Offshore Wind Potential for New Zealand

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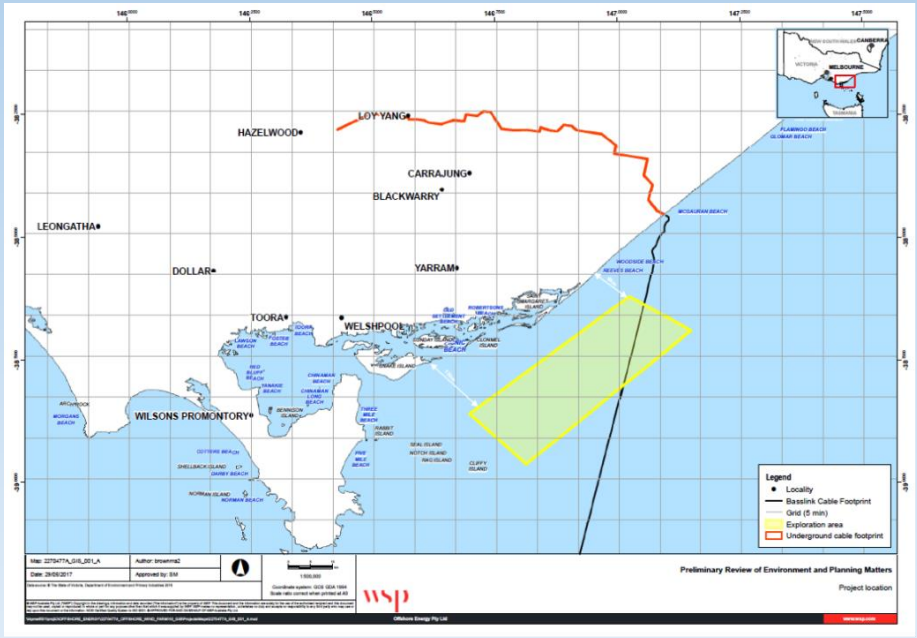
12 June 2019

Offshore Wind around the World

- Global installed capacity 2018 – 23 GW
- ‘Star of the South’ – First offshore wind farm in Australia
- Hywind Wind Farm – First floating wind farm in the world

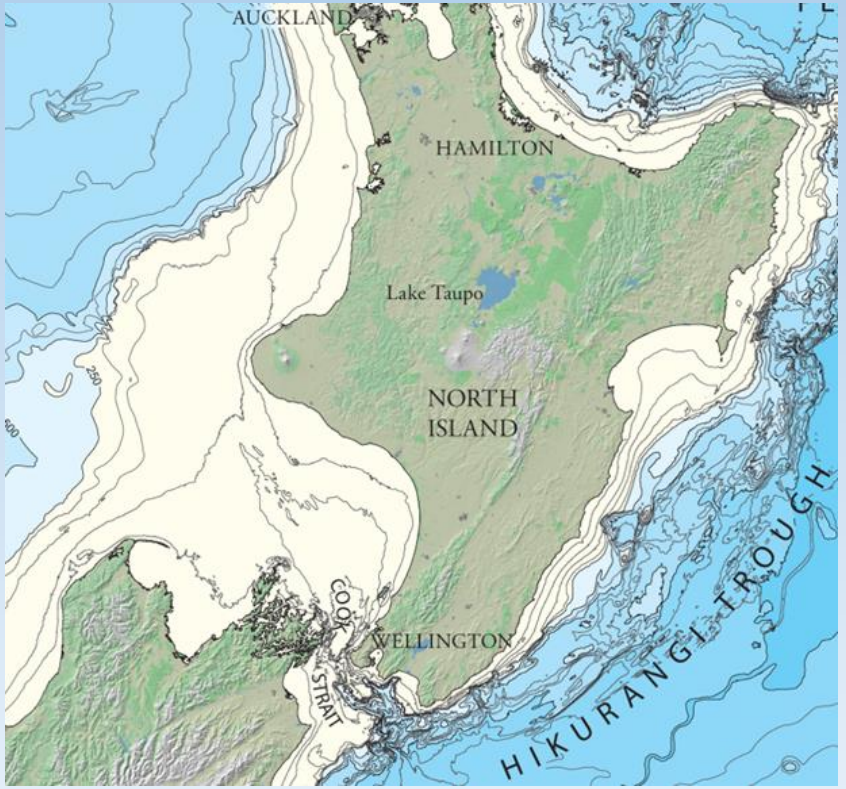
(Equinor, 2018)



(CleanTechnica, 2018)

