

# Floating Offshore Wind Energy Seminar

University of Cagliari

9-13 September 2024

## **ABSTRACT:**

The Floating Offshore Wind Energy (FOWE) seminar will provide an in-depth exploration of the technical considerations throughout the entire project lifecycle from a developer's perspective. It will begin by introducing the fundamentals of FOWE, drawing on knowledge and experience from onshore wind energy and floating structure engineering. This introduction will cover the basics of wind energy harvesting and FOWE technologies, followed by an examination of existing concepts and deployed pilot plants. The seminar will then present a comprehensive overview of all wind farm components and layout. The discussion will proceed to site development and assessment, emphasizing the early stages of offshore wind projects while also addressing the role of site assessment throughout the project's duration. The seminar will explain how various restrictions affect the viability of specific areas and detail the process of selecting suitable sites from potential locations along the Italian coast. This will be followed by a focus on site-specific studies aimed at gaining a detailed understanding of physical and environmental conditions and their impact on the technical characteristics of the wind farm. Subsequently, the national legislative and regulatory framework concerning renewable energy production targets and offshore wind installation permitting will be outlined, with particular emphasis on the environmental impact assessment process, including the scoping phase. The seminar will provide an overview of how major impacts are assessed, the determination of mitigation measures and statistics on projects currently under development. In conjunction with the permitting process, there will be a discussion on health and safety considerations throughout the project's development. This will include an introduction to the main standards and regulations, as well as a review of critical risks. Following, a detailed explanation of the key project phases will be given, including a breakdown of steps from initial development to final commissioning. The seminar will cover the engineering, procurement, construction, and installation work packages, with an emphasis on the steps necessary during the engineering phase. A general overview of the floating wind market will be followed by a discussion of supply chain challenges and risks during both pre- and post-construction phases, along with supplier selection criteria. The seminar will also explore the potential financing schemes for constructing the plant. It will cover the logistics of the entire project, including port requirements, site selection, and necessary facility preparations for construction and installation. A specific focus will be placed on the supply chain within Italy. Regarding the technical aspects, the seminar will present all components of the wind farm, starting with wind turbines. It will address the fundamentals of wind energy extraction and describe typical turbine architecture, along with technologies related to the drive train, blades, and power electronics. The session on grid connection and electrical infrastructure will cover the design and common configurations for wind parks, offering a high-level overview of the key elements typically comprising the electrical evacuation system of an offshore wind farm. Finally, the seminar will discuss the interconnection process in Italy, as well as key grid code requirements applicable to offshore wind projects. The seminar will address the critical aspects of power cable installation, burial, and protection in the context of floating offshore wind farms. It will examine the challenges involved in installing power cables, including the selection of appropriate cable routes and the consideration of environmental factors. The presentation will cover specialized techniques and equipment used for

laying both static and dynamic cables, with a particular emphasis on accommodating the movement of floating structures due to waves, currents, and wind forces. The discussion will focus significantly on the challenges posed by dynamic cables and explore solutions to mitigate fatigue and bending stresses. In addition, the seminar will discuss methods for cable burial and protection, underscoring the importance of safeguarding these power cables from external threats such as fishing activities, anchoring, and seabed movements. The use of trenching, rock dumping, and other protective measures tailored to the environment of floating offshore wind farms will be highlighted. Following this, the seminar will present the various foundation types designed for wind turbines, offering an overview of the main foundation typologies employed in the offshore wind industry. Given the bathymetry of Sardinia, special attention will be given to floating foundations, covering a wide range of aspects including their operation, key characteristics, and the design and construction processes involved. The fundamentals of station-keeping systems for floating structures will then be introduced. This will include a presentation on mooring lines, providing an overview of configurations, materials, and design methodologies. Additionally, the seminar will cover the sizing of anchoring points and discuss available market solutions. The interface with offshore transport and installation of station-keeping systems will also be detailed, including installation methodologies for anchors and mooring lines, as well as the towing and hook-up of floating wind turbines and the installation operations of inter-array cables. Finally, the seminar will address the operation and management of the wind farm post-installation. There will be a focus on the operations and maintenance package during the development phase of the project lifecycle and the handover from construction to operations. The seminar will outline the typical operations and management activities, key value drivers, and the new challenges introduced by the adoption of floating technology.