# RENEWABLE ENERGY FAQs

#### **ENGLISH**

#### INUKTITUT

#### WIND AND SOLAR ENERGY QUESTIONS

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#### How does solar energy work?

# Solar energy technologies capture light energy from the sun and convert it to electricity using solar photovoltaics (solar PVs). Solar PVs consist of thin membranes made from special metals called semi-conductors (e.g. silicon), mounted on self-contained glass panels. When these membranes absorb light, the light energizes electrons within to create an electrical current. Electricity from solar panels is produced in direct current (DC), but has to be converted to alternating current (AC), which is the type of energy used in our homes. Inverters collect electricity from the solar panels and convert it from DC into AC before transmitting it to the grid.

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#### How does wind energy work?

Wind energy technologies capture kinetic energy (the energy of motion) from the wind. Wind turbine blades are specially designed to catch the wind, and are typically shaped like airplane wings. As wind blows over the blades, they are pushed, or "lifted", similar to an airplane wing. The blades rotate in a circle around a central hub which contains a rotor. The spinning of the rotor generates electricity, which is then transmitted from the hub, down wires contained within the tower and onto the electrical grid.

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## How much does it cost to build a wind or solar project in northern Canada?

The cost of solar energy and wind energy projects depends on many factors, including their size and location. A 1MW solar project in northern Canada today would cost approximately \$12-18 million, while a 1MW wind project would cost approximately \$17-23 million. Solar projects are cheaper for several reasons: they have fewer moving parts, are simpler to install due to their low height, and have smaller components that are easier to ship. However, solar projects in the north only produce significant energy for half of the year. Wind energy projects, while slightly more expensive, produce reliable energy year-round.

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## How big is the renewable energy project being proposed in our community?

KAE is proposing utility scale renewable energy projects in Rankin Inlet and Baker Lake. In Baker Lake, the project will consist of two 1MW turbines, for a total installed capacity of 2MW. The wind turbines are 77m tall, and have 30m blades. In Rankin Inlet, the project would be slightly larger, with three 1MW turbines of the same size, for a total installed capacity of 3MW. These projects are sized to generate enough electricity to displace between 40% of the annual electricity currently used by the community. That's enough electricity to power the equivalent of 240-360 homes per year.

Projects of this size requires many engineers, material suppliers, and trade contractors from all disciplines to come together. The project will be led by Kivalliq Alternative Energy, a partnership between Sakku Investments Corporation and Northern Energy Capital, with a limited number of contracting opportunities available to complete the design and construction. A wind project in the community could take 3-4 years to develop and build, while a solar project would take 2-3 years.

Who will build it, and how long will it take?

### Who would own and operate the clean energy project, and who will the revenue go to?

Under Qulliq Energy Corporation's (QEC) Independent Power Producer policy, the project would be owned by Kivalliq Alternative Energy (KAE), a non-utility entity that produces and sells electricity to QEC. KAE is a partnership between Sakku Investments Corporation and Northern Energy Capital, and revenue will be used to maintain the facility, pay operators, and provide a return on initial capital investment.

## Will a clean energy project lower the price of energy in the community?

It is unlikely that any single renewable energy project would have a direct impact on the local price of energy, as these rates are set by the Utility based on territory wide operations costs, including fuel prices. Qulliq Energy Corporation has, however, stated in their Independent Power Producer Policy that adding renewable energy to the grid will not cause customer rates to increase.

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#### What are the possible environmental impacts?

Both wind and solar energy typically have low environmental impacts. Prior to any project being approved, an Environmental Impact Assessment must be completed to ensure potential impacts are minimized. In Nunavut, projects are assessed for possible impacts through the territorial assessment body, the Nunavut Impact Review Board (NIRB), as well as through the Nunavut Planning Commission (NPC), which ensures that new projects conform to existing land use plans.

Wind turbines may interfere with birds and bats during flight, so sites are carefully screened and placed away from such flight paths and habitats. Solar projects require a lot of space, which can displace existing use of the land by wildlife or humans. Selection of land is therefore carefully considered to minimize impacts to wildlife habitat and land users. As with similar infrastructure projects, land disturbance during construction cannot be avoided, and remediation will be completed where possible to return land to its predisturbed state. Wind and solar energy also have positive environmental impacts because they displace the use of fossil fuels, resulting in less environmental impacts from fuel spills and reduced air pollution.

#### Do wind projects make a lot of noise?

Wind projects create noise within about a 500m radius of the turbines. When you are right next to a wind turbine, it generates noise levels similar to that of an idling truck or an ATV engine. As you get further away, wind turbines make less noise. At 300m away, sound levels are similar to that of a refrigerator, and at 500m away, noise levels are the same as average background noise, meaning it would not be discernable in most settings. When project locations are chosen, turbines are placed a minimum of 400-500m away from residential dwellings.

## Will the project impact traditional land use activities like hunting?

Candidate sites are carefully screened in collaboration with local knowledge holders to minimize impact on traditional use of the land as much as possible. More specifically, the project team will be consulting with the Hunters and Trappers Organizations in each community to ensure traditional land use will not be adversely impacted.

