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Where should I build my offshore wind farm?

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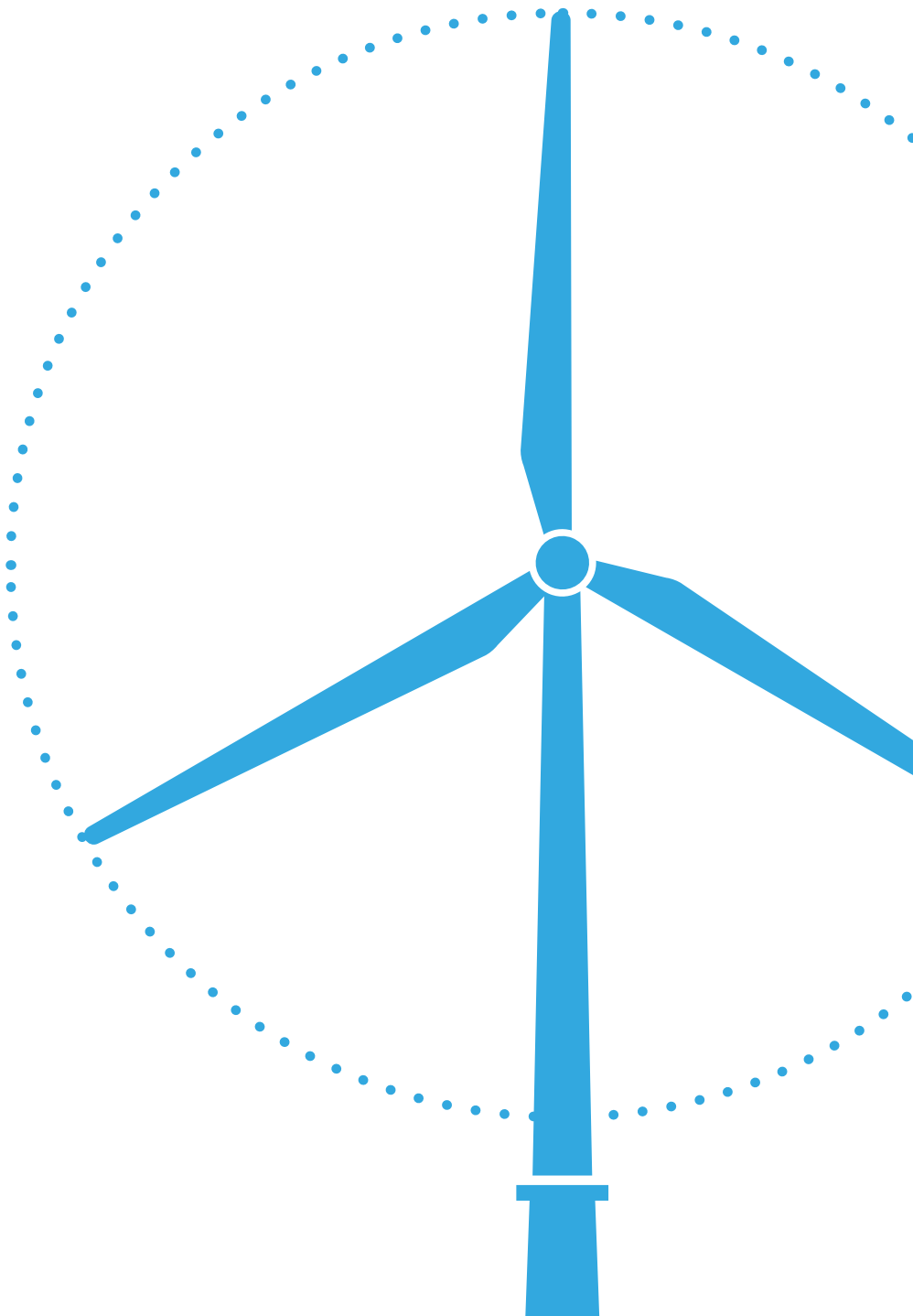


Instructions

You are an offshore wind farm developer looking to build a new wind farm off the coast of Breezeland.