This Study: South Taranaki

- Previous study identified an additional 26,620 GWh/yr is required for the electrification of stationary energy and transport.
- Shallow shelf identified off the coast of South Taranaki.
- Wind data was available at Maui A & B offshore platforms.
- Offshore infrastructure established in Taranaki



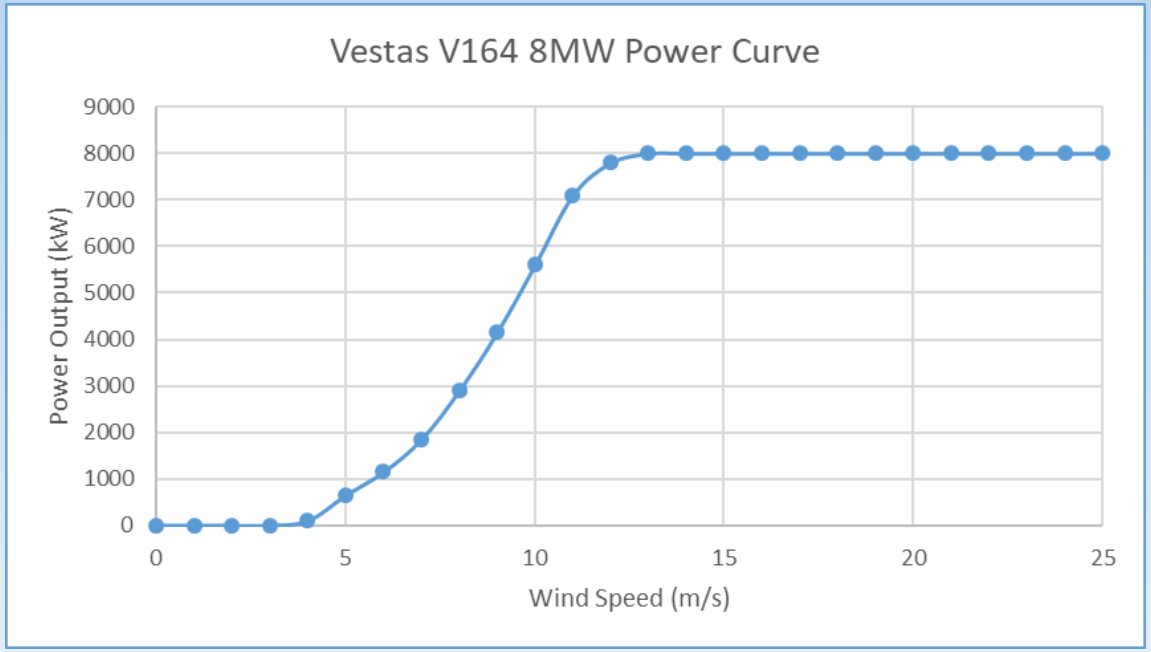
(NIWA, 2018)

Objectives

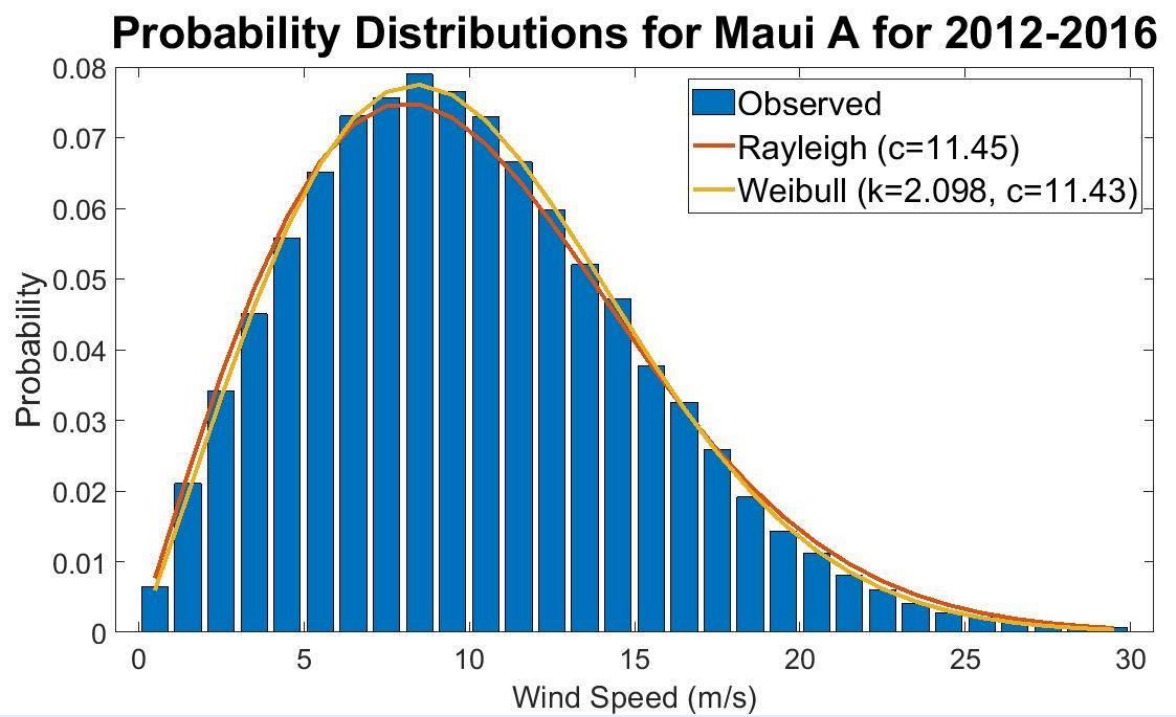
- To evaluate the offshore wind resource and estimate potential electricity generation.
- To evaluate the physical constraints in siting an offshore wind farm in South Taranaki.
- To understand any correlations in the power production between a potential offshore wind farm and existing onshore wind farms.
- To understand the logistical issues in the installation of an offshore wind farm in South Taranaki