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#### How long do solar and wind energy projects last?

Wind energy projects have an average lifespan of 25 years. This is based on the operable lifespan of the wind turbine equipment, which experiences wear and tear and increased maintenance needs over time. Solar projects, on the other hand, can operate for 30+ years or more. Solar panels themselves have no moving parts and very long lifespans, however, decreases in the efficiency of supporting equipment such as inverters and batteries dictate the operable lifespan of a solar project. Supporting equipment is usually replaced at least once during a project lifetime.

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## What kind of maintenance work is required to keep a renewable project operating?

Wind facilities require regular maintenance to ensure all parts are working properly. Maintenance personnel must inspect the structure and ascend to the top of the turbine to inspect electrical components in the nacelle (hub). Rarely, if ever, a crane may be required to replace components at heights.

Solar facilities typically have no moving parts and need less maintenance, but still require regular inspections by maintenance personnel with electrical knowledge, and may need to be cleared of snow and ice in shoulder seasons.

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## Are wind and solar energy proven and reliable technologies, even in cold climates?

Yes. In fact, solar PV panels perform better in cold temperatures, as long as the panels are free of snow. Other equipment such as inverters and batteries must be rated for colder temperatures, or can be heated or insulated during the coldest months of the year.

For wind energy, colder, higher density air provides more energy to move turbine blades, and wind energy technology has improved vastly in cold climates over the last decade. Blade heating technology now exists which allows wind turbines to perform well even in cold, rime-ice prone climates. Several wind turbine manufacturers specialize in building turbines specifically for arctic climates.

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#### Will a wind project impact local caribou herds?

There are almost no wind projects operating in northern Canada within barren ground caribou habitat, so very little is known about the interaction of caribou with wind energy projects. A recently deployed wind project in northern Quebec at the Raglin Mine is one of the only existing wind projects within barren ground caribou habitat, however, it has limited data as it has only been running for a few years. Studies of reindeer and wind projects in Scandinavia show that reindeer may be more sensitive to wind projects during calving and post calving periods, but that herds also adjust to wind projects over time. However, these studies cannot predict for certain how caribou will respond.

To minimize possible impacts, Kivalliq Alternative Energy is engaging with local community members and experts to locate the wind projects away from major migration pinch points or areas where calving or post calving activities take place. While it may not be possible to locate the project entirely away from areas where caribou travel, by strategically placing turbines nearer to the community, and away from sensitive areas or along major routes or bottle neck areas, it is expected that wind turbines can successfully co-exist with wildlife like caribou.

## Why doesn't Nunavut have solar panels in every community?

The cost of solar panels is coming down globally, but they still require a significant up-front investment to install, even at smaller scales. Larger solar energy projects are complex undertakings that require extensive planning, a large capital investment, and coordinated delivery of many parts and personnel. These projects therefore take time to build and pay for, which often means adoption can be slow.

QEC has several programs to enable the installation of small-scale rooftop solar, such as their Net Metering Program. This program allows owners of rooftop solar to receive an energy credit for any surplus power they produce and sell back to the grid. Info about the Net Metering Program can be found here: https://www.qec.nu.ca/node/759

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#### What about small-scale solar panels for cabins?

Small scale solar installations on rooftops can be a great source of renewable energy during the summer time. In more remote areas such as at cabins, solar can be a great way to supplement power for an off-grid house during the summer, but supplementary power is needed in the winter time when it is dark most of the day. The Climate Change Secretariat launched the Renewable Energy Cabin Grant in November 2021, which allows cabin owners to apply for up to \$5000 towards a solar or wind system on their cabin. Information about this program can be found here: <a href="https://climatechangenunavut.ca/en/renewable-energy-cabin-grant-program-guide">https://climatechangenunavut.ca/en/renewable-energy-cabin-grant-program-guide</a>

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https://climatechangenunavut.ca/en/renewable-energy-cabin-grant-program-guide

## Are there other solar or wind energy projects in Nunavut?

There are currently no wind energy projects in operation in Nunavut. There are a small number of wind energy projects in development or feasibility stages within Nunavut, including in Rankin Inlet and Baker Lake, as well as one at Agnico Eagle's gold mine in Hope Bay. There is also one large scale wind energy project under development in Sanikiluaq. There are also several successful wind projects in operation in other northern locations, including at Raglin Mine in northern Quebec, Diavik Mine in NWT, and several projects in Alaska. All of these wind projects have been designed for operation in cold climates and have seen positive results.

Solar projects are more prevalent in Nunavut, and there are a number of smaller scale residential rooftop solar installations. However, there are no commercial or utility scale solar energy projects operational in Nunavut yet, with the exception of a demonstration project by QEC in Igaluit.

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# Once projects like these reach the end of their lifespan, what does the removal and disposal process look like? For example, do they go to a municipal landfill?

Once a renewable energy project such as wind or solar reaches end of life, it may either be re-powered, or decommissioned. Decommissioning involves disconnecting the project from the electrical grid, removing all associated structures and equipment, and returning the land to its previously undisturbed state. In both cases, removal and recycling of a portion, if not all of the project is required.

