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Jean Marie River Solar and Wind Summary Report

Introduction

Since 2005, the Aurora Research Institute (ARI) has researched the wind energy potential for communities in the NWT that are served by diesel. In Jean Marie River, ARI has studied the feasibility of both wind and solar energy and compared them with diesel power generation.

Assessment of Wind and Solar Energy Potential

The average wind speed in Jean Marie River was measured to be 2.0 m/s at 10 m above ground, which is too low for wind energy to be cost effective in the community (at least 4 m/s at 10 m is needed). As a result, the wind economics were not evaluated for Jean Marie River. The average solar energy potential was estimated at 2.9 kWh/m^2/day (daily insolation), which is considered to be good for solar electricity production.

Proposed Solar Projects

Two applications were proposed for Jean Marie River in this study: one was home-based, and the other was a larger utility scale grid-connected application. The first application was a net-metering (connected to the home side of the utility meter) installation of a 5 kW solar panel system (or “PV array”), assumed to be owned by a private residential power consumer. The second application was a larger grid connected project of 18 kW, owned and operated by an independent power producer, or the utility owning the diesel plant.

Production and Cost of Solar Energy

A home-based rooftop PV array of 5 kW would produce about 4,855 kWh per kW and displace 1,766 litres of diesel per year. This system size would cost about

$30,000 to install. Assuming an electricity rate of $0.601/kWh in Jean Marie River, the solar energy system would cover its own costs in 10.7 years.

A utility scale, 18 kW solar energy system (fixed array, mounted on the ground with a 50° tilt) in Jean Marie River would produce 19,386 kWh per year without producing significant excess electricity, and would displace 7,052 litres of diesel per year. An 18 kW ground-mounted system would cost about $126,000 to purchase and install. This size of system would supplement the community's power supply, but not replace it entirely.

For an 18 kW utility scale project, the levelized cost of energy (LCOE) would be $0.560 per kWh. The LCOE of diesel electricity in the community was estimated to be $0.615 per kWh, so the payback for this solar project would take about 11 years.

NTPC could consider the installation of a smaller diesel generator in Jean Marie River more suited to the small electrical load there. This would likely make the diesel plant more efficient and would also allow a higher penetration level of a utility-scale solar project. Alternatively, a battery bank operated on a cycle-charge basis for times when the electrical load is low may be worth considering.

Conclusions

If Jean Marie River is considering alternative energy developments, the use of solar energy generation would be a great option. Solar is a cost-effective alternative compared to diesel generation.

The full Jean Marie River Solar and Wind Monitoring Update Report is available for download at www.nwtresearch.com

For more information on this or other wind energy studies in the NWT, contact the Aurora Research Institute at:

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