



PROJECT

Grise Fiord Power Plant

CONTEXT AND INNOVATION

Grise Fiord is located 1,516 kilometers from the North Pole and is Canada’s northernmost inhabited community, where temperatures are among the lowest in the world. Access to this community is difficult to say the least.

The mission of the Qulliq Energy Corporation (QEC), the only electric utility in Nunavut, is to provide the people of this region with safe, reliable, sustainable and affordable electricity services. QEC was seeking to replace its ageing facilities with a new and more efficient 905 KW power plant.

The project involved substantial design constraints, and it had to be completed on a very tight schedule because of the harsh climate and the very short navigation season. Since just getting to the site is a challenge, building a power plant there represents a formidable undertaking!

INNOVATION THROUGH TRANSPORTATION

In partnership with EBC and SM-Construction, BBA proposed the installation of a **prefabricated modular power plant**.

This innovative design gave us the opportunity to build and assemble the plant in Québec City and then have it shipped to Grise Fiord, which solved this project’s complex logistical challenges.

The BBA team designed the power plant as seven prefabricated modules. These modules were assembled, tested and commissioned in Québec City. Once the plant was ready, the team supervised its disassembly, packing and transportation and then shipped the modules to Grise Fiord. At destination, the team loaded the plant onto a temporary barge, transferred the seven modules to a trailer and then transported them to their final location to complete their installation.



► INNOVATION

Before shipping the power plant 3,350 km, all tests, including an 11-hour endurance test, were run to ensure the plant was operating optimally at the manufacturing site in Québec City.

This innovation significantly reduced construction costs and complexity in Canada's northernmost community. Additionally, the risks associated with the project's construction and shipping were greatly mitigated.

The team optimized the design using 3D modelling, resolving problems upstream and allowing construction to be completed on schedule. The team also designed an innovative structure built entirely of steel to facilitate moving: the structure, pilings, floor, walls, studs, interior and exterior cladding —everything in steel!

BBA also made sure that the power plant's equipment complied with the IEC 61850 standard, allowing interoperability of all protection and control applications, and significantly reducing the quantity of cabling and the risks of communication errors between the plant's systems.



COMPLEXITY

FROM GREAT COMPLEXITY TO GREAT SIMPLICITY

Faced with a highly complex project, BBA succeeded in finding an extremely simple solution. And yet the challenges were many: difficult site access, limited construction period, high shipping costs and the need to bring in workers from far.

The central, modular design, relying entirely on steel, made pre-assembling the modules in the manufacturing plant a straightforward process and allowed the team to conduct the tests at the manufacturing site. Being able to detect any defect prior to shipping the plant 3,350 km from Québec City—1,140 km north of the Arctic Circle—meant the team could optimize installation time and achieve substantial savings. Transport costs were further reduced, as steel is a relatively light material to concrete.

Given the location and climate of Grise Fiord, there was an extremely short window of time for transporting the parts to the site and for constructing and commissioning the plant. Initially, it was thought that the project would have to stretch over a period of several years. However, through pre-assembly and tests conducted at the manufacturing plant, the team managed to accelerate the work and limit the time spent on site—a significant advantage with the scarcity of a local workforce. As a result, the schedule was shortened by one year.

In summary, by using a steel-based design and adopting a modular approach, BBA and its partners mitigated project risks. The work could be completed efficiently, more quickly than expected, and, most importantly, within the allocated budget.