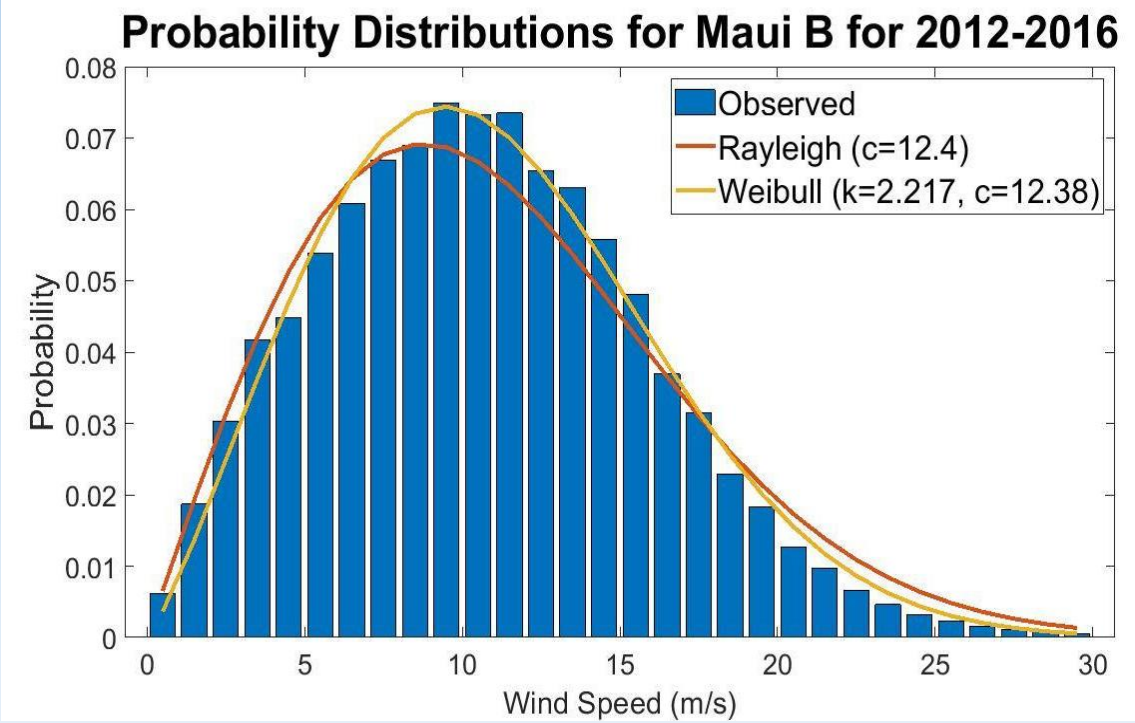
Vestas V164 – 8.0 MW

(CleanTechnica, 2012)