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Most of the components of a solar installation can be removed and recycled without the use of heavy equipment. Metal from the framing, inverters, wiring and battery housing can be salvaged and recycled as scrap metal. The panels themselves are often sold or donated to other buyers that wish to refurbish and reuse them. The recycling industry for solar panels is currently small and contained to the US, but is growing. In 30 years time, recycling is projected to be more widely available, and panels could be shipped to the nearest recycling facility.

Wind turbine components require more planning to decommission and include the use of a crane. Steel tower components can be disassembled, shipped south and recycled as scrap. Wind turbine blades, which are made of fibreglass, are typically broken down and landfilled. However, there is considerable progress being made in creative reuse programs for turbine blades which diverts them from landfill. Infrequently, turbine components may be donated to other groups for refurbishment and reuse.

#### OTHER ALTERNATIVE ENERGY QUESTIONS

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Large, utility scale batteries play an important role in micro-grid renewable energy projects by storing excess energy (charging) when energy production is high, and releasing stored energy (discharging) when energy production is low. Renewable energy can be intermittent (eg. sun may go behind a cloud, or the wind can suddenly stop blowing) so this reservoir of energy storage helps to protect small, isolated grids from sudden drops or surges in power.

Battery energy storage systems are designed to be reused many thousands of times before they must be replaced. Eventually over time, however, batteries experience a decrease in their efficiency and energy storage capacity. Typically, large battery systems must be replaced every 15 years, depending on usage, and wear and tear.

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#### Is Waste-to-Energy hazardous?

Waste can contain harmful chemicals that are released into the air when burned freely without pollution controls. However, modern waste-to-energy facilities are designed with extensive pollution control systems that are very effective in preventing harmful air emissions from being released into the environment. Waste-to-energy systems can be a very effective way of utilizing waste that would otherwise just take up space in a landfill, and the energy produced can be used to heat or power homes and businesses. For waste-to-energy facilities to be successful, however, they need a large, reliable and consistent stream of waste, and thus are not often viable in smaller communities.

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#### Can we use waste heat from the power plant to heat the facility, homes, a pool or a greenhouse?

All of QEC's operations buildings already use waste heat from the diesel generators to heat the building interiors. However, there is still excess heat from the generators being released to the atmosphere which could be utilized for heating in other ways. The main limitation is the location of the building or facility to be heated, which must be nearby to the source of the heat. Heat from the generators could potentially be used to heat a new greenhouse or pool facility built nearby, but the viability of this varies from community to community. A number of Nunavut communities use waste heat from powerplants to heat additional buildings, and QEC is looking to bring this technology to even more communities.

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#### Would it be cheaper to use biomass (wood pellets) for heating instead of oil? How do we store it?

According to a high-level case study conducted for several Community Energy Plans conducted by Kivalliq Alternative Energy, biomass could be viable in Nunavut communities. However, there is no source of biomass nearby (eg. forests), and therefore wood pellets need to be shipped in and stored locally. There are uncertainties around the feasibility of storing an annual supply of wood pellets year-round, as wood pellets must be kept completely dry for proper combustion.

Kivalliq Alternative Energy may explore a pilot sized biomass project, which could be set up in either Coral

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LĎĽĿჼႯႶ⅃Ⴝ<ჼむĎႶႻႽჽჅჼႻႷႷႮჼႱჼჼ ᠋ᢇᠳᠤᡆ᠈ᢗᡥᢧᢞᢗᠫᡳᡥᢣᢂ᠈᠘ᠻᡲ᠂ᢣᠲᠯ,᠈ᡆᠼᠰᢋ᠘ᢕᢕᠾᡥ᠘ᡃᢆ ΓΡ<sup>4</sup>σ<sup>6</sup> (λ<sup>6</sup>), α<<sup>6</sup>"), Δ<sup>1</sup>L CΔL<sup>6</sup>α J<sup>6</sup> ΓΡ<sup>4</sup>C ᢧᡆᠸᢥᠮᡕ᠘ᢖ᠘ᡩᢨᢕᢥ᠋ᢃᡮᢝᡗ᠂ᠳ᠘ᡩᠰ プシ゚ィ。ᢗᠵᡪᡕᠵᠾ。ᢦᡶᡲ᠘ᢗᠮ᠈ᢋ᠘᠘ᠺ᠘᠙᠘᠙᠘᠙ᠺ᠘᠙ᠺ  $\text{PYA}^{\mathsf{C}} < \sigma^{\mathsf{P}} \cap \mathsf{CD}^{\mathsf{C}} \cap \mathsf{A}_{\mathsf{C}} \cap$ 











#### RENEWABLE ENERGY FAQs ってかしくつじゃん♪っといっていっぱん。ったっといってひ

Harbour or Naujaat. A pilot project would be small in scale and would run for several years to determine if wood pellets could be shipped in and kept dry for the long term. A pilot study would also test the cost effectiveness of such a program, and provide information about the quantity and quality of heat produced to better inform its use within the community. If a biomass pilot project was successful, larger scale biomass heating projects could be implemented across the Kivalliq region.









