SUGGESTED READINGS

Energy Security[1]

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The Arctic has recently become a focus of energy security discussions because of its large fossil fuel reserves and because access to these reserves is becoming increasingly feasible as sea ice continues to recede. These globally significant reserves are seen from outside the Arctic as a potential boon for international security, but the significance of these reserves is seen differently at the national, regional, and local levels. There is a contrast between how energy security is viewed from outside the Arctic versus how it is viewed from within.

Remote communities across the Arctic are largely dependent on imported fossil fuels to power isolated community grids. Energy security discussions in these areas are typically shaped by the lack of reliable, affordable energy for residents. In Nunavut and Greenland in particular, there are striking regional patterns of energy insecurity.

Energy security discussions focus on economic benefits at the local and regional level from fossil fuel development. Unfortunately, since these fossil fuel resources are not refined in the Arctic or typically available to local communities (except in a few cases) as a cheaper, more reliable alternative to imported fossil fuels, a focus on large scale development of Arctic fossil is not well situated to address energy insecurity at the local and regional level. Instead, communities and regions are exploring ways to augment their traditional energy supply with alternative sources to reduce costs, increase the resilience of their power systems and reduce the burden of environmental impacts (especially local ones such as oil spills) associated fossil fuel use.

The significance of Arctic fossil fuel reserves for national energy security differs between countries. The United States views the continued development of Alaskan fossil fuel reserves as crucial to their energy security since it reduces or eliminates reliance on foreign fossil fuel imports. Canada has large fossil fuel reserves outside its Arctic which account for most of its fossil fuel production and has a moratorium on Arctic offshore developments over environmental concerns. Greenland has likely fossil fuel deposits which could be an important source of income, especially as it seeks independence from Denmark, but seems reluctant to do so given its commitment to develop green sources of energy and reduce its fossil fuel consumption.

[1] This Policy Primer was produced by a NAADSN graduate fellow or recent postgraduate to provide suggested readings for participants in the Advancing Collaboration in Canada-U.S. Arctic Regional Security (ACCUSARS III) workshop held from 24-25 March 2022.

We invite you to consider the following questions:

· How important will Arctic fossil fuel reserves be to global and national energy security?
· Is exploiting Arctic fossil fuel resources necessary or desirable? What would drive the exploitation of these resources (e.g., global price and availability, Western sanctions against oil producing states like Russia)?
· Will access to fossil fuel resources in the Arctic be a driver of conflict (between Arctic states or between Arctic states and non-Arctic states)? Are there areas in which access to these resources is disputed?
· How are energy resources distributed across the region of interest?
· How is energy security understood differently from outside the Arctic versus inside the Arctic?
· Why are alternative energy sources being explored and how are they being applied in the Arctic?

Defining Energy Security

Bellamy, Jackson. "Understanding the Recent History of Energy Security in the Arctic." *NAADSN Policy Brief*, March 2021.

Petra Dolata's chapter examines the usefulness of the term "energy security" for understanding changes and trends in the Arctic region. Dolata concludes that based on the political context in which the term is predominately used and due to its poor definition and development in the academic literature, its usefulness is extremely limited for understanding or analyzing Arctic issues. She points out that the energy reality within the Arctic region is linked more to soft security issues than hard security issues such as militarization, as the use of the term "energy security" suggests. Her historical analysis of the term "energy security" reveals that it is best understood in a global geopolitical context and as a term of a particular time.

Bouchard, Christina. "Powering Canada's Territories: Governing Critical Infrastructure Assets (2015-2021)." *NAADSN Policy Primer*, October 2021.

Power generation infrastructure is critical both for residents and businesses in the Canadian Territories. Reliable power enables the operation of mechanical systems, such as water pumps and communications infrastructure, and light during long periods of darkness. In 2015, the Standing Senate Committee on Energy, the Environment and Natural Resources published *Powering Canada's Territories*. This policy primer revisits the findings of the report six years later, highlighting recent developments and new or emerging challenges.

CNBC. "How much it costs to drill in the Arctic." *CNBC*, 21 November 2020.

Outside actors such as industry and government see Arctic oil and gas reserves are as potentially profitable. In Alaska, oil and gas development is a cornerstone of the state's economy and part of the U.S. strategy of energy independence, but there is opposition to further developments. The Arctic is warming faster than the global average and this rapidly changing environment has become a focus of growing climate activism calling for reductions in fossil fuel use and to leave the Arctic untouched by oil and gas activity. Some oil companies would likely refuse to develop Arctic reserves because it would cause poor public relations and major banks have refused to finance oil and gas exploration in the Arctic. Increasingly, big oil companies want to be seen as responsible actors and some have even developed net zero strategies. Drilling in the Arctic doesn't make much economic sense either. Exploration and drilling in the Arctic is hazardous, expensive and there is a lack of infrastructure. High oil prices would be the only reason to that drilling in the Arctic could be profitable.

de Witt, Magnus, Hlynur Stefánsson, and Ágúst Valfells. "Energy security in the Arctic: Policies and technologies for integration of renewable energy." *Arctic Yearbook*, 2019.

