ENERGY ACCESS – THE CANADIAN CONTEXT

Planning for plenty – a strategic national priority

We must acknowledge the role of energy as the backbone of a better quality of life for remote communities facing a variety of disadvantages. We can no longer ignore our responsibility to provide the supportive resources these communities need to not only meet their current minimum energy needs but to **plan for plenty**.

Four steps are required to establish this as an area of national priority:

1. Commit to a step change in investment
   Canada's federal government should increase its overall funding commitments for energy in remote communities from the tens of millions to the billions in the immediate future. This funding should be seen as a priority area for ongoing green infrastructure spending programs.
2. Recognize Indigenous leadership and support capacity building
   In order to ensure long-term economic and social benefits, Indigenous clean energy leadership must be recognized and supported through capacity building programs.
3. Create a single, intergovernmental point of contact
   A single point of contact within government – whose responsibility is to ensure those initiating and managing energy projects can navigate regulations, funding and reporting at the federal and provincial/territorial level and across relevant departments – is essential.
4. Connect people, technologies and information
   Knowledge sharing between communities and innovative institutions is critical to success. Private and public sectors should be encouraged to utilize up-to-date information and innovative technologies to seek new arrangements for energy projects in remote communities that are financially sustainable over the long term.

Excerpted from Waterloo Global Science Initiative's OpenAccess Energy Blueprint (March 2017)

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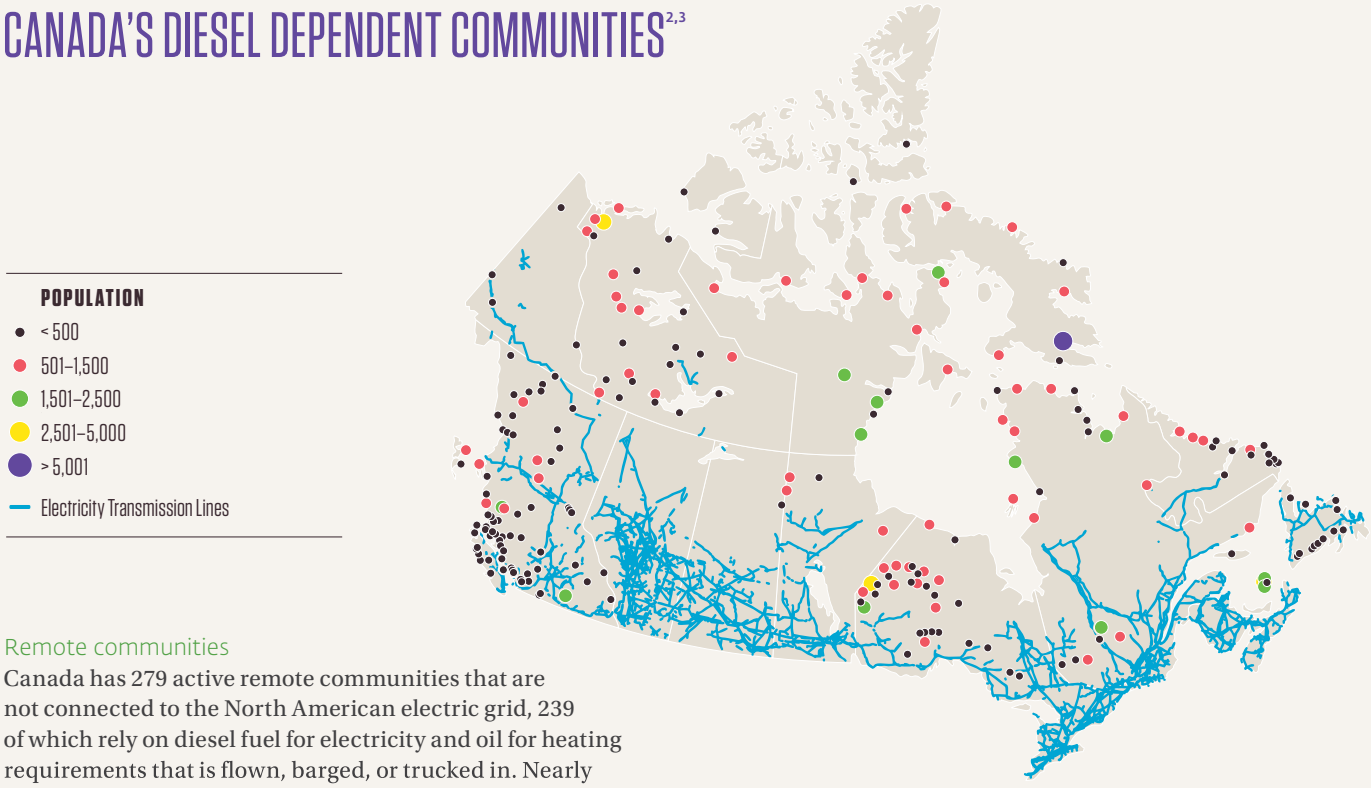
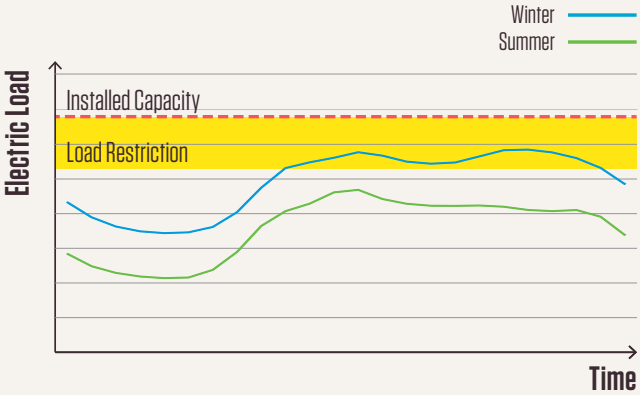
CANADA'S DIESEL DEPENDENT COMMUNITIES[2,3]



Remote communities

Canada has 279 active remote communities that are not connected to the North American electric grid, 239 of which rely on diesel fuel for electricity and oil for heating requirements that is flown, barged, or trucked in. Nearly two thirds of these remote communities are Indigenous.[1]

OUTAGES, LOAD RESTRICTION AND AGING EQUIPMENT[5]