Three potential zones have been identified and the site conditions assessed at each.

Weighing up the various parameters, it is your job to decide which of the three zones you believe is the most suitable for siting an offshore wind farm. You will then need to present your selected zone, and the reasons why you chose it to the board.

To help you to complete this exercise, we have provided the following materials;

- A diagram of all the components you need to build an offshore wind farm
- A list of what we look for when siting an offshore wind farm
- A list of what we don't like when siting an offshore wind farm
- A map showing the three potential offshore wind farm zones off the coast of Breezeland
- A description of each zone

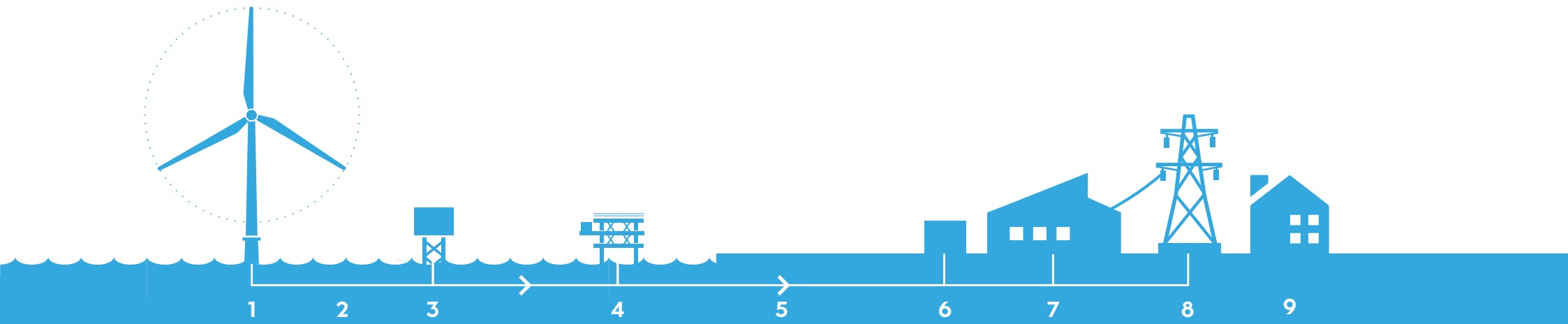
Using these materials you will have 10 minutes in your group to discuss which zone is most suitable.

You will then have 2 minutes to present your chosen zone and why you think it is the best option.

What makes up an offshore wind farm?

Components

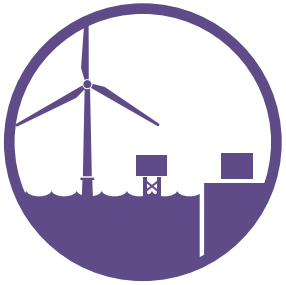
There are several components that make up an offshore wind farm. Electricity generated at the offshore turbines travels through underwater cables via an offshore substation towards shore. Once it reaches the onshore substation it is converted to the correct voltage, ready to be transmitted to the electricity network.



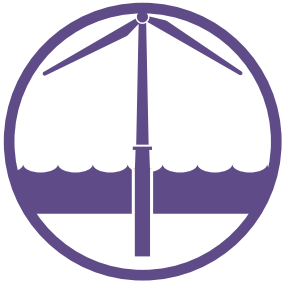
1. **Offshore wind turbine –** Electricity is produced as the wind turns the rotor blades. The blades turn a shaft containing magnets inside loops of copper wires.
2. **Array cables –** These cables link the turbines to one another and to the offshore substation.
3. **Offshore substation –** Converts electricity to a higher voltage so less energy is lost as it transmits to shore.
4. **Reactive Compensation Station –** Specific to Hornsea Project One and Two, this enables the high voltage AC system to work with cable lengths longer than those previously used for offshore wind.
5. **Export cables –** These cables connect the offshore substation to the onshore substation.
6. **Ørsted onshore substation –** Connects the electricity supplied by the offshore wind farm to the National Grid.
7. **National Grid onshore substation –** Converts the electricity to the voltage of the onshore transmission network.
8. **Transmission and distribution –** Transmission lines carry electricity at high voltages over long distances from power plants to communities. Electricity is reduced to lower voltages at a substation prior to distribution to communities.
9. **Homes –** Electricity is used to light our homes, power our appliances and make our lives more comfortable.

