial governments have been involved in the electrification of First Nation communities, creating ambiguity and complexities for these communities. In 1992, Ontario Hydro changed its policy to allow for unrestricted service to First Nation households. While lifting a 20-amp limit increased energy consumption, the cost of generating electricity remained high. Before the deregulation of Ontario Hydro in 1998, the cost of diesel for remote communities was included in the cost of fuel for the whole corporation. After deregulation, and the creation of Hydro One Remote Communities, Inc. (HORCI), diesel fuel became the single largest cost in community budgets [31].

### **Meeting Current Energy Needs and Service Providers**

The two energy service providers for the KO communities are HORCI and independent power authorities (IPA). The HORCI communities from the KO tribal council are Fort Severn and Deer Lake [32]. The IPA communities are Keewaywin, Poplar Hill and North Spirit Lake. Energy planning outcomes vary between IPA and HORCI communities due to the distinct characteristics and operations of the energy providers.

HORCI, a subsidiary and not-for-profit company of Hydro One Network Inc., is owned by the Province of Ontario. HORCI operates and maintains the generation and distribution assets used to supply electricity across northwestern Ontario to communities not connected to the province's electricity grid [33]. HORCI's operations are unlike other generators or distributors in Ontario [34]. They require a subsidy so that electricity can be provided to its customers at a comparable cost to the rest of Ontario. This subsidy is provided by the Rural and Remote Rate Protection (RRRP) fund that is collected from consumers across the province. This subsidy is key to the success of the communities of Fort Severn and Deer Lake since it helps to maintain low electricity prices and ensures cost control and maintenance. Capital agreements with indigenous and Northern Affairs Canada (INAC) are HORCI system subsidies through which INAC recovers the costs of new electrical generation. The final subsidy for HORCI communities is through Standard A interest rates that are charged to accounts that are receiving funding or subsidies from INAC or some other government agency.



The IPAs are non-regulated power authorities. As unlicensed operators, they are not bound by the regulations applied to HORCI. IPAs serve the KO First Nations of Keewaywin, Poplar Hill and North Spirit Lake. Each IPA is unique and provides distinct benefits to its owners such as control, employment and community awareness [35]. As independent entities, IPAs are unable to access provincial subsidies to maintain power prices at artificially low levels as is done with HORCI communities. This key difference negatively affects the profitability and viability of IPAs leading to compromises on renovations and new infrastructure development. Since IPAs offer a higher potential for employment of local community members, they can be a source of community pride. Arrearages on residential utility accounts are lower in IPA communities, suggesting that a community approach to accommodation of payments results in stronger community support for the IPA than for a HORCI utility [35].

The single largest cost for both IPAs and HORCI communities is diesel fuel, due to the high cost of airfreight and the decreasing winter road seasons caused by climate change. In HORCI communities, all power is generated, distributed and sold by HORCI. In the IPA communities, the situation is the same in that the IPA is the sole supplier, distributor and retailer of electricity. This monopoly situation is not entirely without benefit as HORCI operates as a break-even business and does not seek to profit from services provided to remote First Nations [35].

The nature, structure and functionality of IPAs and HORCI as energy service providers affect energy planning in the KO communities. Cost recovery is more difficult for IPAs without RRRP subsidies. Community programs subsidize customer utilities with many IPAs charging a flat rate or an affordable amount. IPAs maintain lower safety standards for domestic hookups and diesel plants. First Nations have limited funding for technicians under IPAs. Finally, IPAs depend on INAC to cover operational losses after auditing has been completed.

For both HORCI and IPA-served First Nations, INAC funding is required to construct, expand and maintain infrastructure. INAC does not fund short-term upgrades. First Nations are responsible for purchasing, shipping and storing fuel for the generators. Liability for injuries, fuel spills, and contaminated sites remains with both the First Nations and HORCI, depending on who owns the fuel tanks. Both HORCI and IPAs purchase fuel from First Nations. In the case of HORCI, the

diesel generation systems are built and maintained to higher standards. Many HORCI First Nation communities face restrictions on their energy use and customers pay based on their energy consumption. The RRRP offers some incentives for conservation. Additionally, there are HORCI conservation programs that are underutilized [35].