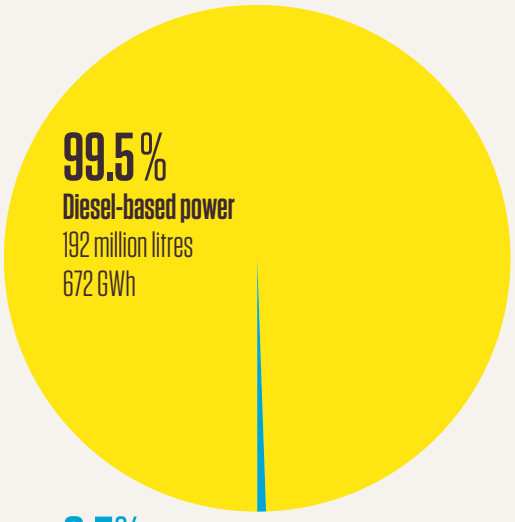
Inadequate energy services

Nunavut, Ontario, and British Columbia are regions where an estimated 25 to 50 percent of communities have a load restriction status, meaning that peak electricity demand is near the maximum operating capacity of the diesel-generator plant.[4] Load restriction status has a number of negatively compounding consequences, including a strangling effect on a community's economic development due to an inability to connect new houses, buildings or water treatment plant upgrades to the electrical system. This chokes economic and community development opportunities and has significant impact on quality of life.

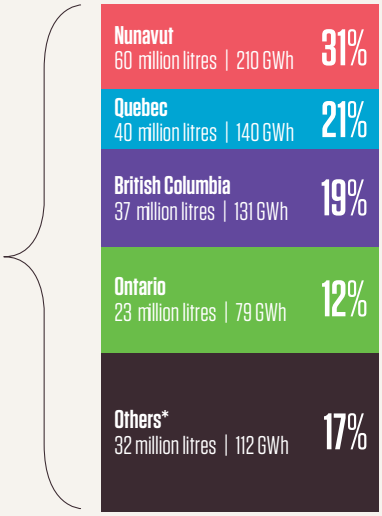
ELECTRIC ENERGY SOURCE AND DIESEL CONSUMPTION ESTIMATE IN FUEL DEPENDENT COMMUNITIES[6, 7, 8, 9, 10, 11, 12, 13]

Fossil fuel dependency

Diesel fuel is used to generate 99.5 percent of all electricity in remote communities. Aging diesel storage facilities cause frequent spills which are enormously expensive to clean up. It is not always clear who is responsible for initiating and paying for remediation. According to Indigenous and Northern Affairs Canada (INAC), there are over 2,000 contaminated sites on First Nations reserves across Canada, 70% of those sites are contaminated with diesel.[1]



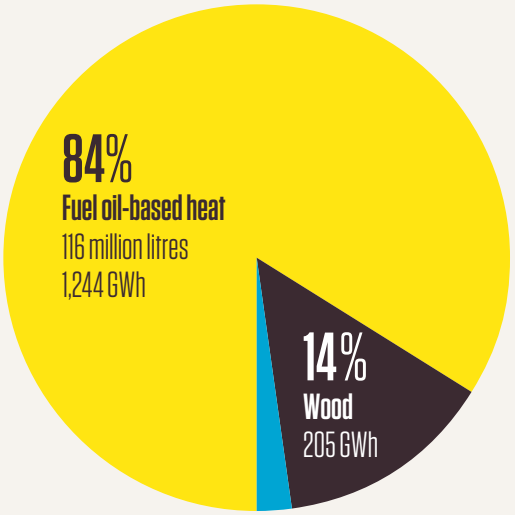
0.5%
Small-hydro and other renewable energy power
3.2 GWh



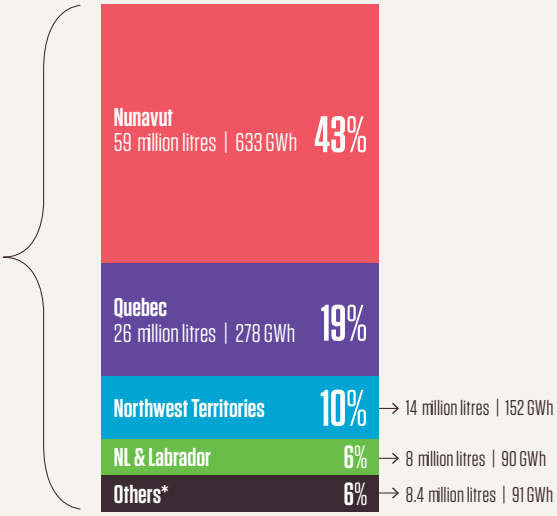
* Manitoba (4.0 million litres, 14 GWh, 2.1%)
Northwest Territories (12.8 million litres, 44 GWh, 6.7%)
Newfoundland and Labrador (13.3 million litres, 46.5 GWh, 6.9%)
Saskatchewan (0.05 million litres, 0.2 GWh, 0.03%)
Yukon (1.7 million litres, 5.9 GWh, 0.9%)

HEATING ENERGY SOURCE AND DIESEL CONSUMPTION ESTIMATE IN FUEL DEPENDENT COMMUNITIES[3, 18, 19, 20, 21, 22]

For heating, wood and fuel-oil are the most common sources of energy. In forested areas, wood is the preferred source for residential use due to its perceived lower cost.[14, 15] However, there are regions that fully depend on fuel-oil since no other resource is available. In energy terms, fuel-oil accounts for approximately 84 percent of the total energy use for heating across remote communities.[16,17]



2%
Others
27 GWh



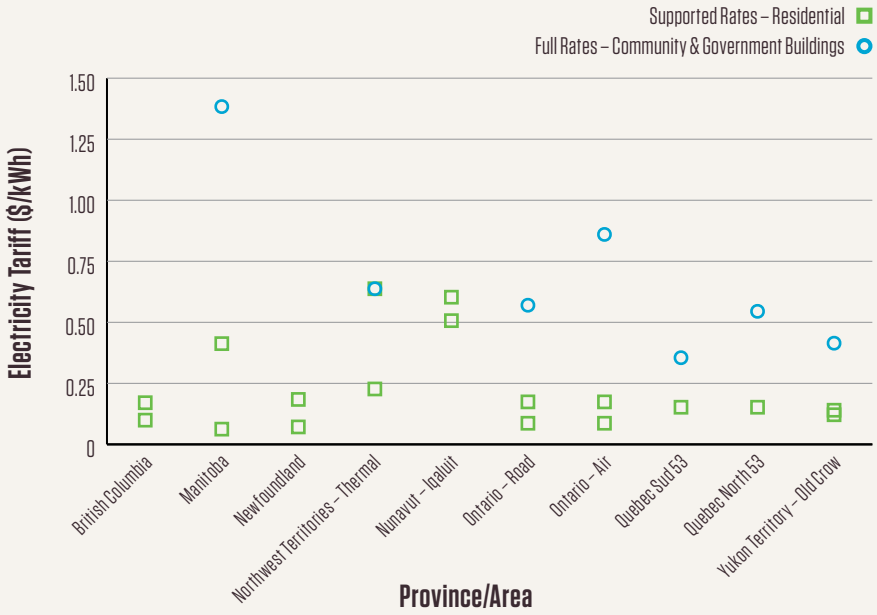
* British Columbia (3.4 million litres, 37 GWh, 3.0%)
Manitoba (0.5 million litres, 5.4 GWh, 0.4%)
Ontario (3.9 million litres, 41.5 GWh, 3.3%)
Saskatchewan (0.09 million litres, 0.9 GWh, 0.1%)
Yukon (0.6 million litres, 6.2 GWh, 0.5%)
** Norman Wells (NT) not considered.