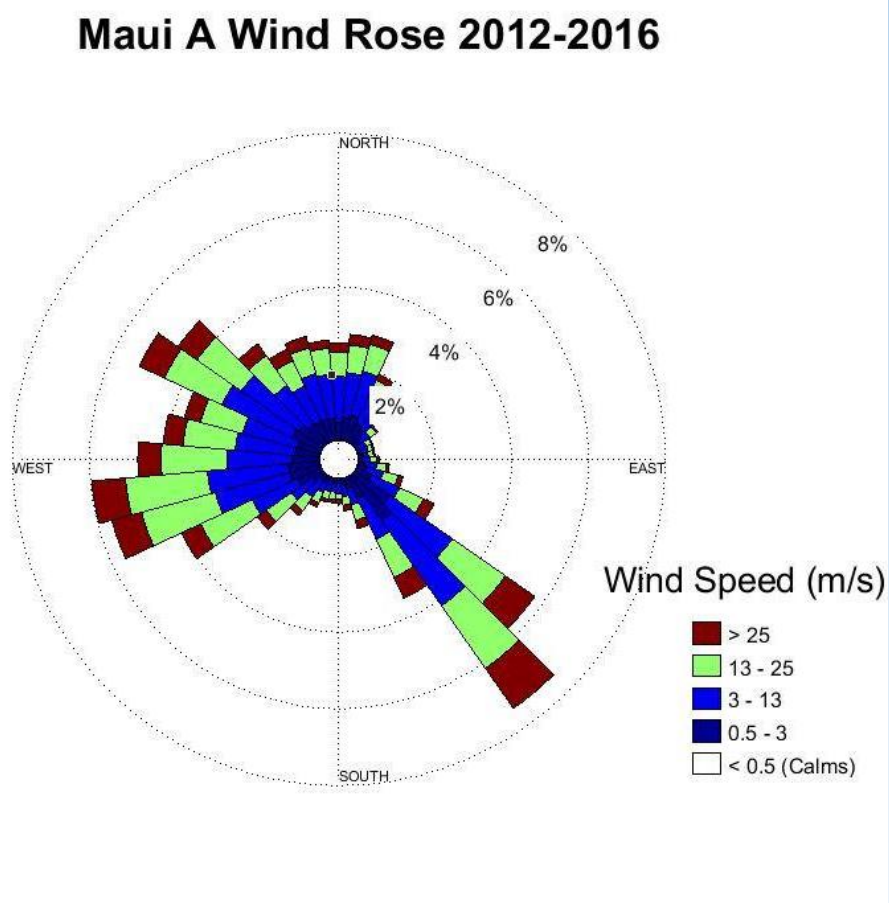


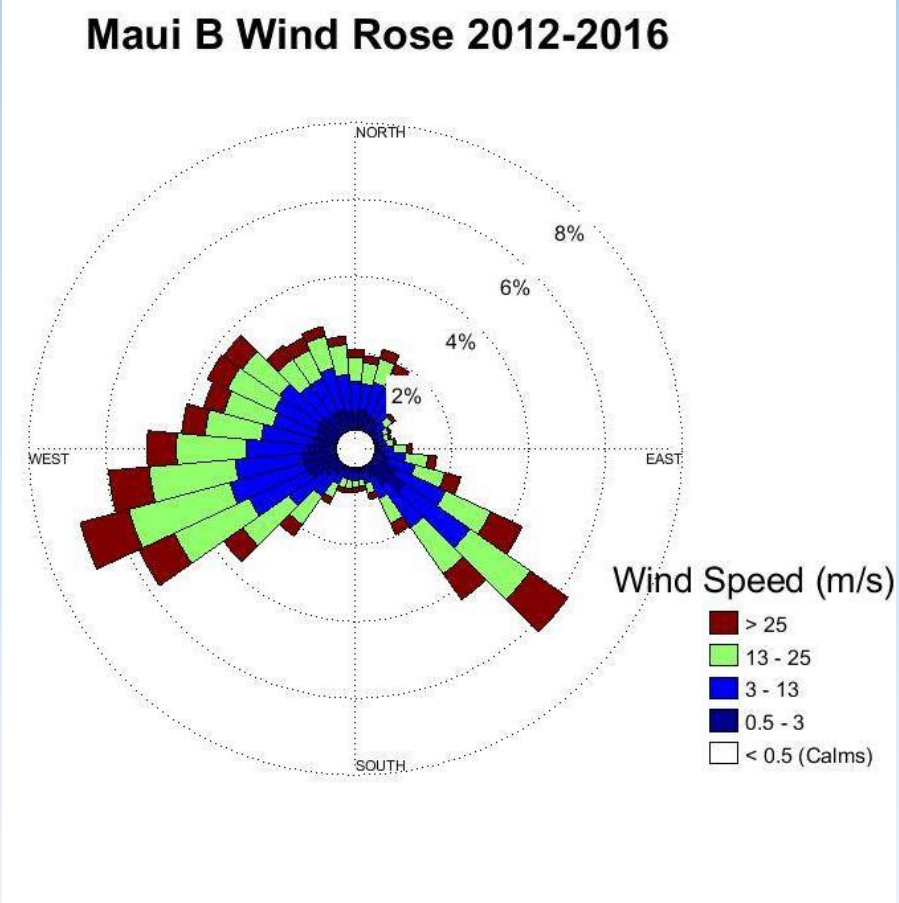
Wind Speed Assessment





Wind Directional Assessment





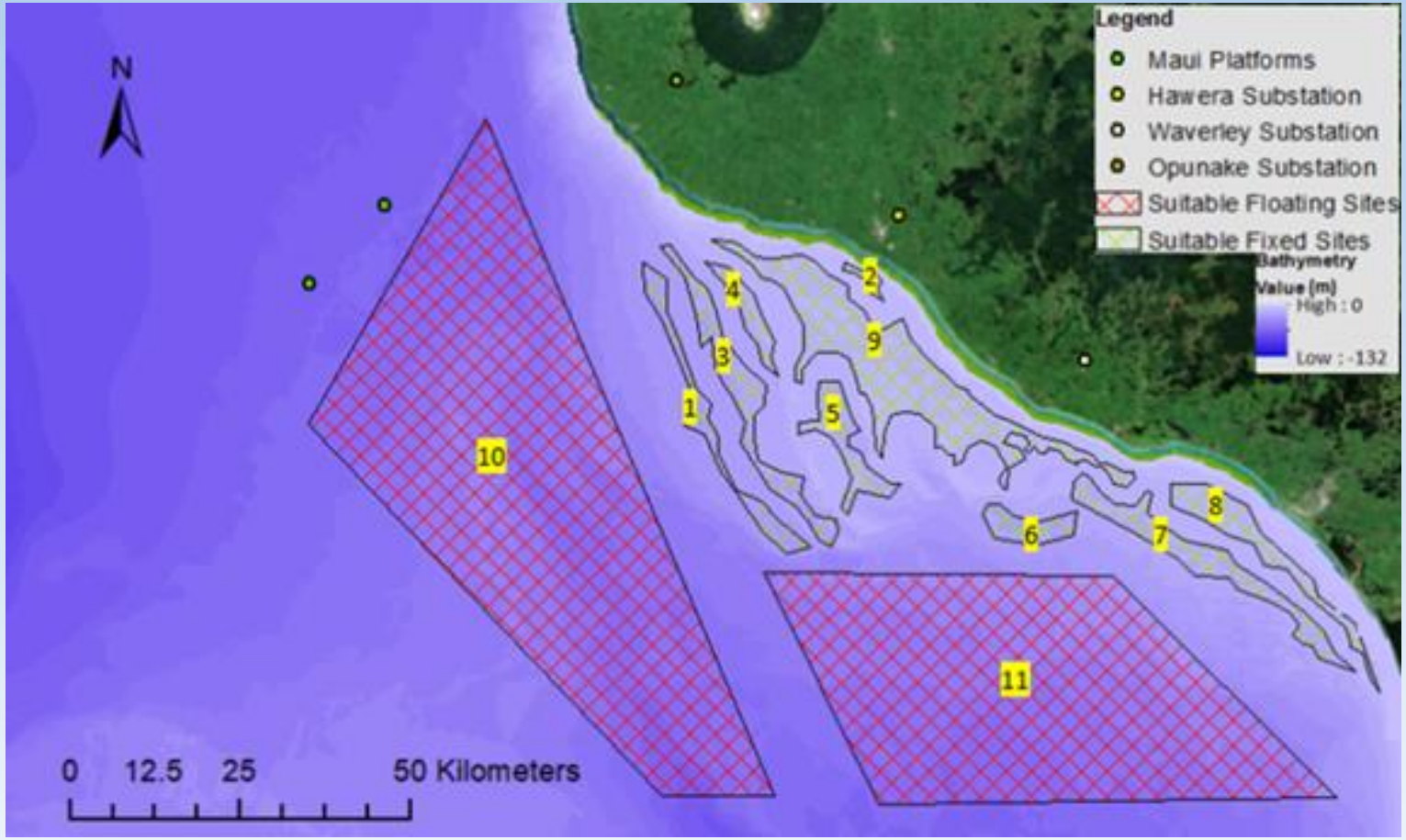
Annual Electricity Generation

	Maui A	Maui B
Gross Annual Energy Production (GWh/yr)	39.9	43.6
Net Annual Energy Production (GWh/yr)	32.4	35.5
Net Capacity Factor (%)	46.3	50.6
Turbines Required	821	751

