RETScreen® International
Clean Energy Decision Support Centre

CASE STUDY

ASSIGNMENT 02

WIND ENERGY PROJECT

WINDFARM REPOWERING / ALBERTA, CANADA

DESCRIPTION OF ASSIGNMENT

You have been hired by a wind energy project developer that is interested in purchasing older windfarms and repowering them with modern wind turbines. You have been asked to look at an existing wind energy facility and prepare a pre-feasibility study on their behalf. The site that the firm is considering is a 19 MW facility consisting of 52 wind turbines that are 10 years old, no longer supported by the original manufacturer, and the operations & maintenance costs are rising. The firm wants to examine the possibility of repowering the facility with 19 MW of newer, more efficient turbines. The firm wants to use a Nordex N43 600 kW model for this project. Based on original wind resource studies, as well as ongoing wind monitoring, it is thought that the site has anomalous wind shear, such that higher towers put rotor blades in lower wind speeds. Thus, a 40 m tower has been chosen over taller versions.

Among the challenges of the project are the complications of using, wherever possible, existing infrastructure (wires, substation, etc.) and certain limitations in the existing supply contract. The windfarm has a contract under a special government renewable energy program from the 1980's, designed to explore and stimulate renewable energy. This 20-year contract does not accommodate green power premiums or the sale of emissions reduction credits, and requires government approval for significant changes to technology, sites or contract terms.

SITE INFORMATION

The site is located in southwest Alberta, on a high ridge that is situated almost perpendicular to the strong local winds. The nearest weather data are from Lethbridge, AB, however the firm has access over 10 years of nearby wind data at 10 m and has found the average wind speed to be 1.1 m/s higher than reported at Lethbridge. The original wind study suggested that the wind shear is unusual at the site: the wind shear exponent is 0.15 to about 30 m, then begins to reverse, and wind speeds are actually thought to decrease with increasing height. The site already includes a substation for interconnection, and there is good access for cranes and construction equipment. With communities nearby, the cost of travel and accommodation is modest.

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Canada

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FINANCIAL INFORMATION

Financial figures for the analysis are provided by the firm (income tax rate of 28%, inflation at 2.5%, debt ratio of 70%, debt interest rate of 8.5%, discount rate of 8.5%, and a debt term of 10 years). The debt term of the project was originally 20 years, but with only 10 years left in the contract, must also now be 10 years. The project does not qualify for the immediate expensing of capital costs permitted under Canadian tax law for energy exploration investments. The capital cost of all new wind turbine equipment is therefore depreciated at a 30% declining balance. The repowered project is expected to last for 25 years. The price for the remaining 10 years of the contract is fixed at $0.06/kWh. It is assumed that the salvage value of the existing equipment will equal the cost of decommissioning and removal.

Prepare a RETScreen study, documenting any assumptions that you are required to make, and report on the significant conclusions from this analysis.