

Solar PV Case Study

Lutsel K'e Dene First Nation, Northwest Territories

Photo: Dwayne Woolgemuth

Independent Solar Power Production Project

Lutsel K'e Dene First Nation is on the cutting edge of the clean energy transition by becoming the first independent solar power producer in Canada's Northwest Territories.

Community

Lutsel K'e is a remote, fly-in Dene First Nations community of approximately 350 people located on the east arm of Great Slave Lake in the Northwest Territories of Canada. Community members have long been looking for clean and autonomous energy alternatives to the three diesel generators that have been producing their electricity.

Motivation for the project

The Lutsel K'e Dene First Nation has wanted to produce their own power since the early 1990s. Their reliance on imported diesel fuel to produce electricity was not only expensive (\$0.61/kWh residential; \$0.52/kWh commercial) and emissions intensive, but also left the community dependent on fossil fuel and vulnerable to price and supply changes. With the intent of building knowledge and skills in renewable energy, the community evaluated run-of-river hydro as well as solar power.

Solar PV system

Ground-mount, micro grid-tied solar PV system

Overall system

- 35 kW solar PV array, grid-tied to local power utility with Power Purchase Agreement
- Placement: Direct south, 60° tilt
- System will have on-line monitoring capabilities for real-time viewing of electricity generation
- Expected annual electricity generation (modelled from RETScreen) – 39 MWh / year

Solar PV modules

- 12 strings of Jinko 250 watt poly-crystalline solar modules
- 144 panels in total, each row (made up of four strings) connected to a separate inverter, metered and fed into the grid

DC – AC Inverters

- Three Fronius IG Plus – 11.4 kW Delta
 - recommended PV power = 9.7-13.1 kW
 - maximum input voltage = 600 V DC
 - maximum efficiency = 96.2%
 - operating temperature range = -25°C to 55°C

Racking and ground-mount systems

- Three sections of racking; each has two rows of 24 modules in portrait with a fixed tilt at 60 degrees
- Ground-mount system is secured on innovative foundation: specially designed mounts are weighed down by two rows of gabion baskets filled with locally sourced gravel. Each wire mesh basket is 3 by 3 metres by 1 metre deep.

Other details

- The system is located in an abandoned diesel tank farm. An environmental study found no soil contamination. The area is now maxed out, so there is no room to grow the solar array in this location.
- The system will run year round. It will receive four to five hours of sun on December 21. November to January are expected to be very low production months. Sunlight reflection from snow and the cool weather in spring (April) are expected to result in higher production. Summer months will be most productive.
- The system achieves a 20% average electricity load share, complying with the Government of the Northwest Territories' 2012 *Solar Energy Strategy*.
- The system produces 39 MWh of electricity annually.

Project life cycle

Lutsel K'e Chief and Council decided that independent solar power was the preferred option; they worked with the Arctic Energy Alliance (a non-profit society in the NWT) to issue requests for proposals in August of 2014. By early September, Northwest Solar Inc. in partnership with Canadian Solar Institute were selected to design and install a 35 kW solar system and provide five days of solar training. Training was underway by the end of the month. Four community members completed the training; two of these assisted with the installation of the system.

October 2014	Materials arrived on three charter flights
November 2014	Ground-mount supports were completed
Early 2015	Electrical equipment installed to connect to the existing Northwest Territories Power Corporation's grid
April 2015	Initial electrical inspection completed
Late September 2015	Final electrical requirements should be complete; system is expected to be ready for final electrical inspection and be up and running

Lutsel K'e, the Arctic Energy Alliance and the solar installer also spent some time in the local school teaching students about renewable energy.



Financials

Lutsel K'e owns and operates the solar PV system as an independent power producer. A power purchase agreement between the First Nation and Northwest Territories Power Corporation was established and will provide ongoing stable revenue from the sale of the electricity to the community.

The community raised financial and in-kind support for the project from various sources including:

- EcoENERGY for Aboriginal and Northern Communities, which provided \$100,000 towards the capital cost of the system
- Government of the NWT Environment and Natural Resources and Municipal and Community Affairs
- Bullfrog Power, which provided meaningful funding at a critical stage and provided guidance during the power purchase negotiations
- Lutsel K'e Human Resources Department
- Lutsel K'e Dene First Nation, which provided significant in kind contribution including staff time, construction of electrical shed, use of heavy equipment and vehicles, fuel and gravel

The entire project is estimated to require a \$330,000 investment.

Project highlights

Even though Lutsel K'e championed this project, the community worked collaboratively and forged new relationships with a variety of partners to ensure project success. This included financial, technical and capacity building assistance as well as the very unique Power Purchase Agreement between the community and the Northwest Territories Power Corporation.

Involvement of the entire Lutsel K'e community has led to pride of ownership of the new solar PV system. Four community members completed the five-day solar training course and two of these elected to work on the installation. Students in Grades 7 -12 learned about and discussed the new electricity generation system with the installers, AEA and the Lutsel K'e Dene First Nation senior administrative officer.

The Lutsel K'e community was nationally recognized in 2015 with CanSIA's Game Changer award.

