NORONT EAGLES NEST PROJECT

ENERGY ALTERNATIVES TO DIESEL

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ABSTRACT

Environmental assessment in Canada has come a long way since the early 1970's in both its approach and content. The intent of the environmental assessment process is to evaluate projects for their environmental, economic and social costs and benefits. The Noront Eagle's Nest mining project is currently undergoing a comprehensive environmental assessment with strict timelines that limit the nearby community of Webiquie's ability to study the proposal and seek possible alternatives. A 25 megawatt diesel generator will be supplying all the power to the mine which brings with it many possible negative environmental effects. Possible alternatives to powering the mine and the community itself will be looked at with the intent of providing the community with informed choices with long term benefits. Alternative energy projects usually require a separate environmental assessment which complicates the planning and funding of projects where alternative energy solutions are looked at to power another major project such as a mining operation.

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NORONT EAGLE'S NEST PROJECT

This project is a combined nickel/copper mine proposed to be located 25km southwest of Webequie First Nation. The mine project will have an expected life of 11 years and be powered on diesel generators. A full 25 megawatts (25 million watts) of power is required to run all the machinery and infrastructure associated with the project. There are currently no transmission lines connecting the community to the Ontario electrical grid so the community itself also is powered by diesel generators. We intend to look into different options to power the mine and also alternatives for the community itself to use cleaner and more sustainable power sources that are within the means of the community.

Hydro-electric power is a proven technology that is an option for the community but will require construction of a dam and flooding of areas that might be of cultural importance. Run-of-the-river technology is also a proven option that requires less modification of the river but will require burying a pipe below the frost line to carry water to spin the generation turbines. Fish can easily swim around these smaller structures as shown in the photos on the next page.

Figure 1. Run of river technology (ROR Power 2009).

Biomass is also a proven technology that is a possible alternative to diesel for the community itself to power larger buildings. There are currently no access roads in the area and no forestry operations, so the mining company may be unwilling to invest in a feasibility report that may find that biomass is not able to provide the power necessary for the mine. Biomass may be a better option on a smaller scale for the community for its own power needs.

Wind and solar power are “greener” options for the mine site that may be a bit complex for the mining company to undertake. A baseload of reliable power will be required when wind and/or solar are not producing energy, which would likely be diesel or hydro power. Being connected to the grid would solve some of the complexity issues but introduces the potential problems of a transmission line corridor. Smaller scale wind and solar are good options for the community itself because the prices have come down for both technologies, and are to a certain extent modular. The community could start with a small solar array that can be added to over time which allows entry into this technology at a much reduced price. Wind power is very site specific which will require measuring the wind-speed over a year at selected sites. The portable tools for

this are inexpensive and could be run as a college or university study at a much lower cost compared to a consultants cost.

Solar thermal power is an older and proven technology that cannot power the mine site but is a worthwhile option for the community. Solar thermal systems can heat liquid in a tank (similar to a conventional water heater) to heat water for home use and also power in-floor heating. A single home system would cost a few thousand dollars but would also reduce the amount of electricity used for a water heater and the amount of heating energy required. These systems would augment current systems and require very little modification of current buildings. This technology has a short payback period of 7-8 years in many applications.

We intend to look into some possible alternatives to diesel power and look into the costs, benefits and drawbacks of each possible solution. Some of the solutions may not be suitable to power the mine project but may be worthwhile for the community to consider as cleaner energy alternatives for their community use. Lower cost and less complex solutions will be looked at for the community in the event that there is little outside support to ensure the solutions are realistic in a real world context.

DIESEL POWER: ADVANTAGES AND DISADVANTAGES

The diesel engine was invented in 1897 by Rudolph Diesel and is used extensively worldwide in vehicles, submarines, locomotives and generators (whoinvented.org 2012). The technology is very reliable and used over gasoline engines because diesel is not explosive like gasoline and the fuel can be stored

for long periods of time. Diesel engines are also more efficient than gasoline engines and tend to be very durable and long lasting. Diesel fuel is heavier than gasoline and is more like a light oil which is also very stable. Most diesel comes from petroleum but some comes from biological sources like vegetable oil or animal fat. Petroleum diesel contains toxins and particulates that contribute to air and water pollution making it a “dirty” technology. Since it is also mostly derived from petroleum, it is also non-renewable.

