MELIADINE MINE
COGENERATION PLANT

40 YRS

BBA

CANADIAN CONSULTING ENGINEERING AWARDS 2020

ASSOCIATION OF CONSULTING ENGINEERING COMPANIES | CANADA

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TABLE OF CONTENTS

INNOVATION	3
COMPLEXITY	4
SOCIAL AND ECONOMIC BENEFITS	7
ENVIRONMENTAL BENEFITS	8
MEETING CLIENT NEEDS	11
APPENDIX 1	12

80 % **TOTAL ESTIMATED ENERGY EFFICIENCY**

Thanks to high-performance generators and the heat recovery system's innovative design

The Meliadine gold mine, owned by Agnico Eagle, is about 25 km north of Rankin Inlet, Nunavut—more than 1,500 km from Montréal. The site is one of Canada's largest mining projects since 2015 and can only be accessed by sea and air.

COMBINING EFFICIENCY, ENVIRONMENT, AND TECHNICAL AND ECONOMIC FEASIBILITY

Supplying power to such remote mining facilities can be a real challenge. Agnico Eagle was looking for an economically viable and socially acceptable solution. It mandated BBA to carry out the detailed engineering and participate in the construction management and commissioning of a 28 MW cogeneration plant, equipped with five generators, as well as the mine site's thermal and electrical systems. The team proposed an innovative solution that optimized the heat recovery process, given the highly variable electrical and thermal loads.

SHORT- AND LONG-TERM SAVINGS

In the past, mining companies tended to minimize capital investment and foster a conservative approach. In collaboration with the client's integrated team, BBA suggested using 720 rpm generators, which, despite their higher initial cost, would offer better performance.

Up to 24 MW of thermal energy could be recovered, heating all buildings on the main site and providing much of the thermal energy required to heat the underground mine.

LEADING THE WAY

Mining operations in the north are typically powered by Arctic diesel. Natural gas, which would be a lower-carbon alternative—with 25% fewer GHG emissions—was not suitable for two reasons: first, the consumption of liquefied natural gas, which remains insufficient in remote areas, and second, the enormous cost of storing it.

BBA designed a concept so the client could diversify its energy mix in the future by making it possible to easily convert the plant to natural gas. The client will also be able to integrate wind power to further lower GHG emissions. In doing so, Agnico Eagle is setting an example in the mining industry by demonstrating that economic viability and environmental awareness can go hand in hand.

COMPLEXITY

DESIGNING FOR THE FAR NORTH

Building in the Far North is complex in many ways, starting at the design stage. The extreme cold pushed BBA experts to design an exceptionally reliable electrical and thermal system. Site access was also a challenge, because boats could only be used after the ice melted, leaving a very short window to deliver materials. Another complicating factor was the limited lifting capacity on site.