Remote Arctic communities depend 80% on diesel as the primary energy source. Besides the negative climate impact, the use of diesel has a negative impact on mid-term energy security. The mid-term energy security impact is due to the transportation of fuel to the communities. Harsh Arctic weather conditions restrict the transportation period and within a relatively short time window the annual consumed fuel needs to be shipped to the communities. Local energy sources can help to get independence from imported fuels. The use of local energy sources will increase the upstream energy security, which is affected by fuel price changes, oil exploration and oil production/delivery insecurity. Renewable energy technologies adopted to Arctic conditions exist but come with a significantly higher price than the same technologies in temperate areas. Policy can help to lower the barrier to entry and support a secure and sustainable energy supply in the Arctic.

Nesheiwat, Julia. "Why the Arctic matters." *The Atlantic Council*, 17 June 2021.

According to Nesheiwat, the Arctic matters for its natural resources as well as its strategic location. The Arctic also matters in terms of global climate regulation, global sea level rise and is essential to earth's fragile ecosystems. As the Arctic continues to warm there could be potentially devastating consequences, even for populations living far from the Arctic.

The Arctic is a frontier for alternative sources of energy which could be deployed more broadly to reduce global fossil fuel consumption. New shipping routes are opening as sea ice melts which have the potential to reduce shipping times between Europe and Asia and could ease traffic at global choke points such as the Panama and Suez canals. The Arctic Council will be crucial to realizing opportunities and preserving regional co-operation and stability. Finally, the Arctic is home to unique ecosystems that are threatened by climate change and Indigenous people that rely on them.

Pearce, Fred. "Amid Troubles for Fossil Fuels, Has the Era of 'Peak Oil' Arrived?" *Yale School of the Environment*, 24 June 2021.

Peak oil refers to a global peak in oil production after which production begins to permanently decline. Industry analysts have long predicted that peak oil would occur but not until the 2030s or beyond. Some experts are now anticipating this will occur earlier than expected. Decarbonization of economies to meet the Paris climate agreement; deflation of demand as renewable energy sources and electric vehicles kick in; and "detoxification" as cities, emboldened by the experience of clean air during the Covid lockdown, curb particulates and nitrogen oxide emissions from burning petroleum will drive down the world's taste for oil. Most of this hinge on the future of motor vehicles since automobiles currently consume almost a half of the world's oil. But the rise of electric vehicles is accelerating and will be a game changer.

Alaska

The Nature Conservancy. "Alaska's Renewable Energy Economy Alaska's Renewable Energy Economy: Progress and Possibility." *The Nature Conservancy*, July 2021.

Alaska's energy system is unique in the United States. The state stretches across a landmass of 665,000 square miles, with significant regional variation in geology, hydrology, and regional energy resources such as water, wind, and solar. Outside the state's Railbelt region, energy infrastructure is characterized by islanded micro-grids that have been built on a backbone of diesel power generation. This type of power is costly and resource-intensive, particularly in remote communities that rely on long logistical supply chains and limited local resources. Most of these communities are off the road system, rural, and predominantly Alaska Native populations. In addition, diesel generation is carbon-intensive – not only in the fuel source itself, but also along the supply chain that is required to bring fuel to remote communities. Even in the state's urban areas, power generation is relatively expensive and reliant on natural gas, with limited transmission capacity.

Puko, Timothy and Katy Stech Ferek. "U.S. Moves to Restrict Oil Leasing in Alaska." *The Wall Street Journal*, 10 January 2022.

The Interior Department said Monday that it plans to block oil and gas leasing on about 11 million acres on Alaska's North Slope, or roughly half of a 23-million-acre reserve set aside for energy development decades ago. The action, announced in connection with a federal lawsuit brought by environmentalists, would reverse a Trump administration effort to expand oil production in the National Petroleum Reserve in Alaska. The reserve had been set aside for oil and gas development in the 1920s. Under former President Barack Obama, the federal government restricted oil and gas development to 11.8 million acres of the reserve.

Canada

Bellamy, Jackson. "Alternative Energy in the Canadian North." *NAADSN Policy Primer*, August 2020.

The Government of Canada and many Northern stakeholders are actively considering alternative energy options for deployment in the Canadian North to complement or replace existing diesel generators. This comes amid the push to mitigate climate change and local environmental impacts, and in the context of the need for increased electricity generating capacity in the north for economic activity, growing communities, and military operations. Because diesel generators in the Canadian North do not contribute significantly to global climate change, reducing reliance on these systems in the region will not actively contribute to greenhouse gas (GHG) abatement. Nevertheless, policies at all levels of government prioritize transitioning away from diesel generation in the North. Aside from producing GHG emissions, diesel generation also poses a risk to the local environment and human health from fuel spills and emissions, and climate change exacerbates logistical constraints associated with fuel supply. In some cases, alternative energy sources have the potential to alleviate the costs and challenges of transporting diesel fuel.