## METHODOLOGIES

A multitude of qualitative approaches were used to understand and analyze the energy challenges of KO First Nations. Participatory research methods were used in planning and conducting the research with the authors and participants equally generating knowledge. Interviewees' perspectives were essential for the processes of discovery, accumulating knowledge and fostering empowerment for energy planning. There was mutual curiosity between the participants and the authors to understand motivational factors, drivers, energy planning processes and application challenges. During this exploratory process, our role evolved from "outsider" to "mobilizer, "information provider," "ally" and "writer." The evolution of roles was predominantly based on relationship building, honesty and trust.

Our guiding research protocols and standards included the principles of ownership, control, access and possession [36]. This included briefing sessions with KORI concerning protocols for community visits, drawing from research guidelines and practices with the KO-affiliated communities [37]. The field research was undertaken following tri-council policy requirements and approval from the university's research ethics board. Exploratory interviews were dependent on the type of research questions, language barriers, accessibility and readiness of the informants. The questions, drafted in consultation with KORI's research director, were adjusted for target groups. Informants included elders, tribal council members, community members, resource project coordinators, utility officers, industry representatives, and event participants with previous involvement in First Nations energy planning. The interviews were adapted to each informant's interest, response and willingness to explore topics.

Points of contact with key informants were through the NOFNEC events and community visits to Poplar Hill First Nation. The total number interviewed were 57—25 at the events and 32 during the visits. The

digitally recorded interviews were conducted in a respectful and culturally appropriate manner using open-ended questions. This minimized biased opinions [38]. Most of the individual interviews were planned experiences. Three sessions were informal gatherings—over bead making, cooking meals for elders and during casual walks.

The questions were grouped under themes related to sustainability—environmental, social and economic—and were designed to explore socio-cultural factors as drivers for energy planning, both at an individual and community levels. The author emphatically mentions “individual” to scope heterogeneous perspectives [16]. Discussions also revolved around technologies, access to alternative sources of energy, climate change, energy literacy, and awareness due to their relevance to energy planning.

Questions regarding environmental issues sought indigenous perspectives on how to best align energy planning within the worldview of sustainability, insights on ecological values, beliefs that resonate with clean energy, and reflections on renewable energy sources in relation to environmental stewardship. The socio-cultural dimensions of CEPs were explored using questions about:

- Personal and community choices concerning fuel options.
- How development in relation to well-being is defined and perceived by indigenous communities.
- Perspectives on pro-development or pro-conservation discourse.
- Community implications of transition from diesel to clean fuels, energy generation and consumption.
- Identifying links between energy security and traditional ways of life.
- Role of traditional ecological knowledge in the energy discourse, raising energy literacy, and designing outreach programs.
- Understanding tools such as community land use plans, economic development plans and infrastructure plans in CEP.

Questions probed indigenous views on direct and indirect economic impacts of energy planning for community well-being, new economic opportunities, electricity access as a transformative driving force creating opportunities for women and youth, transitioning from

western paradigms of economic development and planning for community-oriented electrification plans. Finally, informants were asked to identify the motivations of CEP as a stimulant to traditional economies, development and well-being.

The data from interview transcripts, key informant perspectives, author's field observations, academic papers, reports, websites and e-mail correspondence were collated and qualitatively analyzed. Manual coding was followed using environmental, economic, and social thematic filters that were adopted from INAC and the ecoENERGY Program [39]. Coding was performed both during and after the data collection. Coding was based on judgement, field perspectives and our understanding of interviewees' meanings.

## RESULTS AND DISCUSSION

In-field community engagement and open dialogues at events helped identify the drivers and determinants—socio-cultural, environment, socio-economic, technology, governance, institutional mechanisms—for integrating culturally-appropriate energy planning for the KO communities. These are discussed below.

### **Drivers and Determinants for an Integrated CEP**

*Socio-cultural:* The people's histories, literature, language, religions, traditions, ceremonies, ancient beliefs, and present day lifestyles are integrated within KO communities. Interpretation of the intimate relationships between the people and their lands helped us discern perspectives on energy planning, energy options, ability to control energy consumption and lifestyle choices.