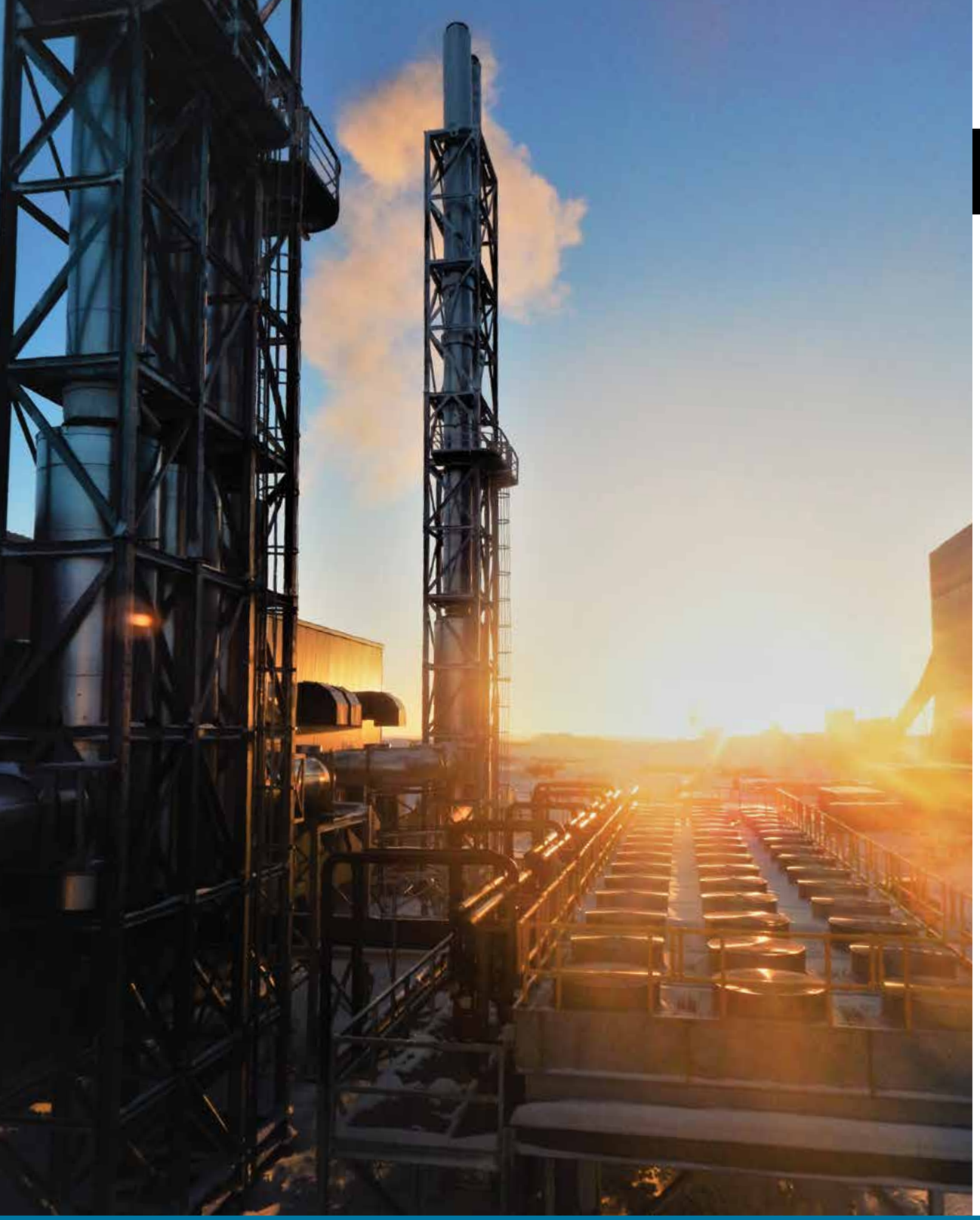
COMPLEX LOGISTICS

Constructability is an issue that requires fine-tuned logistics. In collaboration with the client, BBA used a modular construction approach, which involved prefabricating some of the power plant buildings. This reduced onsite labour and increased worker comfort.

THOROUGH PLANNING

BBA and the project team made every effort to optimize the sequencing of work activities and to take advantage of the warm season. Given long delivery times, the generator was ordered first. Because of equipment size, we would normally wait for it to arrive before building the main facility around it. Instead, we decided to construct the building upstream so employees could start work as soon as possible, protected from the weather. The building design was therefore cleverly adapted for the large equipment by strategically defining openings.

SINCE THERE WAS NO PORT, EQUIPMENT WAS UNLOADED DIRECTLY ONTO THE SHORE.



SOCIAL AND ECONOMIC BENEFITS

PRIORITY TO WORKER SAFETY

Worker safety and comfort is always important. BBA studies suggested installing an acoustic ceiling that reduced ambient sound levels by 50%. The studies also indicated that the power plant's stack design should be modified to improve air quality for workers. Moreover, the off-grid power system's design was recognized as one of the safest in Canada for significantly reducing arc flash hazards.