Diesel exhaust is produced when an engine burns diesel fuel. It is a complex mixture of thousands of gases and fine particles (commonly known as soot) that contains more than 40 toxic air contaminants. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. It also contains other harmful pollutants, including nitrogen oxides (a component of urban smog). Diesel exhaust particles and gases are suspended in the air, so exposure to this pollutant occurs whenever a person breathes air that contains these substances. As we breathe, the toxic gases and small particles of diesel exhaust are drawn into the lungs. The microscopic particles in diesel exhaust are less than one-fifth the thickness of a human hair and are small enough to penetrate deep into the lungs, where they contribute to a range of health problems.

Diesel exhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde and nickel) have the potential to contribute to mutations in cells that can lead to cancer. In fact, long-term exposure to diesel exhaust particles poses the highest cancer risk of any toxic air contaminant

evaluated by the Environmental Protection Agency (EPA). The California Air Resources Board (CARB) estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles (CARB 1997).

Smaller remote communities like Webequie already get their power from diesel generators because there are no transmission lines from the Ontario grid to the community. Noront has expressed interest in obtaining power from the grid if possible on their website (Noront resources 2011). Buying power from Hydro One is much simpler than producing power and shipping in fuel on Ice roads and by air. Connection to the Ontario grid would benefit the community of Webequie and eliminate the need for polluting diesel. Being connected to the grid also allows the mining company or the community (or both) to consider producing at least a portion of their power in an alternative energy project and sell it to the Ontario Power Authority (OPA) at a premium price under the Green Energy Act.

ONTARIO FEED IN TARIFF

All green energy projects in Ontario can qualify for the feed in tariff provided they are connected to the grid. The following chart was taken directly from the O.P.A. website in figure 2.

Feed-in Tariff Prices for Renewable Energy Projects in Ontario August 13, 2010			
Renewable Fuel	**Size tranches**	**Contract Price ¢/kWh**	**Escalation Percentage[5]**
Biomass[1,2]			
	≤ 10 MW	13.8	20%
	> 10 MW	13.0	20%
Biogas[1,2]			
On-Farm	≤ 100 kW	19.5	20%
On-Farm	> 100 kW ≤ 250 kW	18.5	20%
Biogas	≤ 500 kW	16.0	20%
Biogas	>500 kW ≤ 10 MW	14.7	20%
Biogas	> 10 MW	10.4	20%
Waterpower[1,2,3]			
	≤ 10 MW	13.1	20%
	> 10 MW ≤ 50 MW	12.2	20%
Landfill gas[1,2]			
	≤ 10MW	11.1	20%
	> 10 MW	10.3	20%
Solar PV			
Rooftop	≤10 kW	80.2	0%
Rooftop	> 10 ≤ 250 kW	71.3	0%
Rooftop	> 250 ≤ 500 kW	63.5	0%
Rooftop	> 500 kW	53.9	0%
Ground Mounted	≤ 10 kW	64.2	0%
Ground Mounted[2, 4]	> 10 kW ≤ 10 MW	44.3	0%
Wind[3]			
Onshore	Any size	13.5	20%
Offshore	Any size	19.0	20%

Figure 2. Ontario Feed in Tariff rates (OPA, 2010).

Should transmission lines be built to this area, green energy investment could be a source of revenue for the local community and even the mining company. Such an investment would be a long term jobs and revenue stream as opposed to the eleven years of the mining project.

HYDROELECTRIC TECHNOLOGY

Hydroelectric technology provides almost 50% of Ontario's power and is a very reliable form of technology. The Sir Adam Beck generating station in Niagara Falls is 80 years old and continues to be one of the most reliable sources of energy in the province. Smaller scale hydro has been done in the

north with good results with one major drawback; it requires building a dam and flooding large areas for a reservoir. Many rivers in the north are of great cultural importance and necessary to the fishing and hunting done by the local communities. A damming project could power the mine and the local community but would require a trade-off many people might be unwilling to make.

RUN OF RIVER HYDRO TECHNOLOGY

An alternative to a dam project is a technology known as run-of river technology. This technology is much less invasive to a river and has proven to be very reliable. A structure must still be built in the river but fish can still swim upstream and very little flooding results from these structures. A snapshot of such a structure on the Brandywine River is shown in Figure 3.

Figure 3. Run of river on the Brandywine River (ROR, 2009).

The power created from this technology is dependent on the vertical drop of running water and dependent on seasonal flow. This means the power output will vary from season to season in contrast to conventional hydro. A base load of power would be required from a generator or connection to the grid. There

are currently 40 of these projects in various stages across Canada with at least as many more being proposed.