Anishiniini Gayenaabuhstooauch Akheeni (indigenous or First Nation use of the land) includes activities that are recognized as aboriginal and treaty rights under Canada's Constitution. Besides hunting, fishing, trapping, rights-based activities include travel on waterways, occupation and maintenance of portages, access to trails and campsites, planting and harvesting, gathering traditional foods, cutting wood for community use, building shelters, recreational access, and visitation and maintenance of cultural sites. Rights-based features include rock paintings, burial sites, historical campsites, settlement locations, quest sites and ancient villages.

Preservation and protection of history and cultural legacies have deep connections to community well-being over time. From an indigenous people's perspective, no compromise is to be made with any heritage and archeological resources [40]. Careful planning and management of indigenous cultural values, and promoting healthy lands are of high priorities. Thus, integrating land and resource use in energy development is essential whether it is planning new transmission, considering alternative energy sources, deploying technologies or undertaking conservation efforts.

Aboriginal languages are a powerful means of understanding indigenous ways of life. There is community significance and importance in local indigenous languages. Using local language to translate technical energy terminologies enhances energy literacy and community-based knowledge. Collectively, traditional knowledge, historical facts and communication through local language contribute to identifying community-wide energy planning assets. Engaging with the elders and members of the KO communities increases local capacities to conduct energy surveys and create baselines for sustainability assessments.

Marginalization has left devastating and ongoing multi-generational impacts on the health and welfare of individuals, families, and communities that challenge community development efforts. The trauma reverberates through physical, psychological and economic disparities that persist across generations leading to weakened social structures. Exposure to trauma is manifest in discontent, anxiety, depressions, grief, and addictions within the community. Efforts to engage with the community, especially the youth, in accepting stewardship roles in energy planning poses challenges due to ongoing personal struggles. This was made evident during discussions with key informants. Understanding and sensitivity to the community's historical contexts are social determinants for effective energy planning.

*Environment:* Waterways are regarded by KO communities as important travel routes and sources of subsistence upon which hunting, fishing, trapping and other activities are based. The waters support high quality fish habitats and spawning areas. The lakes and rivers have connected people for trading, marriage and historic events since the earliest times. Waterways (e.g., rapids, rivers, falls and lakes) would be given offerings to demonstrate respect and safe passage. Protecting culturally significant ecological systems—waterways, aquatic habitat, fisheries, wetlands, wildlife and forests—is important as KO people believe them

to be interconnected lifeforms. Understanding this philosophy is crucial for efficient energy planning. The needs for community energy access, infrastructure, transmission corridors, and renewable energy can be realized while respecting aboriginal rights and minimizing ecosystem disturbances. This maintains a balanced perspective on development processes.

*Socio-economic:* Any economic development activity in a community, be it renewable energy, tourism, mineral development, commercial forest harvesting, fishing or trapping is directly or indirectly dependent on energy supplies. Energy planning must consider developmental activities, community demographics, gender distribution, social cohesion, energy consumption trends and employment opportunities. Efficient energy planning supports existing and potential economic and resource development initiatives such as community housing and infrastructure needs. CEPs incorporating community land use plans and economic development plans are more inclusive than producing energy plans in isolation.

*Technology:* A key determinant in energy planning is that the technologies to be adopted should dovetail with KO communities' plans for renewable energy. Feasibility studies and benefit and cost assessments are required to determine the potentials. New technological development needs to be aligned with conservation and natural resource protection efforts. How indigenous people relate to tangible and intangible attributes of nature can help promote the adoptability of technologies such as run-of-the-river hydropower and solar power. Biomass is presently a less viable option due to a narrow view that biomass might require felling trees which is counter to indigenous values.

The lack of energy experts in the community to perform post-installation maintenance and sustainable operations is challenging. There is evidence of projects being stalled or dependent on consultants. Energy planning requires addressing the technological service gaps when considering energy options.