"Canada explores small modular nuclear reactors for Arctic areas." *IHS Markit*, 20 July 2021.

In a virtual pep talk in June, the head of Canada's main nuclear research organization told delegates attending the Arctic Development Expo that small modular reactors (SMRs) have the potential to serve as a safe, cost-effective, and reliable source of clean energy in the remote region.

"We believe that SMRs have the potential to serve as a transformative technology for regions such as Canada's Arctic, serving as the foundation for environmental, social, and economic prosperity," said Joe McBrearty, president, and CEO of Canadian Nuclear Laboratories (CNL). SMRs are small nuclear plants designed to produce 1 MW to 300 MW of electricity per module. They are factory built and shipped to sites, which speeds up the construction process, though the cycle from design to regulatory approval still can take several years. Globally, some 70 SMRs are in various stages of development and two research reactors are operational in China and Japan, according to the International Atomic Energy Agency (IAEA). Just one has been commercially deployed—onboard the Akademik Lomonosov, a floating nuclear power plant anchored off Russia's Arctic coast. For remote sites, Canadian energy authorities have said SMRs could provide clean, economical, and reliable power and heat to mines and surrounding communities, reducing, or eliminating reliance on diesel.

Exner-Pirot, Heather. "Pathways to Indigenous Economic Self-Determination." *MacDonald – Laurier Institute*, May 2021.

While there is growing recognition and affirmation of Indigenous people's inherent right to self-determination in Canada, most of the work aimed at exercising those rights has been directed to its political and legal dimensions. Less attention has been paid to the need for economic self-determination: the ability to earn a good livelihood, generate own-source revenues, and determine and fund community priorities independently.

Perceived conflict between Indigenous peoples and the resource industry is one of the most dominant political narratives in Canada. This struggle was true of the 20th century, but it no longer applies in the 21st. The relationship between resource companies and Indigenous communities has been exploitative in the past, and there is more work to be done to achieve fairness. Significant Indigenous engagement in the resource sector in Canada has resulted from legal rights, contractual demands, and the need for social licence, but also Indigenous business acumen and persistence. While the duty to consult doctrine opened a new era of benefits for Indigenous communities, the trend in recent years has evolved towards nations asserting themselves as partners, owners, and shareholders. This is often the most consequential way through which they can achieve economic self-determination and real leverage in how projects proceed, including having a more direct say in the environmental provisions of projects. Compared to other sectors, oil and gas development offers the highest wages and the greatest economic benefit.

"Northwest Territories Energy Profile." *Canada Energy Regulator*, 17 March 2021.

In normal precipitation years, approximately 75% of NWT's electricity comes from hydroelectricity. The NWT relies on fossil fuels to supplement hydroelectric generation in drier years and for remote communities or industries that are not connected to one of

NWT's two hydro-based grids. 4% of power generation comes from wind and 1% comes from solar. NWT is looking to expand both sources to reduce reliance on diesel. In 2018, NWT generated about 0.35 terawatt hours (TW.h) of electricity, which is approximately 0.1% of total Canadian production. NWT has a generating capacity of 208 megawatts (MW). In 2017, NWT's power sector emitted 0.1 MT CO_2e emissions, which represents about 0.1% of Canadian emissions from power generation.

"Nunavut Territorial Energy Profile." *Canada Energy Regulator*, 17 March 2021.

Energy insecurity in Nunavut stems from the sole reliance on imported fossil fuels for power generation. This makes reliable power generation susceptible to fluctuating fuel prices, long and logistically challenging supply chains, and generator failures. Qulliq Energy Corporation (QEC), owned by the Nunavut government, is responsible for generation, transmission, and distribution of electricity in Nunavut. QEC operates 25 diesel plants in 25 communities. These communities are not connected by roads or power lines and there is no back-up grid. Almost all of Nunavut's electricity is generated from diesel fuel imported during the summer and then stored for year-round use. Approximately 55 million litres of diesel are consumed annually to generate electricity in Nunavut. Alternative sources of energy are being explored to reduce the burden of reliance on imported diesel fuel and reduce costs. Nunavut has a generating capacity of 78 megawatts (MW). In 2018, Nunavut generated around 0.2 terawatt hours (TW.h) of electricity (Figure 1), which is less than 0.05% of total Canadian production. In 2017, Nunavut's power sector emitted 143 thousand tonnes CO_2e emissions, which represents about 0.2% of Canadian emissions from power generation.

Qulliq Energy Corporation. "QEC Energy Framework: The Cost of Generating Electricity in Nunavut." *Qulliq Energy Corporation*, 21 March 2018.