What to look for when choosing the location for an offshore wind farm

Things we like

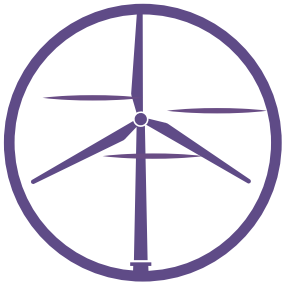


Grid connection close to landfall

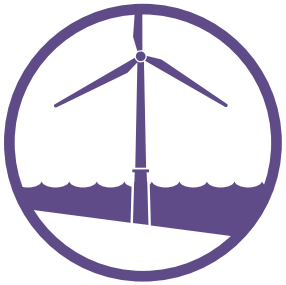


Stable and sandy sea-bed

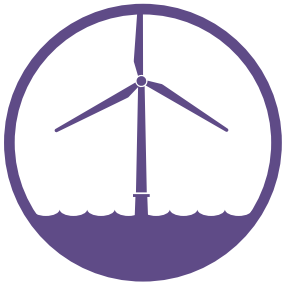
Large capacity regional ports in the area



Windier the better!



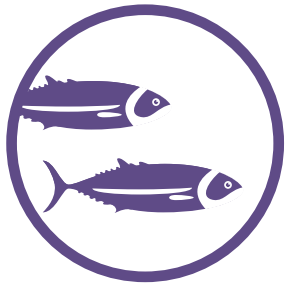
Shallow seas (20-50 m)



Big area to power more homes

What to look for when choosing the location for an offshore wind farm

Things we try to avoid



Environmental considerations - birds and marine animals

Oil and gas activities

Shipping lanes

Uneven sea bed

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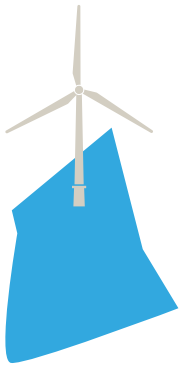
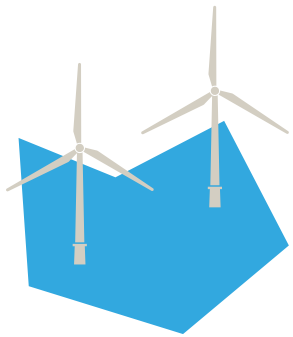


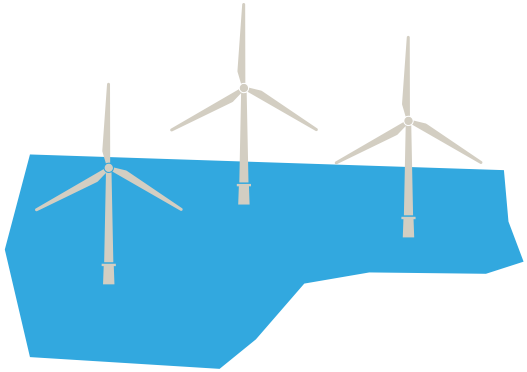
Zone 1

- Very high wind speeds
- Average water depth 30-40 m, although deep pits in areas
- Sandy/rocky sea bed
- 100 km from shore
- Small area
- Large port located nearby
- Rare bird species nesting in the local area



