

GEOSCIENCE FOR LEAVING CERTIFICATE TEACHERS

Continuing Professional Development Course 2024



OFFSHORE WIND ENERGY AND COASTAL EROSION ADDITIONAL RESOURCES

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Further information: Understanding Geophysical Surveys for Offshore Wind Farms

What is a Geophysical Survey?

A geophysical survey is a method used to study the physical properties of the Earth's surface and subsurface. In the context of offshore wind farms, these surveys help us understand what lies beneath the ocean waves, which is crucial for planning and constructing wind turbines.

Why Are Geophysical Surveys Important?

Before building an offshore wind farm, engineers need to gather information about:

- The shape of the seabed (morphology)
- The geological makeup of the area
- The condition of the seafloor

This information is essential for several reasons:

1. **Foundation Planning:** Knowing the seabed's characteristics helps engineers design the right type of foundation for the wind turbines.
2. **Ground Disturbance:** Understanding the ground conditions allows for accurate predictions of how much disturbance will occur during construction.
3. **Hazard Identification:** Surveys help identify any potential hazards that could affect construction and maintenance activities.
4. **Field Layout:** Engineers can determine the best layout for the wind farm based on the seabed's features.

Tools Used in Geophysical Surveys

Geophysical surveys utilize advanced technologies to gather detailed information about the ocean floor. Some of the tools used include:

- **Multi-beam Sonars:** These devices create detailed maps of the seabed by sending out sound waves and measuring how long it takes for them to return.
- **Dual Magnetometers:** These instruments measure the magnetic field of the seabed, helping to identify different geological materials.
- **Side-scan Sonars:** These are towed behind a boat and provide images of the seafloor, revealing its features.
- **Sub-bottom Profilers:** These tools penetrate the seafloor to provide information about the layers of sediment and rock beneath the surface.

- **Seismic Systems:** These systems use sound waves to explore deeper geological structures.
- **GNSS and Motion Units:** These help in accurately positioning survey equipment and understanding the movement of the ocean floor.

<https://www.bbc.com/storyworks/unlocking-science/what-do-irelands-shipwrecks-have-to-do-with-renewable-energy>

Survey Range

Geophysical surveys can cover a wide area, extending from the beach out to tens of kilometers offshore and reaching depths of about 75 meters.

Benefits of Geophysical Surveys

Geophysical surveys provide accurate and precise data, which is essential for:

- **Planning Cable Routes:** Determining the best paths for electrical cables connecting the turbines to the grid.
- **Pile Driving:** Understanding the seabed helps in planning how to drive piles into the ground to support the turbines.
- **Mooring Conditions:** Ensuring that floating turbines are securely anchored.
- **Anchor Plans:** Identifying the best locations for anchors to hold the wind farm structures in place.

Example of Geophysical Surveys in Action

The Geophysical survey of the entire mass of the Irish Boundaries as far as the continental shelf. Taking all of Irelands area above ground and marine boundaries, makes Ireland the largest country in Europe.

Conclusion

Geophysical surveys play a crucial role in the development of offshore wind farms. By revealing the hidden world beneath the ocean waves, these surveys provide engineers with the necessary information to plan and construct wind farms safely and effectively. Understanding the seabed's characteristics allows for confident decision-making in a challenging and largely unseen environment.