CASE STUDY

Old Crow Solar Project

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The Old Crow community, home of the Vuntut Gwitchin First Nation (VGFN), is located 800km north of Whitehorse, inside the Arctic Circle. The nation repeatedly refers to its desire to live in symbiosis with nature and its environment, including reducing its dependency on diesel. Installing 900kW of solar panels and 350kWh of battery storage—the largest solar project in the Yukon[1]—will soon increase the community's energy self-sufficiency and reduce its greenhouse gas emissions.

Photo credit: Ben Power

"ANOTHER CYCLE IS BORN"

Throughout the years, Vuntut Gwitchin community leaders have invested in services they depend on —airline carriers, construction companies and power—in order to be as independent as possible. The Vuntut Gwitchin Government has been fully involved in this project and has taken a strong leadership position in managing it. The solar park project is rooted in the drive to reduce the use of diesel in the community and the use of planes to fly the fuel in.

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"Anything that affects our community, we want to have control over. That's our goal with this project, is to have ownership over the facility." [2]

- William Josie,
  Executive Director for the VGFN

[1] https://microgridnews.com/old-crow-renewable-microgrid/
[2] https://thenarwhal.ca/meet-first-nation-above-arctic-circle-just-went-solar/

INNOVATION

BBA FOR SUPPORT

BBA and our associate, 3eyond Consulting, worked together to provide the Vuntut Gwitchin Government with technical support in designing the solar farm and providing specialist advice negotiating an energy purchase agreement with the utility ATCO.

In addition to being Yukon's largest solar park, the project is the first of its kind for this territory. Yukon had no off-grid IPP policy, so our mandate extended to advising the Yukon government to prepare legislation, which would protect ratepayers, the IPP and utilities. This allowed the Vuntut Gwitchin to invest in and receive a return on investment from the project, significantly enhancing their economy and social quality of life.

BBA and 3eyond, along with significant input from Solvest in Whitehorse, designed this 450kW off-grid solar project to reduce the use of diesel by the utility in the community. The plant was specifically designed to be grid forming and to be integrated with the diesel generator, allowing 100% solar generation during long periods in the summer.

Our experts provided support to those who came up with the idea, the Vuntut Gwitchin, and enabled a renewable project that demonstrated our client's environmental stewardship while enhancing social, economic and cultural quality of life for the people of Old Crow and Vuntut Gwitchin citizens.

COMPLEXITY

MAXIMIZING CAPTURE OF ENERGY NORTH OF 60°

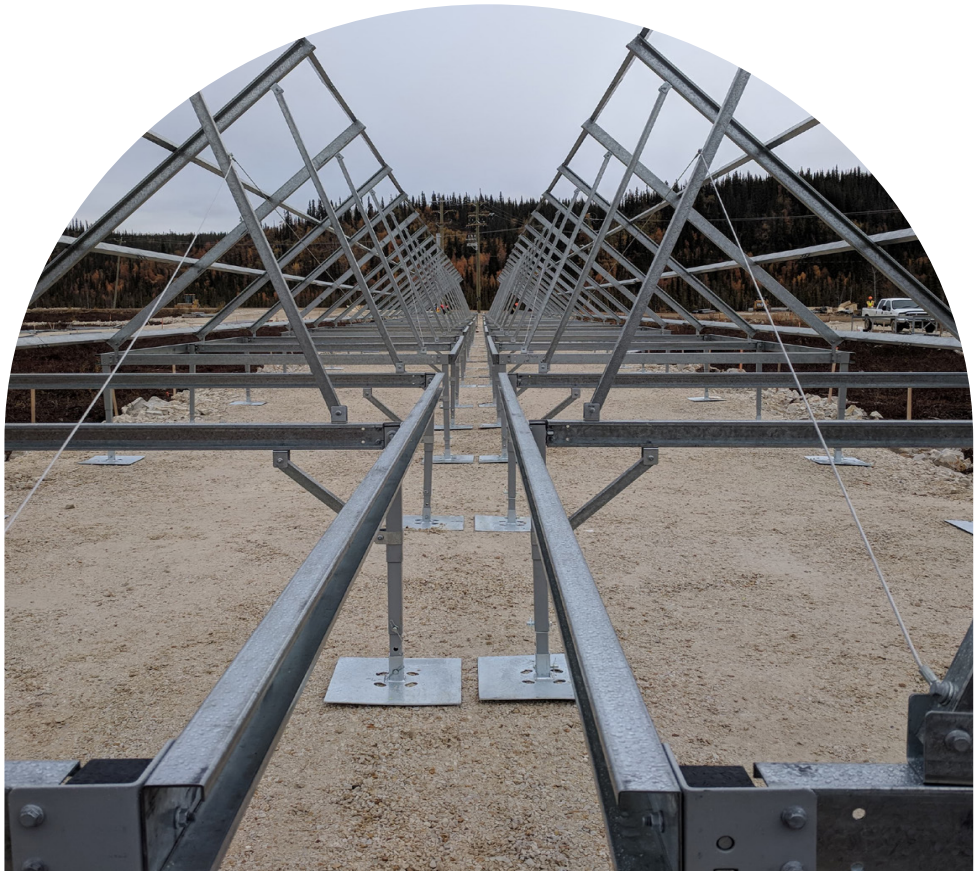
BBA and 3eyond used Helioscope and Homer software to analyze multiple options for panel location, orientation, number and size, resulting in a unique back-to-back design rather than south-facing. We also focussed additional effort on optimizing the angle of the panels, to maximize energy from the arctic suns' low trajectory.