ONGOING ISSUES: HIGH COST OF ELECTRICITY IN REMOTE COMMUNITIES[23, 24, 25, 26, 27, 28, 29, 30, 31]

High cost of energy

Although the cost of energy in remote communities is partially covered by the budgets of federal and provincial governments, economic difficulties mean electricity and heating remains a significant expense. The cost of diesel is much higher than simply the fuel – transportation, storage, and ultimately generation and storage site clean-up and remediation must also be accounted for.

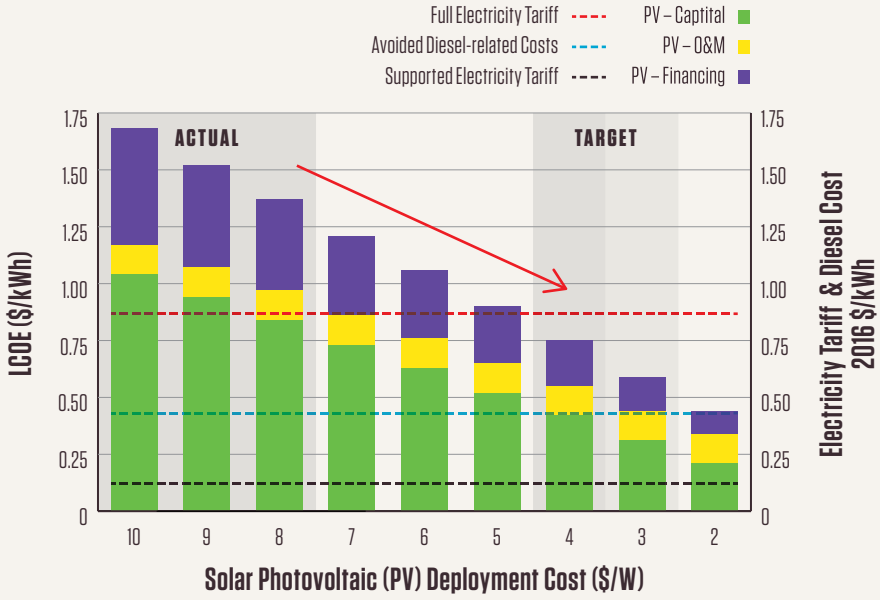
Many communities only have ground transportation access via winter ice roads and warming trends in recent years have seen some communities' road access diminish to the point where they have to fly in their fuel. Air transportation can double the cost of electricity.[3]



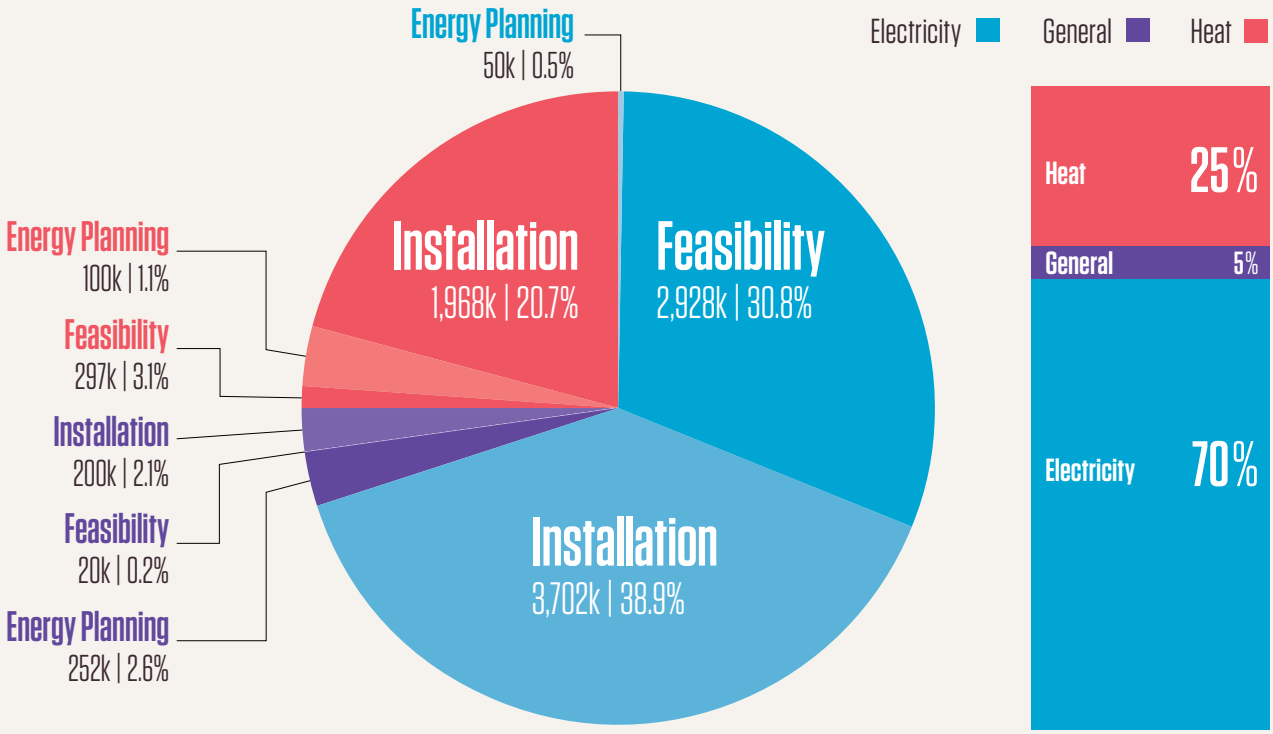
HIGH COST OF RENEWABLE ENERGY DEPLOYMENTS IN REMOTE COMMUNITIES[34, 35]

Installation costs of renewable energy technologies in remote communities are significant. Nonetheless, the savings in carbon emissions and the rising cost of diesel transportation means that, over the long term, projects should be considered worth the investment.[32]

Solar photovoltaics (PV) have been successfully deployed in remote locations across Canada. If 20 MW of solar capacity was installed across Canada's remote communities it could displace 5.8 million litres of diesel fuel annually, an estimated savings of CA$29 million on fuel costs.[33] To make this displacement a reality – assuming solar deployments reach a reasonable target of CA$4 per watt – it would require an estimated investment of CA$81 million.