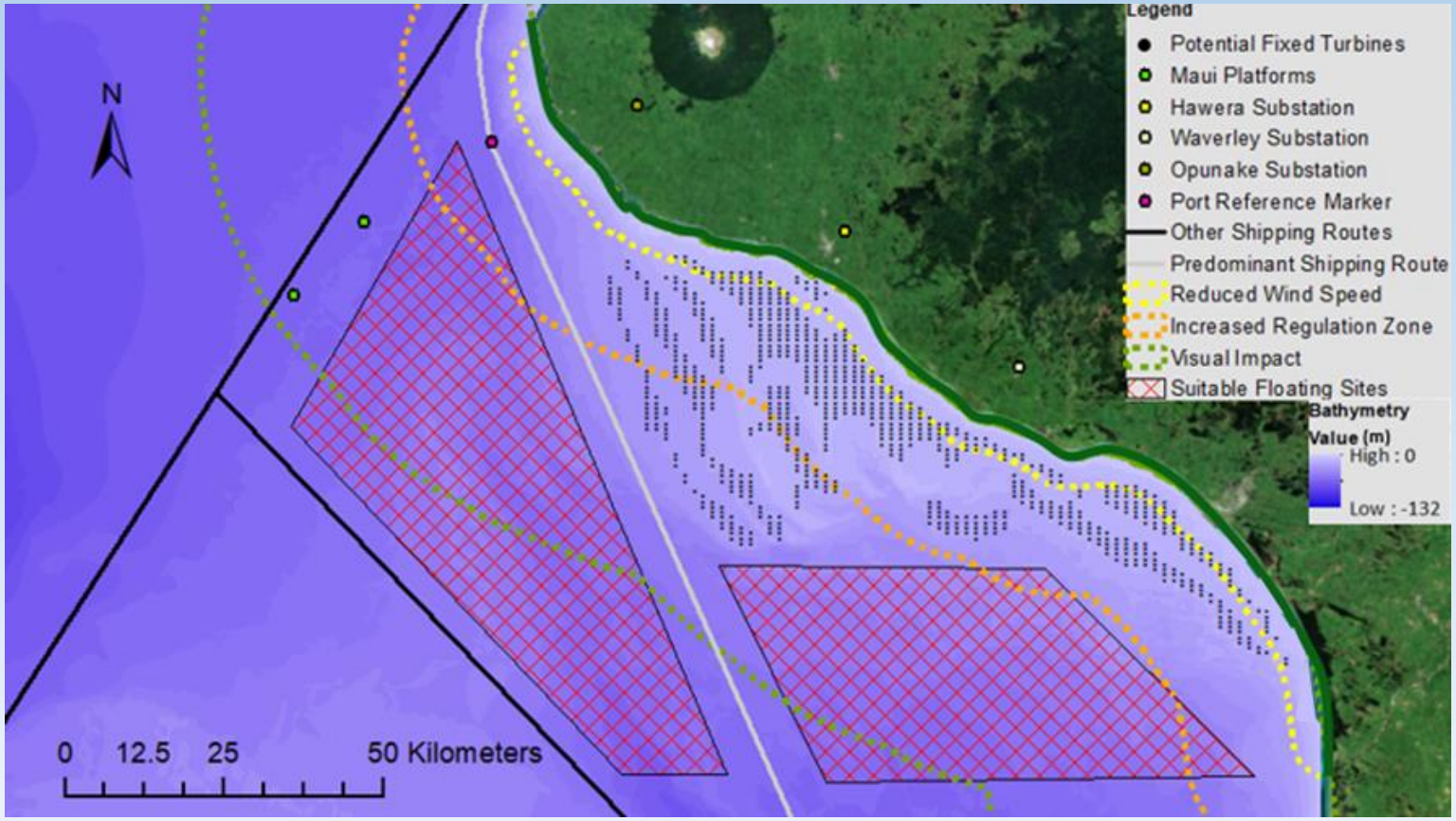
Estimated Losses

- Wake Losses – 15%
- Repair Time Losses – 4.3%
- Electrical Transmission Losses – 3%

