California Coastal Turbine Project

Presented by:
Daeeun Kim
Rajesh Narine
Stephen Sarno
Edgar Loja Espinoza

Introduction

Image of a blackout in a california suburb (New York Times)

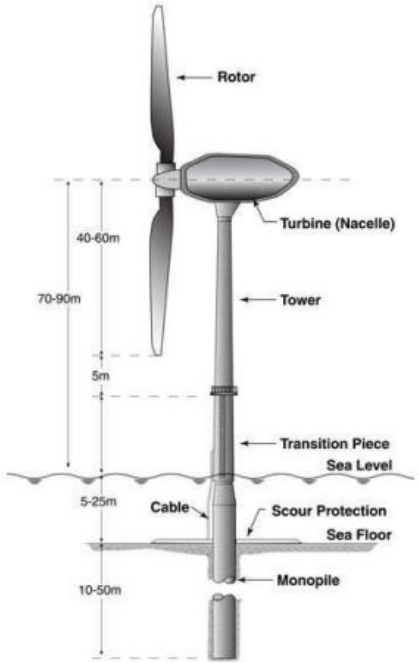
- The state of California suffers from massive blackout problems as the weather in the state fluctuates.
- Blackouts cause power outages in an entire region (in which they share the same power supply source).
- Once electricity is out, the entire power supply in the area is cut off.
- In California, common causes of blackouts are heat waves and wildfires, damaging energized lines and equipment, and disrupting the power supply.

Coastal Turbines

What is needed to help make this possible?

- State government funds.
- State government approval for this project.
- Testing sites for materials being used.

Technical Approach



Wind Turbine System Components (Malhotra, 2007)

- Wind turbine farms will be set up off the coast of San Francisco in Gray Whale Cove State Beach.
- These turbines would connect to the San Francisco grid and deliver power to San Francisco.
- The design of the wind turbine that we will follow is a design known as monopile, a design in which the base of the turbine is fully driven into the ground.
- A monopile wind turbine design was decided as it seems most stable and structurally sound.

Technical Description

- A monopile pipe is what the base of the turbine is made of
- The Monopile weighs about 2,500 tons
- The monopile has a diameter of 12 meters
- The transition piece is a tubular piece of steel
- The transition piece is 32 meters long, 8.3 meters in diameter, and 950 tons

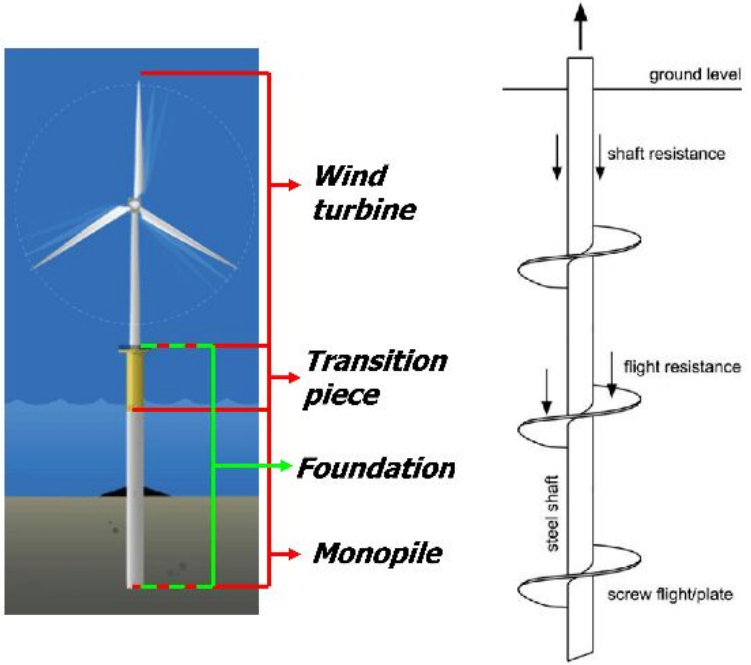


Diagram of an offshore turbine (Brown, 2023)

Quality Assurance Plan

Risks

1. Danger of ocean weather
    a. Including hurricanes
    b. Rising sea level
2. Ocean’s environment
    a. especially salt
3. Maintenance of turbines requires money and human resources

Prevention

1. To keep the turbines safe from the sea environment, they should be designed to withstand wind speeds of at least 70 meters per second (m/s) or roughly 140 knots
2. The tower should be built using tubular steel which is highly resistant to corrosion
3. Turbines should go over maintenance on a regular basis
    a. This process could be handed over to the state government
    b. A turbine must be checked at least three times per year, and more are recommended

Expected Project Results

The expected immediate results from this plan are a supplementation of power into the main power grid of the city of San Francisco.

1. This would allow for the city to have a cleaner source of energy
2. Help power more homes, businesses, and essential buildings during a blackout
3. This is built to mainly affect those that may suffer from power outages the most during a time of intense heat, such as the elderly and sick.
4. We also expect to have little effect on the surrounding ecosystem, as well as fully preserved property values.

Schedule

- Installing the foundation and tower could be done around 24 hours, and installing the parts takes time similarly. However, the process could be delayed due to weather conditions.
- At a fast rate, installing a single turbine could be done in a week.
- Installing all the turbines (at least 15 turbines) and adjusting, including the height and cables should take no longer than two months (under no severe weather problem).
- Best time to install the turbines would be between May to September, which is called ‘Dry Season’ for less rain.
- The average lifespan of offshore turbines is approximately 20 years. The towers should go over maintenance every three months, and blades every month.

Budget (Direct Cost)

Billing	Quantity	Per Unit Cost	Total Amount
2.5 Mw Wind Turbines (See Below)	15	4,000,000	60,000,000
Mechanical Engineers	4	30,000	120,000
Civil Engineers	4	30,000	120,000
Environmental Engineers	4	30,000	120,000
Electrical Engineers	4	30,000	120,000
Construction Crew	20	14,400	288,000
Materials Transportation	n/a	n/a	50,000
Jack-up Barge	1	2,000,000	2,000,000

(Table 1, 2, 3, 4: Evaluation of direct cost of the turbine and installation)

These charts break down the costs of both salaries and materials that will be used in the project

Budget (Direct Cost part 2)

(Table 1, 2, 3, 4: Evaluation of direct cost of the turbine and installation)

Turbine Parts	Cost
Nacelle	1,000,000
Rotor	475,000
Tower	175,000
Other (Assembly, etc…)	850,000

Balance of Plant	Cost
Cables	170,000
Turbine Foundation	280,000
Offshore Substation	120,000
Onshore Substation	30,000
Operations Base	3,000

Installation	Cost
Foundation Installation	100,000
Offshore Cable Installation	220,000
Turbine Installation	200,000

Budget (Indirect Cost)

Financial Consideration	Price
Insurance	500,000
Land Surveyor	5,000
Contract Fees	30,000

(Table 5: Evaluation of indirect cost spent for turbines)

- This is a break down of the financial cost and possible burdens that might come up during the project.
- The total cost of this project is predicted to be 64,000,000 dollars to build, along with about $50,000 for operating and maintenance costs.

Conclusion

What are we asking for?

1. State government funds to help pay for this project.

2. State government approval to let us proceed with this project.

3. Testing sites for our civil engineers to test each material and piece for the turbine to make sure it's safe to use.

Thank you for listening!

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