INAC'S ecoENERGY PROGRAM ALLOCATED FUNDING FOR ENERGY STUDIES AND PROJECTS IN DIESEL-DEPENDENT COMMUNITIES[3, 39]



Funding

To date, federal program funding for energy services in remote communities has been inadequate. Compare Alaska's Renewable Energy Fund – which has been allocating US$50M annually since 2008[36] for renewable energy projects that reduce diesel dependency – to INAC's ecoENERGY for Aboriginal and Northern Communities Program which allocated CA$9.5 million to diesel-dependent communities for energy related projects over the 10 year course of the program.[37]

ecoENERGY is one of the few programs where enough public information exists to specifically determine funding targeted to diesel-dependent remote communities. There are several other federal, provincial, and territorial sources of funding that support energy projects and some of the funding recipients have been diesel-dependent communities.[38] Nevertheless, with the public information available, it is impossible to quantify and/or classify the amount of funding allocated specifically to diesel-dependent remote communities. So, while not a perfect comparison, we believe it provides a clear example of the type of dedicated, flagship program and increased level of financial commitment required to plan for plenty.

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Energy access – the Canadian context

The trouble with diesel

For the people of Inukjuak, Quebec, a community of about 1,800, to have energy access, each year a single oil tanker makes a slow, plodding voyage across the Gulf of Saint Lawrence and north into the Labrador Sea. It rounds the horn of Quebec's Ungava Peninsula, which has a land area larger than Western Europe, tracing the southern coastline of Baffin Island before descending into Hudson Bay toward the 14 coastal communities of Nunavik. This annual 'sea-lift' of diesel is limited to a narrow, increasingly unpredictable ice-free shipping season that begins around late June and ends before Hudson Bay freezes solid – historically by late fall.

"It's something we take for granted – that nothing is going to happen to those tankers coming to Inukjuak to supply the fuel that everyone needs," says Pituvik's general manager Mike Carroll. "But if those tankers don't come, this town's in big trouble."

Arctic remoteness can be a blessing and a curse. While distance acts as a buffer protecting culture (virtually everyone here speaks Inuktitut), it also makes everything from the outside prohibitively expensive. A return flight to Inukjuak from Montreal costs about CA$2,700; a small package of bologna in the town's co-op store costs nearly CA$10, after taxes. If you live up here, at least half of your food must come from the land. That food must then be preserved in a freezer powered by the diesel generators – that hum and spew particulates – on the town's northwest corner, situated adjacent to a tank farm storing millions of litres of fossil fuel.

Dependence on diesel comes at a great cost, both financial and otherwise. In July 2015, human error during tank filling caused 13,000 litres of diesel to soak into the ground adjacent to the tank farm. Every particle of contaminated soil and rock had to be scooped up, loaded onto a tanker and shipped south for disposal. By October 2016, the final phase of a diesel spill cleanup was just wrapping up. Two other communities in the region have had to deal with similarly severe spills in recent years. "The risk [of spills] from diesel plants is always going to be there," says Eric Atagotaaluk, the president of Pituvik Landholding Corporation (PLC). "It's giving us a good reason to be more positive about renewable energy."

Stuck on the slow track

Finding a better way to generate energy is not a new idea in Inukjuak. A hydro project was introduced back in the early 1990s by the local municipality, but was rejected by residents. A decade later, Hydro-Quebec explored building a pilot wind project near town, but when that idea fizzled, PLC turned their attention to the Inukjuak River. Hydro was back on the table. Four sites on the river were identified as promising for a small 'run-of-river' hydro plant, considered greener than Quebec's system of large-scale hydro projects because it requires a much smaller reservoir, pipes water through turbines and then returns it downstream. Atagotaaluk says the waterfall Pituvik visited in October was by far the best of four scouted on the river: just 10 kilometres from town, it has the best gravitational drop and will impact fish less than other sites.

But progress on the project has been slow. It's been in the works since at least 2006, stalled after 2010 by an impasse with Hydro-Quebec while negotiating a power purchase agreement (which sets the price the utility will pay for PLC's hydro).

Among the biggest challenges of developing this hydro project is the astronomical cost of construction. It is among the biggest infrastructure projects ever planned in Nunavik, requiring the greatest single mobilization of resources, both human and material. A proposed 2.2-megawatt small hydro project on the remote northern coast of British Columbia was widely considered prohibitively expensive costing just over CA$25 million; Inukjuak's 7.5-megawatt hydro plant is projected to cost almost CA$100 million in all.

Barriers to overcome

Addressing this cost has necessitated sharing the project risk by taking on a Montreal-based private sector partner, Innergex Renewable Energy. Innergex is an established clean energy developer with experience navigating the complex web of federal and provincial agencies and outside funders. By 2012, PLC had secured federal funding for 25 percent of the project cost, contingent on matching funds from the province of Quebec. Atagotaaluk says this arrangement is no longer in place, but discussions continue with both Quebec and the federal government to secure funding. The next pivotal step for the project, he says, is to negotiate a power purchase agreement that will finalize the price Hydro-Quebec will pay PLC to generate the hydro power. The power will then be sold to Hydro-Quebec and delivered back to Inukjuak residents by the utility.

"That will be the determining factor if it's a go-ahead or not," says Atagotaaluk of the purchase agreement, which is currently being renegotiated.

