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Fort Providence 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 Fort Providence, ARI has studied the feasibility of both wind and solar energy and compared them with diesel-powered generation.

Assessment of Wind and Solar Energy Potential

The average wind speed in Fort Providence 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 Fort Providence. The average solar energy potential was estimated at 2.95 kWh/m^2/day (daily insolation), which is considered to be good for solar electricity production.

Proposed Solar Projects

Two applications were proposed for Fort Providence 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 4,900 kWh per kW and displace 1,335 litres of diesel per year. This system size would cost about

$27,500 to install. Depending on the electricity rate calculations for Fort Providence, the solar system would pay for itself in 9.5 to 12.3 years.

A utility scale, 50 kW solar energy system (fixed array, mounted on the ground with a tilt of 50°) in Fort Providence would produce 53,150 kWh per year without producing significant excess electricity and would displace 14,482 litres of diesel per year. A 50 kW ground-mounted system would cost about $325,000 to purchase and install. This size of system would supplement the community's power supply, but not replace it entirely.

For a 50 kW utility scale project, the levelized cost of energy (LCOE) would be $0.582 per kWh. . The LCOE of diesel electricity in the community was estimated to be $0.356 per kWh, so the payback for this solar project was calculated at about 27.1 years.

NUL could consider the installation of a smaller diesel generator in Fort Providence 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 solar project.

Conclusions

If Fort Providence 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 Fort Providence Solar and Wind Monitoring Analysis 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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