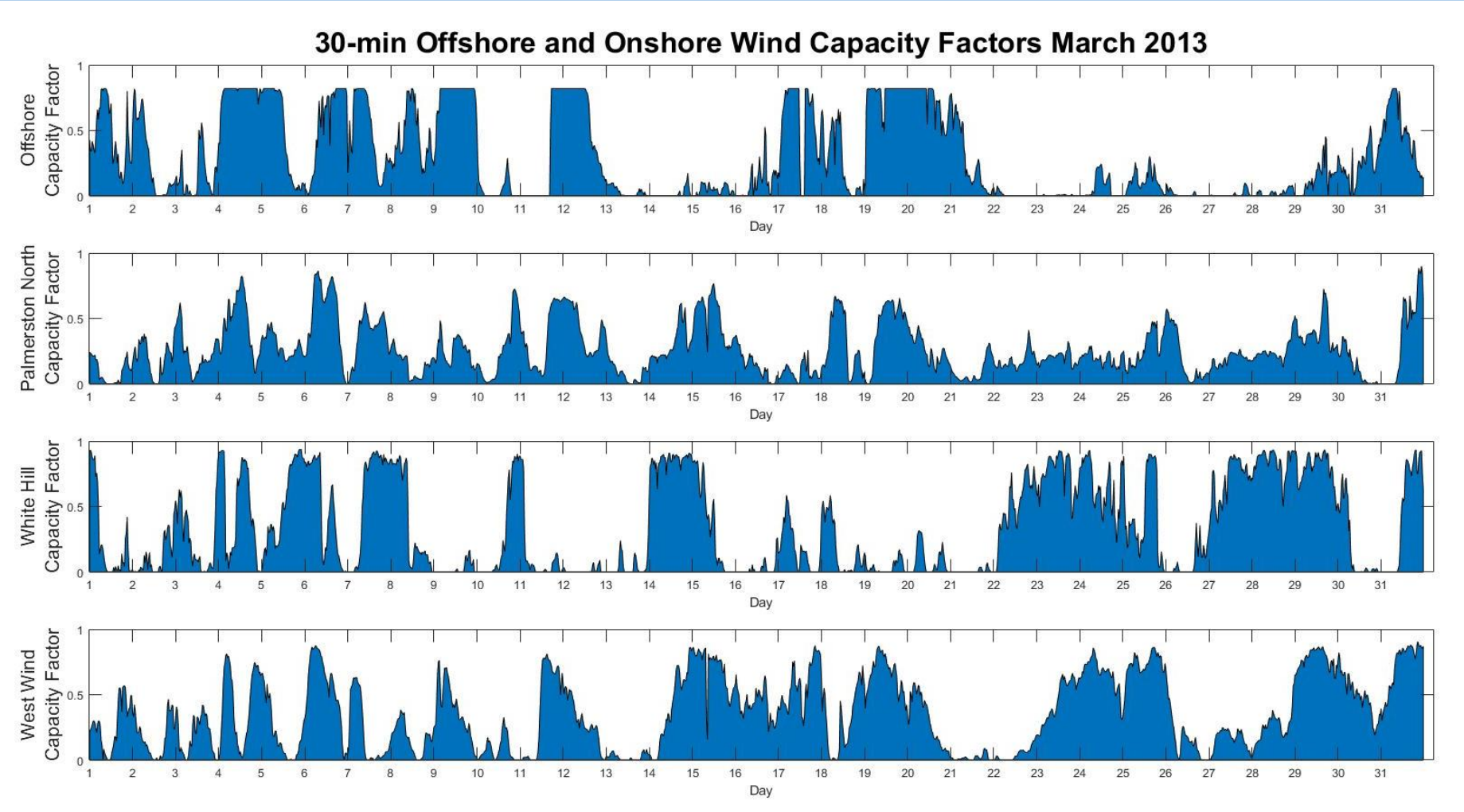
Suitable Sites



Potential Turbine Layout



Correlation Between Wind Farms

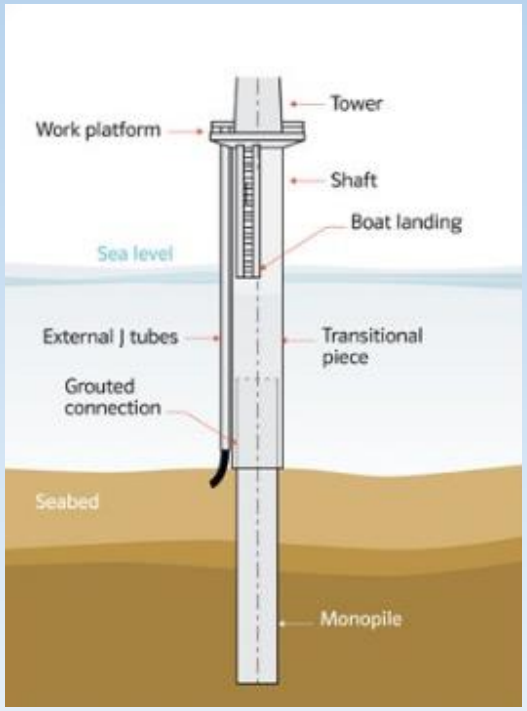


Logistical Issues

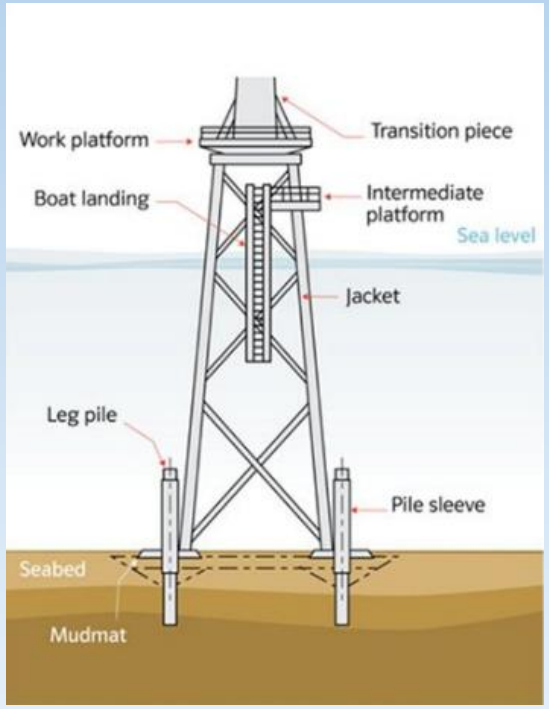
- Electrical Substations – Hawera, Opunake, Waverley
- Construction Rate – 100 MW/year required for 2050 installation
- Port Taranaki – Can accommodate most offshore wind vessel types

(Port Taranaki, 2019)

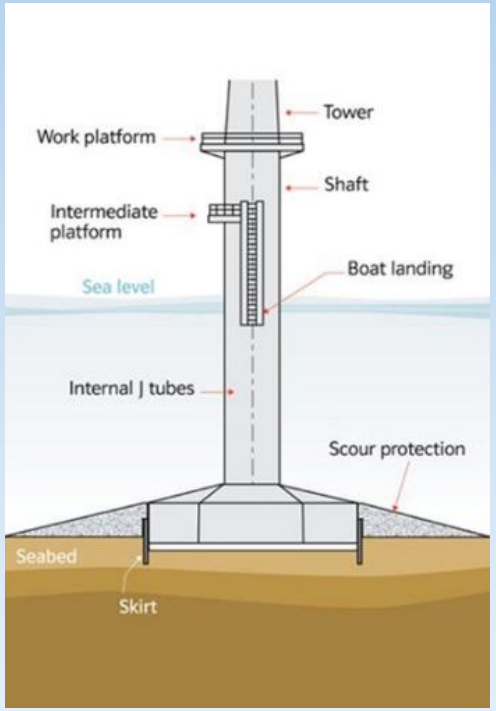
Fixed Foundations



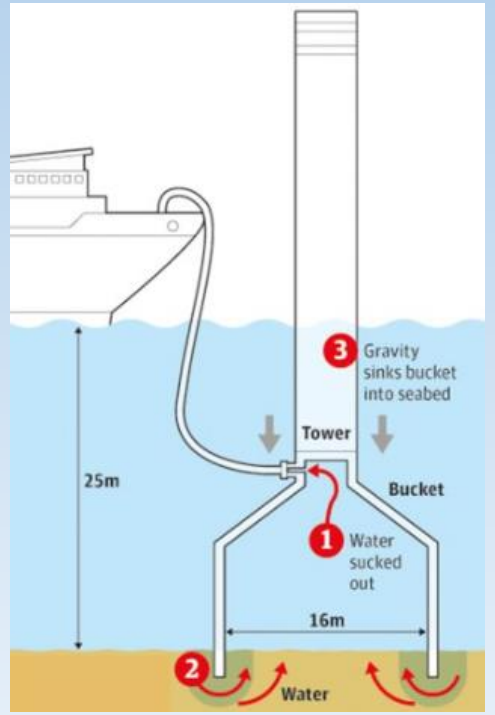
Monopile (< 25m)



Jacket (20-50m)



Gravity Base (20-60m)



Suction Buckets (< 55m)

Images from: (4COffshore, 2019)

Further Research

- Finer resolution required for bathymetric analysis
- More accurate wind resource data at a particular site
- Geotechnical information about seabed soil properties
- Extend assessment to whole of New Zealand

- Beyond the scope of this study:
  - Social Science investigation – visual impact
  - Financial investigation
  - Environmental investigation
  - Electrical substation/transmission options

Conclusion

- Excellent wind resource for offshore wind farms
- 32.4 GWh/year AEP and 46.3% net capacity factor
- 1065 km^2 bathymetrically suitable area
- More research required regarding electrical, financial, social, and environmental issues

References

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