In past negotiations, Hydro-Quebec has offered to pay just half (about 42 cents per kilowatt hour) of what it costs on average to generate Inukjuak's electricity, space heating and water heating with diesel. This price gap illustrates one of the biggest challenges for Canada's estimated 200 plus diesel-dependent remote communities, most of them Indigenous. Christopher

Photo credit: Christopher Pollon

Henderson, a project advisor to PLC and author of *Aboriginal Power: Clean Energy & the Future of Canada's First Peoples*, says utilities will often lowball the amount they will pay a developer like PLC to produce clean energy. They'll only pay what it currently costs to supply diesel.

"Why 42 cents? Because it's the cost of diesel fuel alone. They don't price in the costs for capital systems, [diesel site] management, things like that, so you end up with this really weird situation where the true value of alternatives is not being credited in the contracting context," Henderson says. "As a result, many of these projects cannot proceed because they don't have the revenue basis to proceed."

"You end up with this really weird situation where the true value of alternatives is not being credited."

The price gap combined with a general lack of capacity in many Indigenous communities to navigate complex capital projects, says Henderson, are the two main barriers to clean energy across the North. "It's why we have not yet made as big a dent in remote sustainable energy as we might."

The downside of clean energy leadership

Call it the downside to being a clean energy leader: not only will building the project potentially open the floodgates for clean energy across the diesel-dependent region, but the price for Inukjuak's hydro will set a precedent that the communities coming after will expect, at minimum, to receive.

Progress is similarly slow across the 25 diesel-dependent communities of neighbouring Nunavut, home to about 28,000 Inuit. Sheldon Nimchuk, who oversees clean energy projects for a subsidiary of the Nunavut-based Qikiqtaaluk Corporation, says the only other Arctic clean energy project approaching the size of Innavik is a hydro project designed to power Iqaluit, Nunavut's capital. He says this project was suspended about two years ago, largely because there were so many urgent competing priorities. "Do you build water treatment facilities and sewage lagoons, or do you invest in hydro?"

Nimchuk remains upbeat about clean energy prospects for the Arctic. Wind and solar technologies are plummeting in cost. In October 2016, Prime Minister Justin Trudeau announced that Canadian provinces and territories must impose a price on carbon, starting at CA$10 per tonne in 2018 and rising to CA$50 per tonne by 2022.

On February 10, 2017, CBC reported that the government is planning to commit CA$50 million dollars in their 2017 budget to help get remote communities off of diesel. This funding comes on the tail of Trudeau's signing of the Pan-Canadian Framework on Clean Growth and Climate Change in December 2016, a pact with eight provinces and three territories promising to ramp up clean energy and cut greenhouse gas emissions. No funds have been committed to this latter initiative yet, but even if more money is allocated it seems unlikely to be enough to have a significant impact.

The cost of the small hydro project in Inukjuak's is projected to cost almost CA$100 million, double what the federal government is promising to help remote communities. In Canada there are over 200 communities that depend on diesel. Nimchuk says many of the diesel generation stations across Northern Canada – in Nunavut, Yukon, the Northwest Territories and Nunavik – are now decades old, necessitating hundreds of millions of dollars in investment to keep the same plants humming. Nunavut alone has requested CA$250 million from Ottawa to replace and upgrade its diesel plants and infrastructure. The national project of ending northern diesel dependence remains underfunded and stuck on a slow track.

So what can be done? Perhaps the greatest immediate opportunity for change involves end-of-life diesel plants says Nimchuk. "Would it make sense for the government of Canada to provide hundreds of millions of dollars to upgrade [diesel] facilities, or is the time right to move that money to clean energy projects as a contribution from Canada toward addressing climate change in the Arctic?"

"Would it make sense for the government of Canada to provide hundreds of millions of dollars to upgrade [diesel] facilities, or is the time right to move that money to clean energy projects?"

Excerpt from What will it take to get Canada's Arctic off diesel? *Reported by Christopher Pollon for Discourse Media's Power Struggle project.*[40]

40. Pollon, C. (2017). What will it take to get Canada's Arctic off diesel? Discourse Media Power Struggle. Retrieved from: http://discoursemedia.org/power-struggle/what-will-take-get-canadas-arctic-off-diesel

1.1 Overview

As we can see clearly from the example of Inukjuak, Canada is linked to the global energy access challenge through its remote off-grid communities. Despite being what the UN considers an Annex 1 industrialized country, pockets of population that are distant from the grid do not have an adequate level of energy services. Across the country – particularly in the North – there are 279 active remote communities that are not connected to the North American electric grid, 239 of which rely on diesel fuel for electricity and oil for heating requirements that is flown, barged, or trucked in (see folio). Nearly two thirds of these remote communities are Indigenous.[41, 42]

Indigenous peoples constitute the fastest-growing segment of the Canadian population, with people under the age of 25 representing nearly half of the population of Indigenous communities.[43] These young adults are the most affected by the severe housing crisis in remote communities that has arisen in part because existing electricity infrastructure cannot power any new homes. Nunavut, Ontario, and British Columbia are regions where an estimated 25 to 50 percent of communities have a load restriction status, meaning that peak electricity demand is near the maximum operating capacity of the diesel-generator plant.[44] Load restriction status has a number of negatively compounding consequences, including a strangling effect on a community's economic development due to an inability to connect new houses, buildings or water treatment plant upgrades to the electrical system. This chokes economic and community development opportunities and has significant impact on quality of life.

School closures because of power outages swallow a fifth of the education time in communities like Pikangikum First Nation where power surges due to unreliable generators regularly destroy education infrastructure, such as WiFi routers, internet servers and laptop computers.[45] In the same community lack of electrical power for sewage and drinking water systems has exacerbated existing problems like the rates of gastrointestinal, skin and urinary tract infections which occur at a much higher rate than in grid-connected communities.[46]

We know that education, health, economic opportunity and social inclusion are all radically improved by reliable access to energy. It is unacceptable to ignore the inequity in our remote communities any longer. Today, there is an incredible opportunity to invest in Canada's fastest growing population and one of Canada's fastest growing industries – Indigenous-led renewable energy projects to both power and empower communities.

Watay Power Project

Twenty-two First Nations communities have formed Wataynikaneyap Power in partnership with FortisOntario and RES Canada. The company is an initiative built on the mandate and support of the communities and will develop, own, and operate new transmission facilities in Northwestern Ontario.

The Ontario government has acknowledged that the project is run by an unprecedented partnership between First Nations groups and private companies. Its support is shown by the grant of a license to connect these communities to the grid.

The aim is to connect 17 off-grid First Nation communities currently powered by diesel generators. Wataynikaneyap engaged PricewaterhouseCoopers to perform financial feasibility assessments. The company found that the transmission line project would avoid CA$3.4 billion in fuel costs over 40 years.

