

Day 1: Foundations and Integration of Offshore Wind Energy

Key lecturer: Thomas Hjort (Innovation Director Offshore Wind at Vattenfall)

Introduction to Offshore Wind Energy and Wind Energy Technology

The first day of our course kicks off with an in-depth exploration of the global offshore wind energy market, where you will gain insights into its current status, growth expectations, and the key players driving the industry forward. Led by **Gerard van Bussel**, Emeritus Professor in Wind Energy at TU Delft, this session will cover the fundamentals of wind energy, including fluid mechanics, wind resource characteristics, and the design of support structures and blades. You will also learn about wind power's integration with the electric power system, providing a strong technical foundation for the rest of the course.

Electric Current from Offshore Wind in the System

Next, **Garnt Swinkels**, Advisor Offshore Development at **TenneT**, will guide you through the complexities of integrating offshore wind energy into the power grid. This session will cover strategic considerations for site selection, the role of TenneT in the power system, and the advancements in subsea cable technology. We will also delve into the differences between AC and DC power transmission and how these technologies shape future offshore wind projects.

Integrating Wind in the Hydrogen Value Chains

The afternoon will focus on the intersection of offshore wind and hydrogen production. **Thomas Hjort** from **Vattenfall** Denmark will present the hydrogen value chain, discussing the potential for offshore hydrogen production, the re-use of existing infrastructure, and the business case for these innovations. This session will also touch on government support for hydrogen initiatives, highlighting the synergies between wind energy and hydrogen as a future energy solution.

The Role of Ports in Offshore Wind Developments

Erik Bertholet, Business Manager Offshore Wind at **Groningen Seaports**, will conclude the day by examining the critical role ports play in offshore wind development. This session will address logistics, operations, maintenance, and the emerging role of ports as hydrogen hubs, emphasizing the importance of efficient port infrastructure in the success of offshore wind projects.

Offshore Energy Game (Serious Gaming)

The day ends with a unique, interactive experience: the Offshore Energy Game, developed by **New Energy Business School** and **WeGo Sustainable**. This serious game challenges participants to meet energy demands using various green energy sources from the sea, showcasing the complexity and potential of integrating different energy systems.



Day 2: Development, Circularity & Sustainability, and Ecological Impact of Offshore Windfarms

Site Visit at TKF Eemshaven

We begin the second day with a visit to **TKF Eemshaven**, where **Hans Hoving**, the Plant Manager, will offer a firsthand look at the production facilities and discuss the critical role of manufacturing subsea and inter array cables for the offshore wind sector.

Windfarm Development Process

Following the site visit, **RVO** will lead a comprehensive session on the wind farm development process, from initial planning to Final Investment Decision (FID). You will explore various auction models, financial incentives, and the impact of the EU Net Zero Industry Act. The session will also cover the roles of government, market players, and investors in driving wind farm development and the financial intricacies, including capital costs and the Levelized Cost of Energy (LCoE).

How to Make Offshore Windfarms More Circular?

As the industry grows, so does the need for sustainability. **Annemarie Kerkhof**, Strategic Environmental Advisor at **Vattenfall**, will guide you through the principles of circular economy practices in offshore wind farms. This session will explore the opportunities for circular design, with a specific case study on Zeevonk II, showcasing state-of-the-art circular design measures, particularly in wind turbine blade design and end-of-life strategies.

Case Study: Circularity and Collaboration in the Value Chain

In the afternoon, a case study session led by **Annemarie Kerkhof** and **Tim Wilms** from **Vattenfall** will delve into the challenges and dynamics of applying circular solutions through collaboration in the value chain. This interactive discussion will provide practical insights into fostering partnerships for a more sustainable future in offshore wind.

Panel Discussion: Offshore Windfarm Ecology

The day concludes with a panel discussion on the ecological impacts of offshore wind farms. **Zahra Janipour**, Energy Transition Specialist at **RaboResearch**, along with experts from **De Rijke Noordzee**, **RWE**, and **Vattenfall**, will explore the environmental effects of turbine installation, operation, and decommissioning. This session will also cover regulatory frameworks, biodiversity net gain strategies, and the future challenges for marine wildlife in increasingly crowded seas. Join the discussion!

Day 3: Future Innovations, (Technical) Operations, and Regional Development of Offshore Wind Turbines

Site Visit at BUSS Terminal

The course concludes with a site visit to the **BUSS Terminal Eemshaven** where we will offer insights into the logistics and operational management of offshore wind equipment, and maybe even see parts of a wind turbine up close!

Co-use of Offshore Windfarms

The final day of the course begins with a forward-looking session on the co-use of offshore windfarms, led by **Thomas Hjort** from **Vattenfall**. This session will discuss emerging opportunities such as floating solar, energy storage systems, and offshore hydrogen production. You will also explore the future of floating wind farms and the innovations needed to address deepwater conditions, seismic activities, and other challenges.

The Challenges in Integrating Offshore Electrolysis

Thomas Hjort will also tackle the technological and economic challenges of integrating offshore electrolysis. The session will cover the basics of electrolysis, the development of Power-to-X technologies, and their economic viability within the offshore wind sector.

Operations & Maintenance of Offshore Windfarms

The focus will then shift to the operations and maintenance (O&M) of offshore wind farms. We will discuss service operations, transport and installation (TNI), and the maintenance of wind turbines on sea, highlighting the operational challenges and innovations in O&M.

Sustainable Decommissioning Scenarios & Optimizations

In this session, **Bernard Heikema** from **The University of Groningen** will tackle sustainable decommissioning strategies for offshore wind farms. This session will cover optimization techniques and new approaches to minimize environmental impact during decommissioning.

Interactive Workshop

The day concludes with a workshop focused on the potential of the Nij Begun initiative to enhance the northern region through wind energy. Participants will develop suggestions for integrating wind energy into the Groningen energy system and discuss ways to realize human capital ambitions in the region.