Zone 2

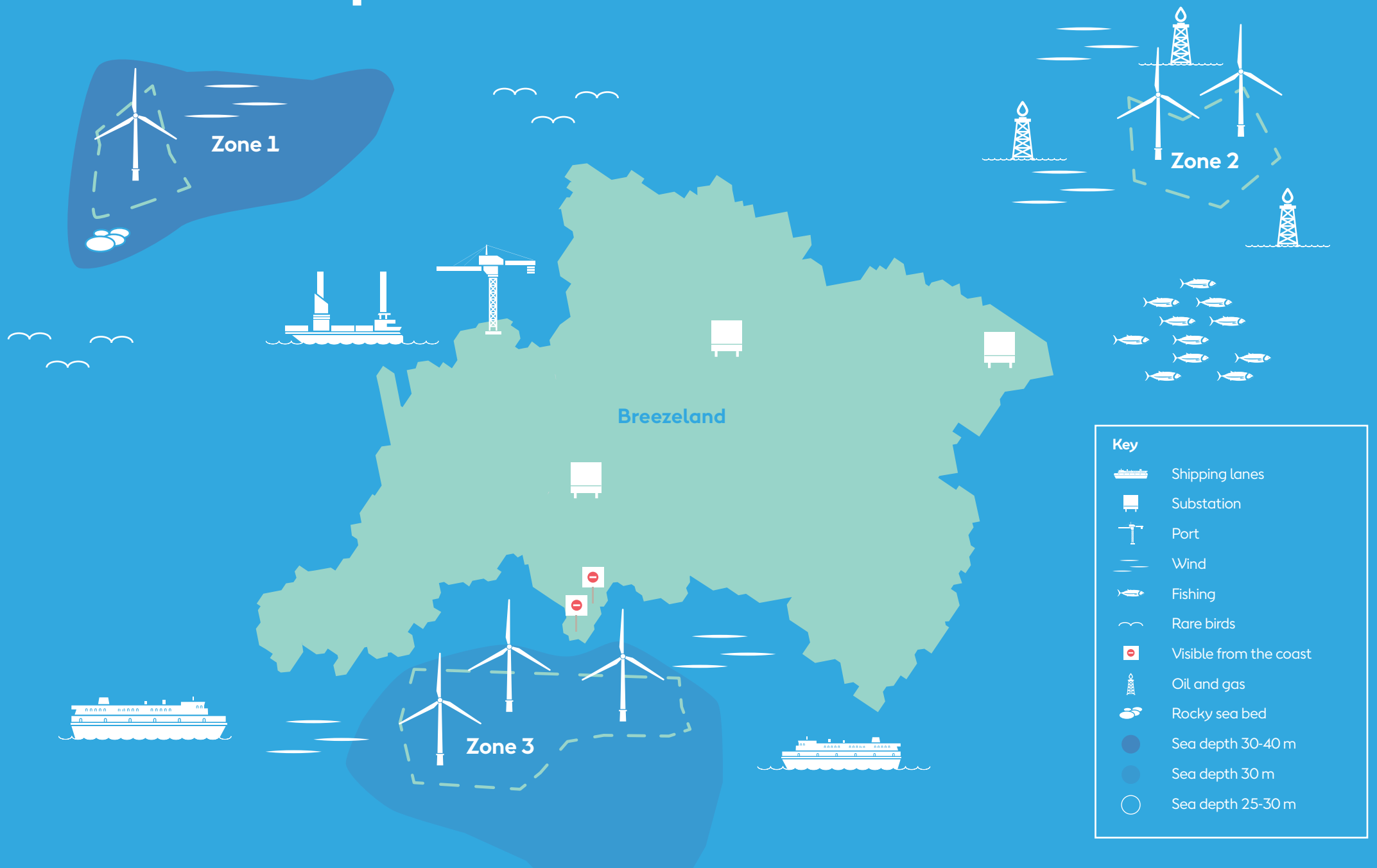
- Medium wind speeds
- Average water depth 25-30 m
- Sandy sea bed
- 25 km from shore
- Medium area
- National grid substation located close to the coast
- Oil and gas activities
- Area is used for fishing



Zone 3

- Low/medium wind speeds
- Average water depth 30 m
- 18 km from shore
- Sandy sea bed
- Large area
- Major shipping route passes through the western section of the zone
- Visible from the coast

Our three potential zones



Ørsted
5 Howick Place
London
SW1P 1WG

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