

CASE STUDY

ASSIGNMENT

06

WIND ENERGY PROJECT

OFFSHORE WINDFARM / COPENHAGEN, DENMARK

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DESCRIPTION OF ASSIGNMENT

A public electric utility has approached you, a wind project developer, to prepare a project due-diligence report on the financial viability of building an offshore windfarm near the harbour of Copenhagen, Denmark. The project is to feed electricity to the national grid and to be partially owned and financed by an investors' co-operative.

SITE INFORMATION

The proposed site, the Middelgrunden shoal, has long been used as a waste dumpsite. It now has a water depth of 2-6 meters and is restricted for ship traffic. The Risø National Laboratory has established an average wind speed of 7.2 m/s at 50 m height at the site. The windfarm is to consist of twenty 2 MW turbines from Bonus Energy A/S. The turbines have a hub height of 64 m and a rotor diameter of 76 m. Bonus provides the following power curve data for the turbine:

Wind speed (m/s)	Power curve data (kW)
3	0.1
4	29.1
5	113.7
6	225.2
7	366.3
8	582.0
9	852.5
10	1,151.4
11	1,451.2
12	1,707.5
13	1,875.2

Wind speed (m/s)	Power curve data (kW)
14	1,956.2
15	1,986.6
16	1,996.2
17	1,999.0
18	1,999.7
19	1,999.9
20	2,000.0
21	2,000.0
22	2,000.0
23	2,000.0

For the greenhouse gas analysis, the conventional generation fuel mix that the wind energy would displace is approximately as follows: 17% #6 oil, 28% natural gas and 55% coal.

FINANCIAL INFORMATION

For the project's 25-year analysis period, assume a 2.5% inflation rate and a 9% discount rate. The initial feasibility study for the project has provided the following cost estimates:

Item	Cost (Euro, €)
Feasibility study	€680,000
Wind turbines	€26,100,000
Turbine foundations	€9,900,000
Transmission lines & grid connection	€11,400,000
Planning & consultants	€2,150,000
Establishment of co-operative	€540,000
Other & contingency	€1,610,000
Total	€52,380,000

For this due-diligence study, you are not required to estimate detailed project costs but rather can use the values provided here.

Based on previous experience, operation and maintenance costs, including major parts replacements, are expected to average €0.009/kWh. The use of the government-owned site is free-of-charge to the project. The feasibility study was paid in full by a grant from the Danish Energy Agency. The project is to be financed primarily through equity.

For the first 6 years of production, the project is guaranteed a power purchase price of €0.044/kWh plus a green energy premium of €0.036/kWh. In subsequent years, the total price (including green premium) is projected to be €0.057/kWh, escalating at 2.5% per year.

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