COMMUNITY BENEFITS

Agnico Eagle is committed to making a positive impact in the communities where it operates and in the lives of its employees. The Meliadine mine is a major socioeconomic player in the region, employing nearly 500 workers. Agnico Eagle and the Kivalliq Inuit Association (KIA) signed an Inuit Impact and Benefit Agreement (IIBA), which BBA kept in mind throughout the process of purchasing the equipment for the power plant.[1]

The generator BBA recommended and integrated into the design was 5% more efficient than those used in conventional power plants, providing improved electrical efficiency and reducing annual diesel costs by $2.5 million. Thanks to the "free" and clean heat recovery in the winter, we achieved as much as 80% efficiency, saving an additional $2 million on diesel costs against the industry standard.

[1] https://www.agnicoeagle.com/English/operations-and-development-projects/operations/meliadine/default.aspx

ENVIRONMENTAL BENEFITS

DESIGNING FOR REDUCED ENVIRONMENTAL IMPACT

The challenges industrial companies face today include carrying out a socially acceptable and economically viable project while reducing environmental impacts. BBA's engineers and environmental service consultants work closely in terms of sustainable development.

CONCLUSIVE RESULTS

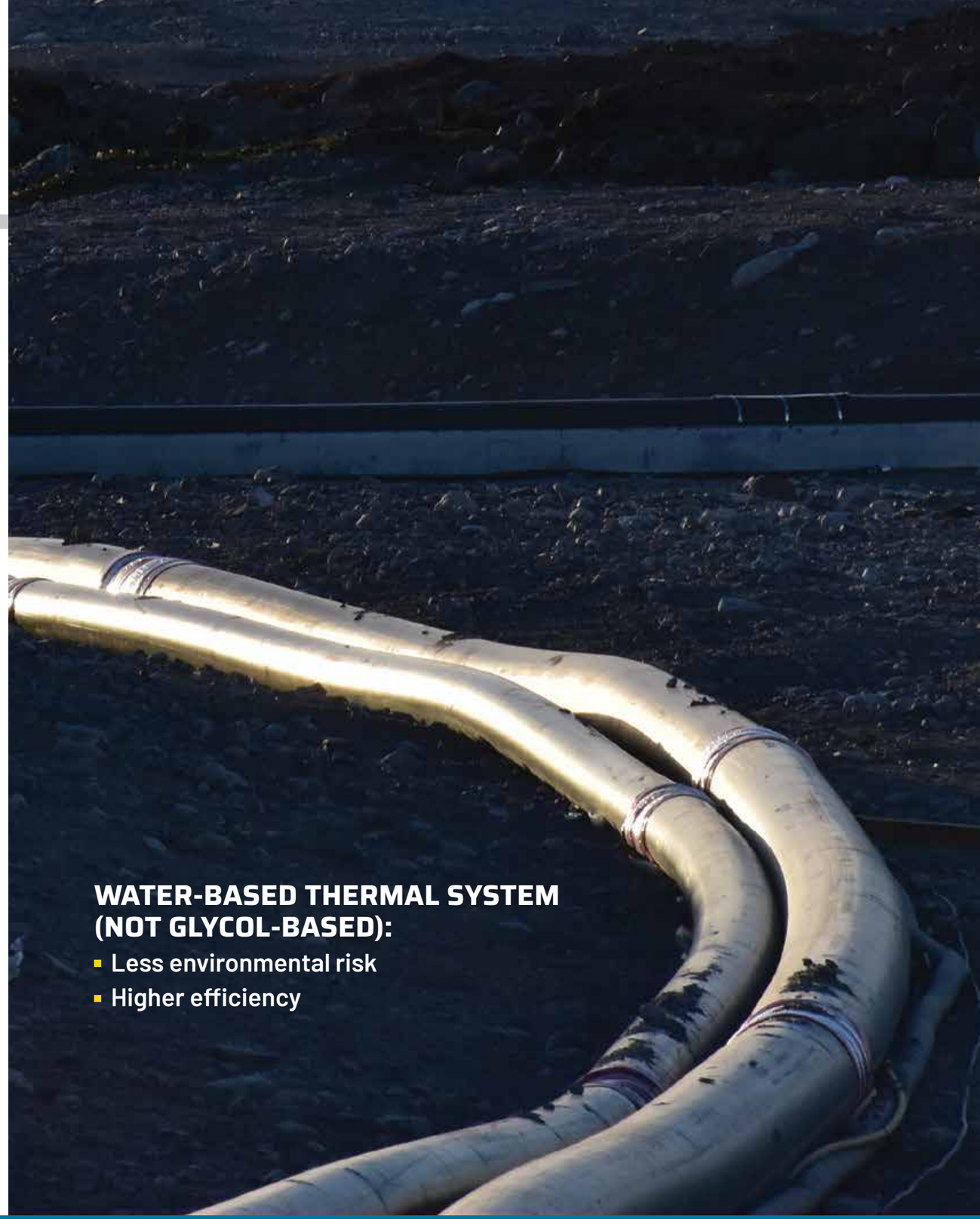
By opting for cogeneration, Agnico Eagle has shown a clear commitment to reducing its environmental footprint. Implementing a series of efficiency measures at the Meliadine mine site has reduced GHG emissions by 12,000 tonnes per year, the equivalent of over 3,000 cars on our roads.