*Governance and institutional mechanisms:* Progressive leadership enhanced by inclusive, transparent, and robust community engagement is a pivotal determinant in energy planning. KO communities strive to provide opportunities for their members to have multiple roles and benefit from their ideas, talents, skills and resources. These roles include advisors, advocates, problem definers, solution identifiers, evaluators, documenters and surveyors. KO communities rec-

ognize the need to identify and mentor local “go-to” energy coordinators while supporting local individuals to participate. Engaging and training youth for such roles is beneficial at many levels. Institutional mechanisms to transition between energy services (i.e., from IPA to HORCI operations) by appointing local talent promotes effective planning. The active participation of women choosing multiple and influential roles is progressive.

KORI provides a supportive and intermediary role by understanding the community contexts and external stakeholders. They drive community actions and promote community change by mobilizing, addressing opposition and resistance, maintaining efforts, influencing systems, achieving community-level improvements and providing tools for CEP. They encourage building local capacities to conduct surveys and collate baseline data for energy planning. This is a key consideration for sustainable outcomes necessary to wean communities from depending on external consultants. A team comprised of the chief, tribal council members, community advisory members, federal and provincial ministries, external stakeholders, and technical experts can form advisory groups to achieve desired results and promote accountability. Elders have an important role in the decision-making process and are very influential in KO communities. Shared challenges including generational gaps and heterogeneity in decision making are affected by work cultures, dynamics and transitional acceptance. The communities are in continuous “election mode,” due to Indian Act mandates for elections every two years, creating institutional challenges. This results in a rapid turnover of chiefs and council members, impacting motivation, time and resource commitments to energy planning.

### **Elements of an Integrated CEP Framework**

CEP is in its formative stages in KO communities. An integrated approach engages community participants, partners with external stakeholders, incorporates cultural values and manages external stressors. Each of these elements is addressed below.

*Community participants:* Socio-cultural knowledge is best learned through community engagement which is pivotal to functional energy planning. Participants include elders and spiritual leaders. Their guidance offers valuable insights, wisdom and life lessons on conservation and sustainability. Engaging a community’s tribal chiefs and council members, community members, women, youth councils, teachers,

education boards, and utility representatives aids in defining the objectives of energy planning and assessment tools. CEP must aim to open communication channels and provide information concerning energy development initiatives. This facilitates the objective of empowering community members to contribute to informed energy planning.

*Partnering with external stakeholders:* Understanding the roles and responsibilities of companies, agencies, and regulators in Ontario's electricity sector is intimidating. Federal and provincial regulators include the Ministry of Energy and the Ontario Energy Board (OEB). Indigenous and Northern Affairs Canada (IESO) is the organization tasked with system operation, planning and procurement. HORCI is the agency for local distribution and generation. INAC, a funding agency, along with the chiefs and the tribal councils have important roles in energy planning in KO communities. Partnerships should be founded on the principles of protecting the lands, waters, and ways of life of indigenous peoples and ensuring benefits for future generations. Access to grants, funding, conservation incentives, energy efficiency programs, and renewables requires cultural sensitivity and inclusiveness. Awareness and education will help with application and practice, plus generate mutual understanding, respect, and trust among these stakeholders and their communities.

*Using tools and resources:* Traditional ecological knowledge must be considered for environmental assessments and for developing criteria for sustainability. They are powerful tools for managing environmental risks [41]. Traditional knowledge, when well documented, interpreted and applied, benefits and complements western worldviews. Incorporating both western science and traditional knowledge into studies, maps, planning, and assessment tools facilitates knowledge that is technically sound and connected to local values, needs and priorities. KO community resources such as economic, housing infrastructure development plans, and traditional land use studies provide information to inform the goals and objectives of energy planning. They also provide baseline data for financial and logistic assessments to establish sustainability criteria.

*Managing external stressors:* Energy regulatory and partnership development complexities, consensus building challenges, corporate interests, community needs, budget uncertainties, and scheduling variability are external stressors that are linked to energy planning. Stressors can be diminished with better understanding of local contexts and



socio-cultural factors. Approaching the KO communities with respect and listening to their concerns has positive impacts and facilitates acceptance.

