



Disclaimer: This document does not present a draft of the Green Deal call to be part of the Horizon 2020 work programme update, nor any future position of the European Commission. It aims to support the development of the call and its content is subject to change.

Title: Demonstration of innovative critical technologies to enable future large-scale deployment of offshore renewable energy technologies and their integration into the energy system

The European Green Deal expects to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy with no net emissions of greenhouse gases in 2050. To decarbonise Europe, clean renewable power production must become the main source of energy, while keeping the stability and resilience of the EU Power System. The Commission's long-term strategy, *A Clean planet for all*, identifies in offshore renewable technologies a key energy system for the Clean Energy Transition. It provides estimates for the offshore wind capacity in Europe of 240-440 GW by 2050, compared to about 22 GW today. This increase would represent a paradigm shift in the European energy system and require a modern infrastructure to seamlessly integrate the power of offshore resources in the energy system via the grid to onshore, or via the option of power-to-X taking into account grid constraints, investments and evolving /new energy market design.

This buildout needs to ensure cost efficiency, while protecting the environment and biodiversity, and assuring a just transition. There is a need for more efficient, cost-effective, affordable and secure technologies using wind, solar, wave and/or tidal resources, considering the potential of the different European sea basins (Baltic Sea, North Sea, Atlantic Ocean, Mediterranean Sea and the Black Sea) and the complementarity of resources to reach the best capacity factor and optimized use of all the power equipment.

Scope

Projects shall demonstrate at sea critical offshore renewable energy innovations considering the efficiency, reliability, sustainability and circularity that is needed in all areas of the offshore renewable energy system, notably:

- Offshore renewable energy power generating systems: innovative large scale integrated systems, floaters and substructures, mooring and anchoring systems specifically conceived for floating offshore considering the varied subsea conditions.
- Grid infrastructure: innovative Direct Current (DC), AC/DC hybrid technologies and systems as a supporting step towards large offshore HVDC grids (e.g. multi-vendor Multi-Terminal HVDC (MT HVDC) systems, grid forming converter, HVDC diode rectifiers, Modular Multilevel Converters (MMC), DC Circuit Breaker (DCCB); DC/DC converter and DC/power hub) and their control and management systems; for floating renewable energy technologies: innovative dynamic inter-device/inter-array cables and connections to converter stations at sea or offshore hubs.
- Power to X /storage systems: innovative offshore storage and/or power to X systems to maximise the use of offshore resources.

Proposals shall address at least the offshore renewable power generating systems and the related energy system integration requirements, and may address grid infrastructure and/or power to X/storage systems. Multi-functional platforms can be considered.

Proposals shall address also the following:

- Industrial design and manufacturing processes, installation methods, transport, operation & maintenance, supply chains and the related digital infrastructures.
- Circularity, regulatory, market and financial challenges.
- Marine spatial planning issues (making multi-use of the seas possible, but also considering optimising environmental impacts) as well as currently known barriers such as costs, public acceptance and vulnerability to changing climate conditions in offshore areas.

Projects are requested to demonstrate the technologies at sea while respecting existing environmental regulatory framework. The project should demonstrate that permits for the demonstration actions are already obtained or will be retrieved soon. The project should also present an environmental monitoring plan that to be implemented during the demonstration action. The project should also demonstrate how it will get a financial close for the whole action.

The project shall demonstrate how it contributes to knowledge building and innovation. Development of new knowledge, models and solutions are paramount to maximize the benefits of the energy transition, to ensure that the right choices are made, and to optimize technologies and systems.

The project has to include a clear go/no go moment ahead of entering the deployment phase. Before this go/no-go moment, the project has to deliver the detailed engineering plans, a complete business and implementation plan and all needed permits for the deployment of the array. A committee of independent experts will assess all deliverables and will give advice for the go/no-go decision.

The project shall bring the demonstrated technologies to TRL 7.

Impact

The project should clearly demonstrate all potential impacts on the future roll-out of large-scale deployment of offshore renewable energy, the market perspective considering existing or alternative (decentralised) systems and all other environmental (like GHG reductions), ecological, social and economic impacts along the value chain. The project should demonstrate how it contributes to the Sustainable Development Goals of the United Nations.

It shall increase incentives for investment and economies of scale in offshore bringing down costs and create new business models and services.