If it goes ahead as hoped, the project will create approximately 770 jobs during construction and some on-going jobs during operations and maintenance over the next 40 years. It will also reduce greenhouse gas emissions by an estimated 6.6 million tonnes and save taxpayers over $1 billion because of the reduced need for subsidies on electricity generated by diesel.

Construction is due to start in late 2018. Wataynikaneyap sees this as a starting point for First Nation power generation initiatives, pointing out that First Nations wish to own, control, and benefit from development in their traditional homelands.[47]

41. Natural Resources Canada. (2012). Remote Communities Database. Retrieved from: https://www2.nrcan-rncan.gc.ca/eneene/sources/rcd-bce/indexcfm?fuseaction=admin.home1&new=true
42. Knowles, J. (2016) Power shift: Electricity for Canada's remote communities. Conference Board of Canada. Retrieved from: http://www.conferenceboard.ca/e-library/abstract.aspx?did=8249
43. Statistics Canada. (2016). Aboriginal peoples in Canada: First Nations people, Métis and Inuit. Retrieved from: https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-011-x/99-011-x2011001-eng.cfm
44. Henderson, C., (2016). Personal interview with Mariano Arriaga.
45. Bombacino, E. (2016). How energy poverty devastates Pikangikum First Nation. TVO. Retrieved from: http://tvo.org/article/current-affairs/shared-values/how-energy-poverty-devastates-pikangikum-first-nation
46. Northwestern Health Unit (2006). Inspection Report on the Pikangikum Water and Sewage Systems. Retrieved from: http://www.turtleisland.org/healing/pikangikum06a.pdf

Although the cost of energy in remote communities is partially covered by the budgets of federal and provincial governments, economic difficulties mean electricity and heating remains a significant expense. The cost of diesel is much higher than simply the fuel – transportation, storage, and ultimately generation and storage site clean-up and remediation must also be accounted for. Climate change is set to make things worse, both by worsening the extremes of the weather, and by making some transport options even more uneconomic.[48] Many communities only have ground transportation access via winter ice roads and warming trends in recent years have seen some communities' road access diminish to the point where they have to fly in their fuel. Air transportation can double the cost of electricity.[49]

Aging diesel storage facilities cause frequent spills which are enormously expensive to clean up. It is not always clear who is responsible for initiating and paying for remediation. According to Indigenous and Northern Affairs Canada (INAC), there are over 2,000 contaminated sites on First Nations reserves across Canada, and 70 percent of those sites are contaminated with diesel. The Canadian federal government faces millions of dollars in liability associated with the ongoing need to remediate sites contaminated by hydrocarbon fuels. The estimated cost for only the sites below the 60th parallel is CA$458 million.[42]

For heating, wood and fuel-oil are the most common sources of energy. In forested areas, wood is the preferred source for residential use due to its perceived lower cost.[50, 51] However, there are regions that fully depend on fuel-oil since no other resource is available like the Ungava Peninsula of Nunavik in Quebec, the northern remote communities in Northwest Territories and Labrador and all communities in Nunavut.

In energy terms, fuel-oil accounts for approximately 84 percent of the total energy use for heating in remote communities.[52, 53]

Installation costs of renewable energy technologies in remote communities are significant. Nonetheless, the savings in carbon emissions and the rising cost of diesel transportation means that, over the long term, projects should be considered worth the investment.[54]

Solar: Solar photovoltaics (PV) have been successfully deployed in remote locations across Canada. If 20 MW of solar capacity was installed across Canada's remote communities it could displace 5.8 million litres of diesel fuel annually, an estimated savings of CA$29 million on fuel costs.[55] To make this displacement a reality – assuming solar deployments reach a reasonable target of CA$4 per watt – it would require an estimated investment of CA$81 million (see folio).

Wind: Several remote communities in Quebec, Newfoundland & Labrador and Nunavut have excellent wind resources.[56] The potential for wind to reduce diesel consumption in these locations is significant. For example, a prospective 6MW wind project in Îles de la Madeleine could conservatively reduce 10 percent – 4.2 million litres – of the island fuel-oil consumption for electricity where an equivalent on-grid equivalent project would cost approximately CA$17.5 million due to the additional logistical challenges.[57, 58, 59]

Hydro: Megawatt scale hydro power requires significant investment of financial resources and time to conduct appropriate environmental assessment. However, as highlighted by the Inukjuak hydro project, a CA$100 million investment will effectively displace diesel fuel use in the community.[40]

47. Wataynikaneyap Power. (2016). Our story. Retrieved from: http://wataypower.ca
48. Stephenson, S.R., Smith, L.C> & Agnew, J.A. (2011). Divergent long-term trajectories of human access to the Arctic. Nature Climate Change. 1:156 – 160.
49. Government of Canada, (2011). Status of Remote/Off – Grid Communities in Canada. Natural Resources Canada. Retrieved from: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/canmetenergy/files/pubs/2013-118_en.pdf
50. Cherniak, D., et al. (2015). Report on the state of alternative energy in the Arctic. Carleton University. Retrieved from: http://www.bullfrogpower.com/wp-content/uploads/2015/09/State_of_Alternative_Energy_in_the_Arctic_POLAR_2015.pdf
51. Weis, T. & Cobb, P. (2008). Aboriginal energy alternatives. Pembina Institute. Retrieved from: http://www.pembina.org/reports/aboriginal-energy-alternatives.pdf
52. Government of Nunavut. (2016). Heating use in communities in Nunavut. Energy secretariat. Retrieved from: http://www.nunavutenergy.ca/communities
53. A Northern Vision (2016). Renewable energy inventory: Existing energy systems. Retrieved from: http://www.anorthernvision.ca/inventory/energysystems.html
54. Arriaga, M., Caizares,C.A. & Kazerani, M. (2016). Long-term renewable energy planning model for remote communities. IEEE Transactions on Sustainable Energy. 7(1):221.
55. Considering an average 10.7% solar PV capacity factor, an average of 3.3 kWh/litre energy conversion factor, and a cost of fuel of CA$1.5/litre. This latter cost is equivalent to $0.45/kWh, which as described in the Inukjuak case study, it is a low estimate of the value of clean energy in remote communities.
56. Arriaga, M. et al. (2014). Database of Electrical Grid Systems in Canada's Remote Communities. Technical report.
57. Considering an annual consumption of 190 GWh/year for the island, a 4.5 kWh/litre energy conversion factor, a conservative 36% wind capacity factor for a 9.1 m/s at 50m annual wind speed average, and a CA$3,000/kW deployment cost.
58. Hélimax Énergie Inc. (2009). Étude de la variabilité de la resource éolienne. Hydro Quebec. Retrieved from: http://www.hydroquebec.com/distribution/fr/ marchequebecois/ap-201501/pdf/ap-2015-01-etude-variabilite-r1.pdf
59. Fournier, L. & Massé, M.O. (2016). Une stratégie énergétique territorial pour les Îles-de-la-Madeleine – Document de consultation. Municipalité des Îles-de-la-Madeleine. Retrieved from: http://www.muniles.ca/wp-content/uploads/2016-01-26_Document-de-consultation.pdf

