

Hydropower the Key to Northern Development

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Knight Piésold Consulting

Knight Piésold Consulting is an international consulting company providing comprehensive engineering and environmental services for the mining, power, water resources, transportation and construction sectors. Founded in South Africa in 1921, the company has expanded worldwide, with over 900 employees based in offices across five continents. Knight Piésold opened its first Canadian office in Vancouver in 1975, and currently employs over 200 people in Canada working on projects world-wide, including in Canada's remote north.

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Mr. Jeremy Haile has over 40 years of experience in all aspects of both large and small project development throughout the world. He acted as President of Knight Piésold Ltd. (Canada) from 1990 to December 2012, and now acts as a Principal Consultant and member of the Global Management Team of the Knight Piésold global group. He specializes in project concept development including all aspects of planning, environmental baseline studies, feasibility studies, investigations, financing, contractual arrangements, permitting, impact assessments, risk assessments and financial viability. His experience is associated with mining waste management, environmental remediation, hydroelectric projects and water infrastructure projects, with direct project involvement in North and South America, Southeast Asia, Europe and Africa.

One thing everyone can agree on is the need for a reliable source of energy for any form of existence in the Canadian north. With the extreme cold and shortage of sunlight hours throughout the winter, energy for heating and light is of paramount importance. This becomes even more important for any form of mining venture where there are large power requirements to run the mine. To date there has been almost total reliance on diesel powered electricity generation for any development outside the electrical grids of Yukon Energy in the vicinity of Whitehorse and NWTP in the vicinity of Yellowknife, both of which are supported by hydropower. Diesel generation is expensive due to both the volatility of world oil markets and the logistical constraints involved in supplying and storing fuel for remote locations. In an ideal world it would be nice to be able to use some form of renewable energy, but obviously solar will not work in the winter months and wind power is unreliable and technically challenging in extreme winter conditions. Hydropower will, in the right locations, provide an economic alternative to diesel generation either as a diesel replacement in the summer months only, or as a complete alternative if storage can be provided. In addition, hydropower will result in a legacy asset that could provide cheap, reliable electricity to adjacent communities for many decades after the initial capital cost is paid off.

Knight Piésold has carried out a number of studies for Qulliq Energy Corporation (QEC) in Nunavut and mining companies throughout the north to identify potential hydropower facility locations that would serve as cost effective alternatives to diesel generation. Precipitation throughout the north is relatively low with much of it falling as snow. Rivers are therefore subject to extreme variations in flow from a short summer high flow freshet consisting mainly of snowmelt to very

low flows in the winter months. However, catchment areas can be very large and the general topography of the Canadian Shield and the region's glacial history means that bedrock is close to surface along most river valleys and steep gradients, waterfalls or rapids exist on many river systems. Potential sites for hydropower require the right combination of catchment area, river gradient, potential storage sites and proximity to the proposed development (i.e. electrical load). The suitability of sites for construction of storage dams to allow for winter generation will depend greatly on the environmental attributes of the potentially flooded area but in many cases this could be bare rock with the potential benefits far out-weighting any adverse environmental impacts.

Diesel generated electricity currently costs in the range of \$0.40/kWh to \$0.60/kWh and will vary depending on world oil prices in the future. Hydropower facilities in the north are obviously more expensive than ideal sites further south and could be in the range of \$10,000/kW to \$20,000/kW of installed capacity. A significant capital outlay is required to bring a hydropower facility into operation but the operating costs thereafter are very low. Typically the payback period against diesel is in the order of five years, with significant on-going savings for decades to follow. The environmental benefits will also include the elimination of greenhouse gas emissions from diesel generation.

Mining companies can be the vehicle for the development of new hydropower facilities and as the primary off taker provide the revenue to pay off the initial capital. Thereafter, the hydropower facility could be a major driver for increasing the ore reserves and hence mine life by lowering operating costs, and transmission lines could be used to interconnect remote communities with these legacy assets when mining is completed. •