Qulliq Energy Corporation (QEC) is the sole provider of electrical power in Nunavut. Currently, all QEC's electrical needs are met by imported diesel fuel. QEC delivers electricity to approximately 15,000 electrical customers across Nunavut. Power is generated and distributed to Nunavummiut through the operation of 25 standalone diesel power plants in 25 communities, with an installed capacity of approximately 76,900 kW. The corporation also provides mechanical, electrical and line maintenance from three regional centres: Iqaluit, Rankin Inlet and Cambridge Bay. To facilitate an understanding of the renewable energy business case and enable further discussion, the corporation is sharing the financial framework associated with generating electricity. Approximately 55 million litres of diesel is consumed annually to generate electricity for the territory. Electricity costs vary across Nunavut and are known to be the highest rates in Canada. Diesel generation will continue to be the central means of generating electricity in a practical and reliable basis throughout Nunavut for the immediate future; however, QEC

would like to incorporate renewable energy where possible in an economically sustainable manner.

Venn, David. "Nunavut utility continues push to replace aging diesel generators." *Nunatsiaq News*, 27 July 2021.

With the recent decommissioning of Grise Fiord's aging diesel plant, Qulliq Energy Corp. continues to chip away at replacing community power plants that have surpassed their life expectancy. A 2015 report found that 14 power plants in the territory fit that description. Since then, Qikiqtarjuaq and Taloyoak got new plants in 2016, followed by Pangnirtung in 2017 and Kinngait in 2018. The most recent recipient is Grise Fiord, which received a new power plant in 2019. QEC's acting president and CEO, Bill Nippard, said the new plant has added reliability to the community's power supply.

"Yukon Territorial Energy Profile." *Canada Energy Regulator*, 17 March 2021.

Yukon currently meets 94% of its energy needs with hydropower which is distributed through a territorial grid network to most communities. Generation from diesel and natural gas is required for periods of peak demand. Yukon used to rely primarily on diesel, but the lower cost of liquefied natural gas (LNG) in recent years has made investments in LNG facilities more economically feasible. Five remote communities that are not connected to the grid rely solely on diesel generators but are increasingly integrating renewable sources into their power supply. In 2018, Yukon generated about 0.5 terawatt hours (TW.h) of electricity, which is approximately 0.1% of total Canadian generation. Yukon has a generating capacity of 124 megawatts (MW). The 8.8 MW Whitehorse LNG power plant started operations in 2015, with a third LNG unit installed in 2018. Yukon's only wind power plant is the 0.7 MW Haeckel Hill facility.

Greenland

Global News. "Future belongs to renewable energy,' Greenland says as it stops oil search." *Global News*, 16 July 2021.

The left-leaning government of Greenland has decided to suspend all oil exploration off the world's largest island, saying it is "a natural step" because the Arctic government "takes the climate crisis seriously."

No oil has been found yet around Greenland, but officials there had seen potentially vast reserves to help Greenlanders realize their long-held dream of independence from Denmark by cutting the annual subsidy of 3.4 billion kroner ($540 million) the Danish territory receives. Global warming means that retreating ice could uncover potential oil

and mineral resources which, if successfully tapped, could dramatically change the fortunes of the semiautonomous territory of 57,000 people.

International Renewable Energy Agency. "Greenland Energy Profile." *International Renewable Energy Agency (IRENA)*, 29 September 2021.

Greenland is reliant on oil for 83% of its total primary energy supply. 1% is generated by coal and the remaining 16% of the total primary energy supply comes from renewables. Most of this renewable capacity comes from hydroelectric/marine (97%). Bioenergy makes up the remaining 3%. Greenland is committed to further develop renewable energy to displace fossil fuels. Over the period 2017-2018 all of Greenland's growth in their total energy supply came from fossil fuels. Fossil fuels will remain an important part of Greenland's total energy supply and will likely continue to account for short-term growth until they can achieve more significant growth in their renewable capacity.

Stausland, Kristian, and Einar Torfi Einarsson Reynis. "Glacial Water Melt in Greenland: Resource for the Future." *Nordicum-Mediterraneum: Icelandic Journal of Nordic and Mediterranean Studies* No. 16:3 (2021).

Research into the cause and effect of increased thawing in permafrost areas and rising sea level has led to the conclusion that without extensive decrease in carbon emissions, future generations may be presented with severely different global conditions. This condition could make populated areas uninhabitable and leave others with limited possibilities for agriculture and other activities vital for human survival. However, the increasing melt rate of Greenland's glacier may present an opportunity to harness more energy for electrical generation than is currently being done today. Such a project could prove beneficial for Greenland's economy and may possibly attract the interest of various energy demanding industries, which may in turn present various employment opportunities and infrastructure investments for the benefit of the Indigenous people of Greenland.