Despite financial challenges, an increasing number of remote Indigenous communities are successfully collaborating with government, NGOs, and utilities to lead clean energy projects that are supplementing and, in some cases, replacing aging diesel generators. Adding renewables to the existing energy mix can help pull communities out of load restriction status and create a foundation for future social and economic development built on a supply of local, clean and high quality energy. As part of their energy planning, communities may have to consider upgrading aging diesel infrastructure and optimizing it with smart grid technology while promoting energy efficiency and conservation to meet their overall goals.

Deer Lake Hybrid Solar Project

Deer Lake First Nation is a small community of approximately 1,100 people. It has no access to the grid and pays close to CA$2.7 million for diesel every year to satisfy the energy need of the community. Despite these high costs, it is not prudent for Deer Lake or many other off-grid communities to abandon diesel generators entirely. A better approach is to offset diesel electricity generation with renewables as part of a transition strategy. A recent installation at Deer Lake First Nation Elementary School, for example, has given its users a hybrid solar PV system that will work alongside existing diesel and hydro resources.

The PV system, installed in a partnership between Canadian Solar and NCC Development, a company formed by the Chiefs of six First Nations communities, has cut the community's annual energy bill by CA$92,000, created part-time employment opportunities, reduced diesel fuel consumption by 31,000 liters per year and cut carbon emissions by 99 tonnes annually.[60]

1.2 Four actions needed to plan for plenty in Canada's remote communities

We must acknowledge the role of energy as the backbone of a better quality of life for communities facing a variety of disadvantages. We can no longer ignore our responsibility to provide the supportive resources remote communities need to not only meet their current minimum energy needs but to plan for plenty.

1.2.1 Commit to a step change in investment

To date federal program funding for energy services in remote communities has been inadequate. Compare Alaska's Renewable Energy Fund – which has been allocating US$50M annually since 2008[36] for renewable energy projects that reduce diesel dependency – to INAC's ecoENERGY for Aboriginal and Northern Communities Program which allocated CA$9.5 million to diesel-dependent communities for energy related projects over the ten year course of the program.[62]

ecoENERGY is one of the few programs where enough public information exists to specifically determine funding targeted to diesel-dependent remote communities. There are several other federal, provincial, and territorial sources of funding that support energy projects and some of the funding recipients have been diesel-dependent communities.[63] Nevertheless, with the public information available, it is impossible to quantify and/or classify the amount of funding allocated specifically to diesel-dependent remote communities. So, while not a perfect comparison, we believe it provides a clear example of the type of dedicated, flagship program and increased level of financial commitment required to plan for plenty.

We need an order of magnitude increase – on the order of billions – in investment by Canada's federal government in sustainable energy solutions for meeting the current and forecasted energy needs of remote Indigenous communities in Canada. Recall that, at the time of publication, only CA$50 million is earmarked in the 2017 federal budget

60. Canadian Solar, (2014). Deer Lake First Nation elementary school. Retrieved from: http://www.canadiansolar.com/solar-projects/deer-lake-first-nation-elementary-school.html
61. Renewable Energy Alaska Project. (2016). Renewable Energy Fund. Retrieved from: http://alaskarenewableenergy.org/index.php/clean-energy-in-alaska/clean-energy-programs/
62. Indigenous and Northern Affairs Canada (2016). ecoENERGY for Aboriginal and Northern Communities Program. Retrieved from: http://www.aadnc-aandc.gc.ca/eng/1100100034258/1100100034259
63. Federal: ecoENERGY Innovation Initiative (NRCan); Provincial: IESO Aboriginal Renewable Energy Fund (ON), Microgrid Testing Facility in Rivière-au-Renard (TechnoCentre éolien), First Nations Clean Energy Business Fund (BC); Territorial: Alternative Energy Technologies Program (Arctic Energy Alliance), Micro-Generation Program (YK).

for diesel reduction in remote communities[64] and that CA$100 million is the expected cost of Inukjuak's proposed hydroelectric project.[40] The significant quality of life and economic development improvements that are possible should make this Canada's top priority when it comes to green infrastructure development.

1.2.2 Recognize Indigenous leadership and support capacity building

People are the primary resource in energy access projects. Successful renewable energy and fuel saving projects in remote Indigenous communities in Canada to date have relied upon in-community leadership and support, motivated by Indigenous cultural values of environmental stewardship and self-determination. Community commitment and involvement leads to lobbying for investment, partnerships with external organizations that help guide the process, and empowered citizens ready to be a part of decision-making and promotion of the opportunities.

From initial planning to maintenance, recognizing Indigenous leadership and building further capacity to lead and manage energy projects over the long term must be a priority. Existing education and training programs include 20/20 Catalysts,[65] and intensive summer program designed to provide 'Catalysts' from Indigenous communities across Canada with the skills and resources to maximize the social and economic benefits their communities can gain through participation in clean energy projects, and TREC Education's renewable energy options and opportunities programs for Indigenous communities that build skills, confidence and develop networks of practitioners, advocates and investment partners.[66]

Canadian governments, NGOs, utilities and investors must support existing and emerging programs that support Indigenous energy champions, skilled workers and entrepreneurs who can facilitate and realize energy access projects allowing communities to deploy their chosen technologies to their full potential.