Deer Lake, Newfoundland, cut its diesel use in half in a single year and as the project progresses that figure will most likely drop even more in the future. The Deer Lake run-of-river project helped to save approximately $400,000 worth of diesel fuel between 1999 and 2000, while also lowering operating costs. In conventional energy systems, 75 to 90 cents of every energy dollar leaves the local community. Locally-owned or locally-developed projects are often pursued as a means of keeping a higher proportion of energy dollars circulating in the community. Research has also indicated that locally-owned wind power projects create about 10 times more economic activity in the local community than large developments owned by companies from outside of the community and region. The same economic benefits may be true of other forms of locally-owned or locally-developed renewable energy production (Canada's Rural Partnership 2011).

Many proponents talk of good jobs for 11, 16 and 20 years for the local community but locally owned or run power projects provide revenue for 20, 30 and even 50 years or more. The OPA contracts for green energy projects are for 20 years creating a guaranteed revenue stream for that time which could assist a smaller community like Webequie in obtaining financing for such a project. The mining companies that are trying to develop projects which require large amounts of power could consider this when approaching a community during the environmental assessment process. With the number of projects being

proposed in the Ring of Fire area it might make sense for mining companies to consider alternative energy projects and lobby the provincial government for a transmission corridor to bring that power to the grid. This could represent a possible revenue stream for companies and the communities where these projects are proposed.

WIND POWER

Wind power is growing in popularity in Ontario and the technology is proven in Canada and many other parts of the world. More new wind power capacity was installed in the EU in 2009 than any other electricity-generating technology. Thirty nine percent of all new capacity installed in 2009 was wind power, followed by gas (25%) and solar photovoltaics (17%). Europe decommissioned more coal, fuel oil and nuclear capacity than it installed in 2009. Taken together, renewable energy technologies account for 62% of new power generating capacity in 2009 (European wind association 2012). Wind technology requires a base load since it is not always producing power and can reduce the amount of diesel used in a community. Large power projects using this technology require a large investment to create large amounts of power, 25 mega-watts in the case of the Eagles Nest project. It is unlikely that wind power could power the mine but it can certainly reduce the amount of diesel used and might be a worthwhile investment on a smaller scale.

SOLAR POWER

Solar electric power from photovoltaic panels is one of the most maintenance-free technologies that lasts at least 30 years with normal use and frequently longer. These panels only create power with a light source and also need a base load for around the clock use. This technology is also the most expensive technology but the price for panels has fallen 50% in the last 10 years. This technology is also modular, meaning a small array of panels can be added to over time to increase output or whenever more money is available to upgrade the array. A 25 mega watt array would be prohibitively expensive but a much smaller array for the communities power needs might be within reach with present resources.

Solar thermal technology is one of the oldest technologies that exists and is also very reliable and proven world-wide. This is a heat producing technology that will work year round (although better in the warmer seasons) that can reduce the amount of diesel and propane used in the community. The costs for this technology are among the lowest of any “green” technology and the payback period is very short. This technology may be within the reach of the communities’ resources as a way to reduce the use of diesel. The money saved stays in the community instead of leaving the community to pay for and ship in diesel fuel. The community would actually own this and with ownership usually comes pride and caring for the project.

BIOMASS

Biomass is also a greener technology that is being used to replace coal in some generating stations. Lack of forest access roads and infrastructure prevents this technology from being used on a large scale and to create large amounts of power. Lack of inventory data north of the area of undertaking prevents an estimate of the size of the resource available for development. A small scale pellet operation to provide heat for community buildings (school, health clinic, administrative buildings or recreation centre) might be a realistic option for the community to reduce use of diesel and propane.

RECOMMENDATIONS

The simplest solution for the mine project and the community is to have access to the Ontario grid to power the infrastructure. The costs of extending the grid to remote areas of the north may prevent this option from becoming a reality in the near future, given the current weakness of the economy. Present day alternative energy technologies provide options for communities currently using diesel generators like Webequie. Each technology has advantages and disadvantages along with financial and environmental costs. Run of river technology appears to be the best current option for making larger amounts of power with a lower environmental impact. Wind and solar power are good options should the grid be extended to the far north as an alternative to diesel and a possible source of revenue. These technologies could also reduce diesel use if the grid does not get extended into the north. The environmental and health benefits of reduced diesel emissions might be a selling point to this

community. Solar thermal might be a worthwhile investment to individual buildings to reduce emissions since this technology is less expensive and has a short payback time. In the end the community should choose which technology to use giving them a sense of empowerment and control over their future.

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