Based on an understanding obtained from community interviews and the literature review, a conceptual framework is suggested for the KO communities (see Figure 2). A reductionist approach is used to design the conceptual framework that was predominantly driven by researcher’s empirical observations and informants’ insights. The detailed descriptions in the results demonstrate the elements of the

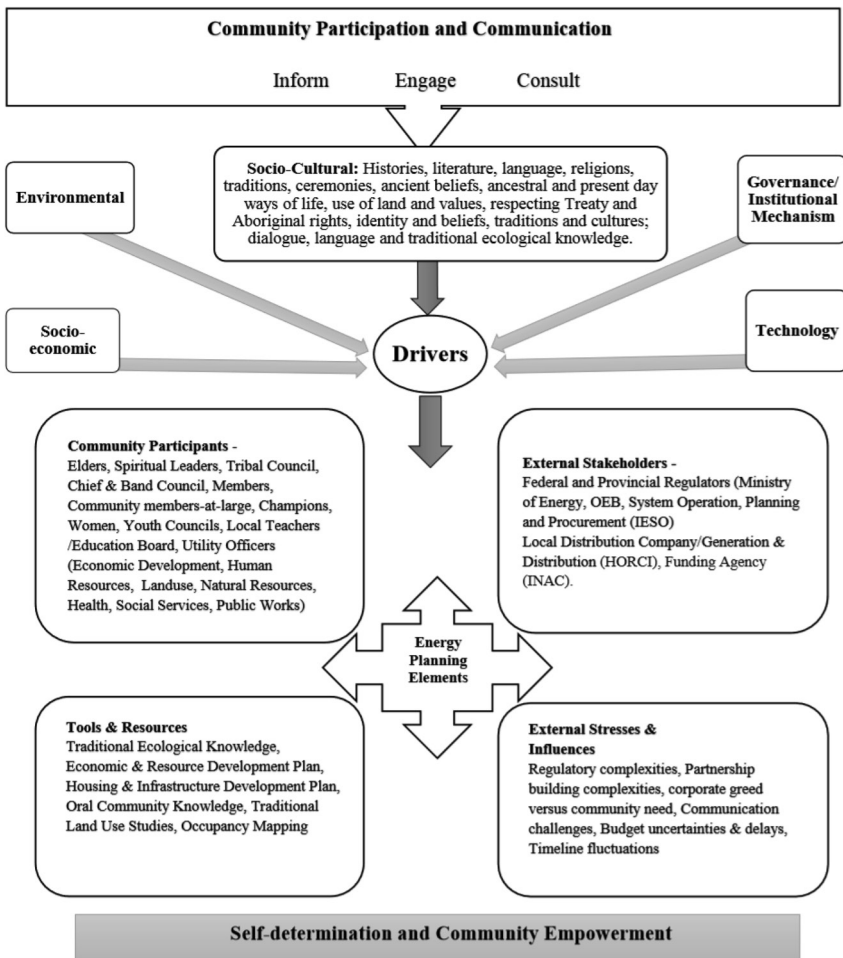


Figure 2. Community energy planning framework.

framework and their interconnectedness. They reflect the voices of the community with a functional, bottom-up approach to energy planning. Figure 2 offers a structure to explain the observations, provides context, and suggests direction for culturally-appropriate energy planning in KO communities. It is independent of previous models and provides fresh perspectives that include social-cultural factors.

## RECOMMENDATION: LONG-TERM ENERGY PLANNING

The remote off-grid energy crisis of KO communities presents unique challenges and opportunities. Energy systems have tremendous impact on communities, affecting their traditional ways of life and activities. Planners need to be sensitive and aware that the adoptability and acceptance of energy plans lies with the communities as its beneficiaries. Based on interview responses, researcher's observations, and the conceptual framework, the following recommendations are proposed:

- Energy surveys, baselines, and assessments should be undertaken by the KO communities to ensure integration of their needs, priorities and ways of life. This results in enhanced implementation and community-based energy solutions incorporating traditional interpretations of energy systems. The approach also facilitates building local capabilities.
- The energy agenda can be made more relevant when long-term institutional mechanisms are established at the community level. For example, Watay Power has provided funding support for a KO community to establish an "energy coordinator" position for two years to coordinate sustainable energy efforts and assist in building local capacities.
- CEP must emphasize engagement of youth and women. Modern economies are changing lifestyles, especially for youth, children and women. KO communities, while striving to provide a promising future for their youth with career pathways, are also keen for them to remain in their communities. Youth perspectives on adopting new, modern lifestyle choices rooted in traditional values play a role in retaining young people in their communities. Women in the communities are beneficiaries of energy technologies and are

positioned to lead educational, awareness and outreach efforts. They can also become energy entrepreneurs, producing or selling improved equipment, marketing renewable energy products, or providing after-sales services. Female entrepreneurs can lower customer acquisition and servicing costs and lead efforts to support decentralized, small-scale power generation projects.