Old Crow Solar Array

The Vuntut Gwitchin First Nation is leading the movement to decrease fossil fuel use in Old Crow - the Yukon's most northern community, and home to about 300 people – consumes approximately 500,000 litres of diesel a year.[178] The community had been looking for years to develop alternative sources of energy, because "We want some energy security," said William Josie, Director of Natural Resources for the First Nation to CBC News North.[68]

A 330 kW solar array, approved by the Yukon Environmental and Socio-economic Assessment Board (YESAB), set to begin construction in 2018, is expected to meet 17 percent of the community's annual electricity demand and reduce annual diesel consumption by over 90,000 litres. The project is a partnership with ATCO Electric Yukon, Yukon College's Research Centre, and the Yukon Government's Energy Branch and is estimated to cost CA$2.3 million. A working group made up of people and organizations that have developed similar projects has been set up to assist in the planning of the solar array.[69]

1.2.3 Create a single, intergovernmental point of contact

Across federal, provincial and territorial governments there are around 40 funding programs that conduct research, carry out pilot studies and work in other ways to improve energy access.[70] These various programs often have different scopes, timelines and approval processes that are not complementary making coordination between agencies and programs a difficult prospect.

When provincial/territorial and federal contributions and regulations cannot be mutually agreed upon it is the communities that suffer. Uncertainty can not only jeopardize a specific project, it can also cause private investors to avoid the whole sector, making it difficult for remote communities to finance what can be extremely costly infrastructure.

64. McDiamid, M. (2017). Federal budget money earmarked to help Indigenous communities get off diesel. CBC. Retrieved from: http://www.cbc.ca/news/politics/indigenous-remote-federal-budget-1.3975022
65. Lumos Energy. (n.d.) 20/20 Catayst program. Retrieved from: http://indigenouscleanenergy.com/2020-catalysts-program/
66. TREC Education. (n.d.) Indigenous communities. Retrieved from: https://treceducation.ca/programs/#indigenous-communities
67. Arctic Inspiration Prize. (2016). 2016 finalists. Retrieved from: http://www.arcticinspirationprize.ca/finalists/2016finalists.php
68. Tukker, P. (2016). Old Crow looks to solar power to cut diesel use. CBC News North. Retrieved from: http://www.cbc.ca/news/canada/north/old-crow-solar-power-proposal-yukon-1.3674277
69. Forrest, M. (2016). YESAB gives thumbs up to Old Crow solar project. Yukon NEWs. Retrieved from: http://www.yukon-news.com/news/yesab-gives-thumbs-up-to-old-crow-solar-project/
70. Arriaga, M. (2015). Sector profile for remote microgrids in Canada. Conference Board of Canada.

We recommend creating a single point of contact within government whose responsibility is to ensure those initiating and managing energy projects can navigate regulations, funding and reporting at the federal and provincial/territorial level and across relevant departments to minimize replicated work as well as wasted time and resources.

Hupacasath First Nation and the BC First Nations Energy Toolkit

When faced with the prospect of a natural gas-fueled power generation located on their traditional territory in the Alberni Valley of Vancouver Island, British Columbia, the Hupacasath First Nation not only stood in opposition but proposed a solution for a sustainable energy alternative that would have positive economic and community development benefits.[71] The China Creek run-of-river hydroelectric project supplies power to over 6,000 homes through an agreement with BC Hydro.[72]

Lessons learned throughout the development of this project are consolidated in BC First Nations Clean Energy Toolkit developed by Judith Sayers, a lawyer, strategic advisor and former Chief of the Hupacasath First Nation. The Toolkit explains available clean and renewable energy options and how on- and off-grid communities can begin the process of exploring them. It includes information on the best ways to explore pre-feasibility, feasibility, developing, financing and relationship building, as well as offering a comprehensive directory of resources.[73]

1.2.4 Connect people, technologies and information

To improve project outcomes knowledge sharing between communities and innovative institutions will be critical. Key steps are already being taken. A Northern Vision is a strategic plan for Northern development produced by the governments of the Northwest Territories, Yukon and Nunavut. Energy is a pillar of this plan as is a strategy for collaboration between government, NGOS and the private sector.[17] Lumos Energy's emerging Canada-wide Indigenous Clean Energy Network is a knowledge sharing platform that aims to unlock potential in Indigenous communities by providing a comprehensive set of collaboration tools.[65] The Ontario First Nations Technical Services corporation provides technical and advisory services to First Nations communities in Ontario, covering energy-linked areas like housing and infrastructure.[74]

There is also a need for reliable, up-to-date and publicly accessible data about each remote community's energy status, including load restrictions, and future electricity needs. Not only will this provide accountability, it will guide project planning and expose the market opportunities that will help governments leverage their investments in energy access for greater impact, and for new off-grid energy business models to be developed in the Canadian context. There is no need to start from scratch either. Natural Resources Canada (NRCan) has committed to updating and expanding its Remote Communities Energy Database [41] which, at the time of publication has fallen out of date, by fall of 2017.[75]

Canadian institutions from the private and public sectors should be encouraged to utilize up-to-date information and innovative technologies to seek new arrangements for energy projects in remote communities that are financially sustainable over the long term.

71. Aboriginal Business and Investment Council. (n.d.). Hupacasath First Nation. Retrieved from: http://www.bcabic.ca/success-stories/hupacasath-first-nation
72. Indigenous and Northern Affairs Canada. (2005). Hydro-project partnership fuesl growth for island communities. Retrieved from: https://www.aadnc-aandc.gc.ca/eng/1100100021384/1100100021391
73. Sayers, J. (2015). BC First Nations clean energy toolkit. Clean Energy BC. Retrieved from: https://www.cleanenergybc.org/reports–publications/b
74. Ontario First Nations Technical Services Corporation. (n.d.) About us. Retrieved from: http://www.ofntsc.org/about
75. Public Works and Government Services Canada. (2016). Request for proposal: NRCan-5000026971.

1.3 Call for a strategic national priority

As laid out here and in an ever-growing body of global evidence, the objective of energy access efforts is not simply to provide energy at reasonable cost and reliability. Rather, it is to provide levels of energy service of high enough quality and quantity to allow for greater economic and social development and self-determination in communities strangled by energy deficit.

A strong commitment from the Canadian government is required to break the historical logjam of jurisdictional disputes and delay that has so far proven woefully inadequate in addressing the energy needs of remote Indigenous communities. Canada needs an approach centered on clean energy provision that, at its heart, addresses a serious inequity issue within its own population.

Such a strategy would be a bold step towards enabling solutions to multiple crises in housing, water quality and sewage facilities, as well as adequately supporting community health and well-being in remote communities. It must be carried out with the leadership of and in partnership with the communities themselves and draw upon Canadian innovations and institutions to help forge sustainable energy service solutions for a plentiful future.