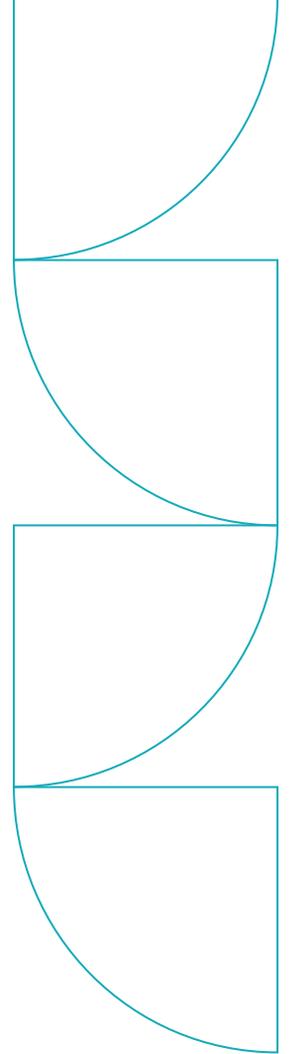
► SOCIAL AND/OR ECONOMIC BENEFITS

SAFEGUARDING THE HEALTH AND SAFETY OF LOCAL RESIDENTS

Grise Fiord is the most remote community in Northern Canada. QEC, Nunavut's sole electricity utility, shoulders the responsibility of supplying people in the region with safe, reliable, sustainable and affordable electricity services. In this context, it is unthinkable that a community such as Grise Fiord should have to rely on a power plant that had reached the end of its service life.

In today's world, most means of communication depend on electricity. Without a reliable working power plant, inhabitants were at risk of being cut off from the rest of the world, a situation that nobody wants to contemplate.

In addition, the location of the new power plant was moved away from the community to improve the quality of life for the some 140 residents of Grise Fiord. Since the plant is no longer in the centre of the village, hazards related to its operation and acoustic footprint are better controlled.



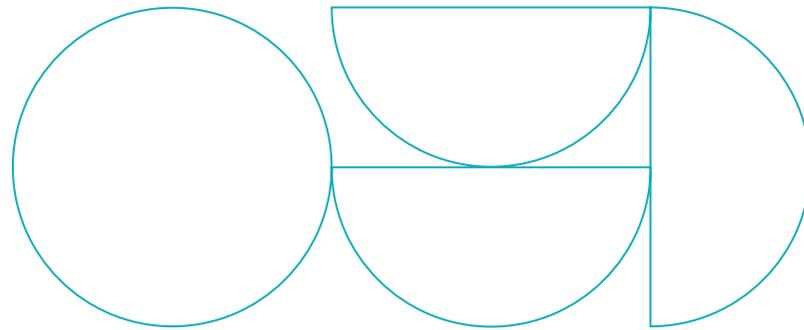
ENVIRONMENTAL BENEFITS

MORE MODERN. GREENER.

Replacement of the Grise Fiord power plant was part of a major drive to rejuvenate QEC's services. Since facilities had exceeded their service life by a number of years, modernization was essential.

Energy efficiency concepts have progressed greatly in recent years. QEC's modern, reliable new power plant, with its eco-energy generators, considerably reduces the utility's environmental footprint in the region.

BBA included a glycol system in its design to make the plant self-sufficient with regard to heating. Heat generated by the four generators' diesel engines is recovered and distributed through the power plant's heating system. The offices, electrical room and mechanical room are maintained at temperatures that are comfortable for workers and safe for equipment—a profitable, economical and sustainable solution.



MEETING CLIENT'S NEEDS

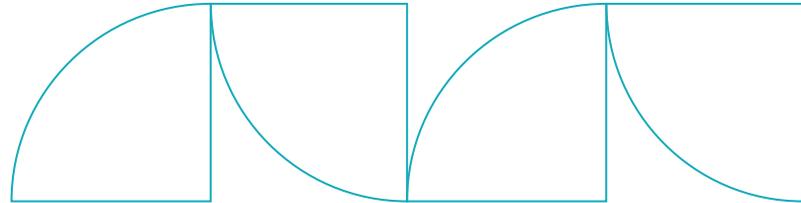
WARMING BODY AND SOUL

The client's request was executed with flair by all partners involved. Opting to install a modular prefabricated power **plant** meant that:

- the schedule was shortened by a year.
- the costs of transporting materials and of staffing the construction site with qualified labour in a remote location were reduced.
- the risks associated with transport and construction in arctic conditions were mitigated effectively.

This being said, in addition to the team's efficiency, the greatest contribution to the client's satisfaction has been the fact that the power plant was commissioned flawlessly and has experienced no major problem since it entered service on November 22, 2018.

No power outage has occurred since the new power plant came on stream, which not only made QEC but also all the inhabitants of Grise Fiord very happy, particularly since temperatures hover close to $-50\text{ }^{\circ}\text{C}$ in the depths of winter!



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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