- Energy plans should be prepared with KO communities as primary beneficiaries. This will result in more equitable access and narrow existing energy distribution imbalances.
- There is an urgent need to integrate energy planning in the broader framework of development planning because energy is essential for sustainable resource development.
- Diversifying energy supplies by deploying renewable energy is linked to achieving sustainable energy solutions. For example, energy production can be augmented by exploring the use of biomass as a renewable resource. More research is needed to assess local forestry and other resources for biomass applications in KO communities.

## CONCLUSIONS

The overarching purpose of this article was to bridge the knowledge gap about socio-cultural requirements for energy planning and to advance academic literature on indigenous perspectives on energy planning. The voices of First Nations peoples provide us with new perspectives toward implementing energy planning, not simply focusing on energy supply options but also efficient energy use. The emergent, custom-designed, community-driven energy development approach provides a more effective planning methodology. It creates self-determined and empowered indigenous KO communities.

Our research determined that electrification is a First Nations right by treaty and is necessary to improve the lives of indigenous people living in remote, economically disadvantaged communities. The off-grid, remote northwestern Ontario KO communities have expressed interest in addressing energy insecurity by enabling and supporting energy development through functional and relevant energy plans based on their singular history, values, culture, spirituality, language and knowl-

edge. Each KO community is unique in its composition, size, energy consumption and needs. Custom, rather than generic, energy planning approaches are needed to meet every community's requirements.

Energy planning processes that enable KO communities to participate fully in their social and economic advancement, manage their lands and resources, and maintain their sacred connections to mother earth, lead to sustainable energy solutions. While indigenous cultures have always highlighted the importance of protecting nature, the rest of the world is now grappling with climate change by proposing cleaner, greener energy systems to reach the same goal.

Their present-day energy crisis, challenges due to historical contexts, diesel-dependency, lack of local capacities, tools, resources, top-down energy planning guidelines, and minimal community engagement require urgent action by the KO communities to ensure their future energy security.

Drivers and determinants—socio-cultural, environment, socio-economic, technology, governance and institutional mechanisms—derived by active and informal consultations and engagement with the community play are vital for developing culturally-appropriate energy planning. Integrating them is beneficial in building robust community-centric energy plans and to enhance local capacities, capabilities and confidence. The efforts are undoubtedly a self-determined approach in finding sustainable energy solutions. This article emphasizes that energy development for the First Nations communities is linked to community sovereignty.

The proposed conceptual energy planning framework is drawn from participatory action and indigenous research methods. It embodies community voices, aspirations, needs and desires. Development plans including energy solutions must be derived through local participation that can eventually guide energy conservation and renewable energy development. When done properly, community well-being is enhanced by innovation, technology, local traditions and culture. This is accomplished by considering the unique needs and socio-cultural frameworks of each community.

Further, as the provincial government is strengthening and transforming its electricity and fuels systems, indigenous communities are emerging as partners in the broader energy planning context. They bring singular perspectives, knowledge and leadership to energy projects and systems development. Their involvement supports improved

data gathering, outcome and services. This is crucial for advancing responsive energy development for the diverse First Nation communities.

This article examined community insights on local energy plan development for the KO communities. It identified drivers and determinants for conceptual, bottom-up energy planning frameworks and suggests recommendations to integrate socio-cultural factors within sustainable and functional energy planning approaches. It provided justification that this process ensures multiple benefits for the communities, including acceptance and readiness for CEP implementation.

Potential future research opportunities include developing more culturally appropriate tools and platforms to support indigenous communities in their engagement and leadership efforts. Research is needed to explore consistent and systemic energy policy approaches to complex socio-cultural economic and socio-technical systems within local indigenous contexts.

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