The equipment installed at the mine site is more efficient than conventional generators, lowering diesel consumption by 2.5 million litres per year. With heat recovery, annual diesel consumption can be reduced by an additional 2 million litres.

Opting for a thermal system that uses water instead of glycol not only provides a better means of delivering heat, but also reduces the environmental risk in the event of a spill.

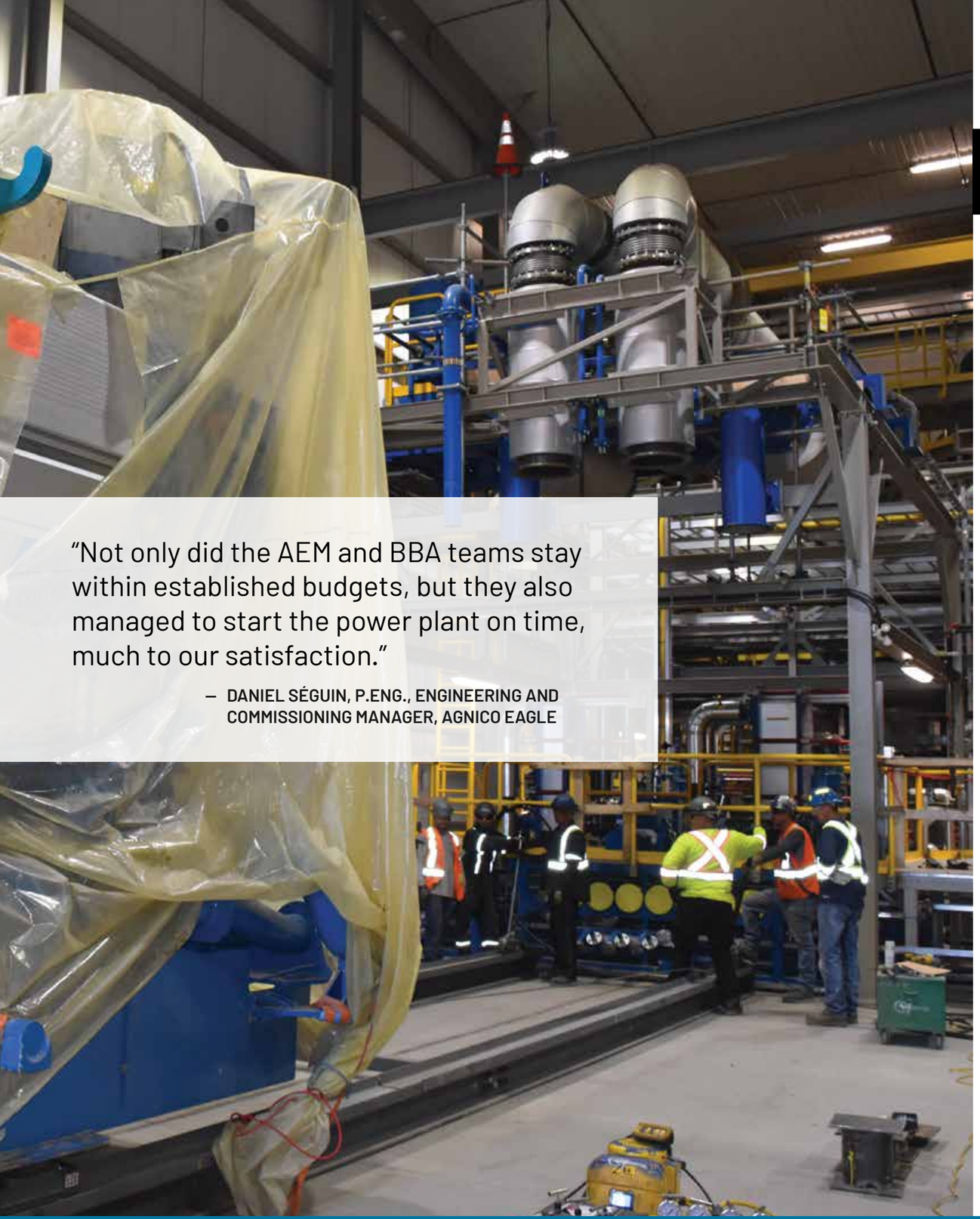
BBA also used a project overview to design the power plant in such a way that the generators used during the construction phase could be reused for ongoing mine site operations.