This involved analyzing many years of demand data from the community and matching it to records of sunshine days. With this design, solar generation can be optimized daily and seasonally. In-community test arrays were set up to confirm some findings, including trackers vs. fixed arrays. In addition to maximizing energy, the "back-to-back" panel design reduced wind uplift forces, allowing us to minimize foundation size and save cost. The Homer analysis enabled us to optimize battery size with PV capacity, while a unique optimizer design from Solvest allowed us to reduce inverter costs.

Since travelling to Old Crow is only possible by air, designs must incorporate local materials or be transportable, eliminating large quantities of steel, wood and cement.

MINIMIZING IMPACT ON PERMAFROST

BBA consulted with Porcupine Enterprises Ltd. (a Vuntut Gwitchin contractor) to gain local knowledge of permafrost issues. They recommended we develop a design that would prevent heat and water from entering the ground. BBA's geotechnical team's foundation design incorporated a shrewd combination of insulation, geotextiles and drain tile. Meanwhile, our mechanical team identified weld procedures for use at site and the civil team designed piling foundations for the e-building.



SOCIAL AND/OR ECONOMIC BENEFITS

People from the VGFN are at the core of this project and the social benefits are great. By working closely with the community, the BBA team ensured that technical and social enhancement was included.

EYE ON TRADITION

The solar park needed to be installed in a sensitive environment, at the heart of an area traditionally used for gathering berries. At the suggestion of the Vuntut Gwitchin, we paid great attention to creating areas on the site to grow native plants that grew there prior to construction. Also, contrary to the common practice of enclosing solar panel farms with fences to prevent access, the site is completely open, while the electrical wiring is protected inside the solar panel “tents”. The citizens, as well as local wildlife, can therefore go there freely and gather berries in season.

A LONG-TERM VISION

We forecast that the project should generate nearly $400,000/year, after financing is paid back. The Vuntut Gwitchin intends to reinvest this revenue into the community, ensuring its future, a long-term vision that ties in with the traditional values of the Vuntut Gwitchin community.

PAVING THE WAY

By being the first to embark on this type of venture, the VGNF is paving the way for other First Nations interested in becoming almost entirely independent of diesel—in Yukon, and across Canada. This is evidenced by the fact that the Yukon Research Centre is currently working on identifying northern communities interested in replacing a portion of their consumption with greener energy.

ENVIRONMENTAL BENEFITS

In Canada, over 170 remote aboriginal communities still rely on diesel for power. Its transport, either by truck, barge or, as with the VGFN, plane, is ineffective and adds to greenhouse gas emissions.

One of the first goals of the VGFN in this project was to align energy consumption with the community's values.

LESS DIESEL, MORE CLEAN ENERGY

The project reduces both social and environmental risks associated with transporting diesel to the community. Moreover, it reduces the VGFN's carbon dioxide emissions, saving 190,000 litres of diesel per year, which is the equivalent of taking 140 cars off the road. This way, the community has less of an impact on global warming, while reducing human risk, a win-win situation from all angles!

MEETING CLIENT NEEDS

BBA and 3eyond provided the VGFN with full support, from project design to energy purchase negotiations.

The team put together for this project (VGFN, BBA, 3eyond Consulting, Porcupine Enterprises, Solvest and ATCO, with additional support from Tetratech and Challenger in Whitehorse) addressed many complex engineering and social issues to bring this project to a successful conclusion.

The Vuntut Gwitchin community is proud of its project, which will add to the nation's autonomy and demonstrate its ability to incorporate innovative technology into its traditional values.

"We talk about owning our own community, so this is exciting[.] This partnership [between ATCO and the community] is going to go a long way and people are going to learn and they're going to want to get involved." [3]

- Former Vuntut Gwitchin Chief, Bruce Charlie

[3] https://www.yukon-news.com/business/vuntut-gwitchin-first-nation-plugs-in-old-crow-solar-power-project/

APPENDIX 1

About BBA

BBA has been providing a wide range of consulting engineering services for over 40 years. Today, its engineering, environmental and commissioning experts team up to quickly and accurately pinpoint the needs of industrial and institutional clients. The firm's expertise is recognized in the Energy and Natural Resources industry. With 16 offices in Canada and internationally (Chile), offering clients local support and field presence, BBA is recognized for providing some of the industry's most innovative, sustainable and reliable engineering solutions.

Energy

Mining and metals

Biofuels, oils and gas

Industrial and manufacturing

pharmaceuticals, agri-foods, wood and forestry, pulp and paper

Fostering ingenuity
to better value nature.

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