Project Objective:
Development of a Wind Farm Off the Coast of Galveston, TX

Wind Farm Design

Foundation Types
The fixed bottom foundation will be used within the Galveston Wind Farm project. Some main foundation type considerations include price, geotechnical compatibility, and strength.

Transmission Lines
Array and Export cables will have to laid out so there is the least amount of cabling needed to transmit the electricity in order to achieve maximum profitability.

Turbine Research
Class 3 winds are identified within the lease area, so an offshore wind turbine selection will have to be optimized so the maximum amount of power can be produced at 7.5 m/s wind speed.

Lease Area Selection and Bid

Lease Area Considerations
• Bathymetry
• Geotechnical Data
• Ocean Activities
• Environmental Impacts

Staging and Port Criteria
Staging and Port Criteria will solely depend on selection of turbine and wind farm size. This criteria will include:
• Port storage size
• Port quayside length and weight capacity
• Port distance from windfarm site
• Access availability for heavy cargo ships
• Ground bearing capacity
• Crane availability

Figure 1. Offshore wind turbine foundation variations. Source: MDPI 2020

Figure 2. Offshore wind power transmission. Source: NYSERDA 2021

Table 1. Turbine technology assumptions for Gulf of Mexico offshore wind cost analysis. Source: BOEM 2018

Figure 3. Comparative scale of four 10 MW conceptual Gulf of Mexico turbines, showing increasing rotor diameter with decreasing specific power. Source: BOEM 2018

Figure 4. Power curves for four 10 MW conceptual Gulf of Mexico turbines with custom specific power ratings. Source: BOEM 2018

Figure 5. Gulf of Mexico technical offshore wind resource area, showing average wind speeds at 100 m (328 ft). Source: BOEM 2018

Economic Analysis

Economic Considerations
The goal of this project is to maximize profitability in order to appeal to an investor. This will require a financial analysis over the life-time of the wind farm.

Financial Analysis will consider:
• Capital Expenses
• Operation and Maintenance Expenses
• Cost of Energy
• Potential Economic Incentives
• Return on Investment
• Payback Period, NPV, IRR

Figure 9. Partner after-tax cash flows.

Table 3. Sample cost analysis of offshore wind farm

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