Every last project detail led to responsible resource management.



WATER-BASED THERMAL SYSTEM (NOT GLYCOL-BASED):

- Less environmental risk
- Higher efficiency



“Not only did the AEM and BBA teams stay within established budgets, but they also managed to start the power plant on time, much to our satisfaction.”

— DANIEL SÉGUIN, P.ENG., ENGINEERING AND COMMISSIONING MANAGER, AGNICO EAGLE

MEETING CLIENT NEEDS

ACHIEVING THE CLIENT’S VISION

BBA has been able to partner with Agnico Eagle to offer innovative and flexible solutions that reduce its environmental footprint while controlling its operating costs.

BBA’s reliable and robust solution maintains power to critical systems and ensures worker safety—a priority in extreme climates. When compared to the previous power plant, power outages have been shortened by more than 80%.

A COMMITTED TEAM

From preliminary studies to commissioning and construction support, Agnico Eagle was always able to rely on the BBA team’s expertise and commitment, which has proven to be a key benefit in the success of the Meliadine cogeneration plant.

Agnico Eagle acknowledges the self-sufficiency of BBA’s experts. By ensuring that each stage of the project was carried out according to plan, BBA gave the mining company peace of mind and the chance to focus on its area of expertise, i.e. mining processes. This is the most valuable aspect of a relationship with a business partner.

APPENDIX 1

BROADER THINKING. ON-POINT ENGINEERING.

BBA has been providing a wide range of consulting engineering services for 40 years. Engineering, environment and commissioning experts team up to quickly and accurately pinpoint the needs of industrial and institutional clients. Recognized for its innovative, sustainable and reliable solutions, the firm stands out for its expertise in the fields of energy, mining and metals, biofuels, and oil and gas. BBA has 12 offices across Canada to provide local support and offer clients increased onsite presence.

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Energy

Mining and Metals

Biofuels, oil and gas

Other industries

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