

Nautilus



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Floating Solutions

Subestaciones Flotantes Proyecto WIND2GRID

II Congreso de Eólica Marina

Jesús M. Busturia

7 y 8 de Noviembre 2023 Director General

Las Palmas de Gran Canaria

Nautilus

ESTABLISHED

2013, Bilbao
(Basque Country)

8 Nov 2023

SHAREHOLDERS

subsea 7

tecnal:a

MEMBER OF BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

VICINAYmarine
innovación

VISION

To be a global player in the
Floating Offshore Wind
market

Nautilus



WIND2GRID

Partners:

IDOM

Nautilus



Objective:
Conceptual design of a
Floating Offshore Wind Substation



EUSKO JAURLARITZA
GOBIERNO VASCO

HAZITEK 2020
Budget: EUR million
4.3
Grant intensity: **50%**

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8 Nov 2023

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Design Strategy



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IDOM



DESIGN HIGHLIGHTS:

- Double deck to arrange cables
- Larger surface for the layout vs bottom fixed
- Simpler loads for FOSS compared to FOWT
- Lower center of gravity-> More stable
- Floater size relatively small

CHALLENGES:

- Design of the Umbilical Cables and
- Mooring lines



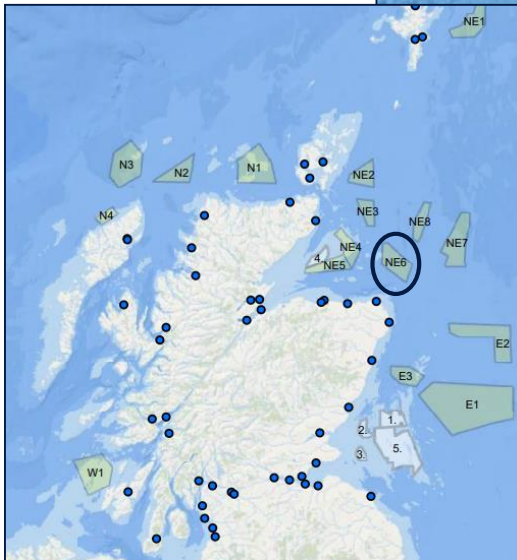
Design Conditions, Assumptions & Requirements

Two sites selected with different metocean conditions

Humboldt , USA



NE6 Dev. Zone
Scotland



Requirements

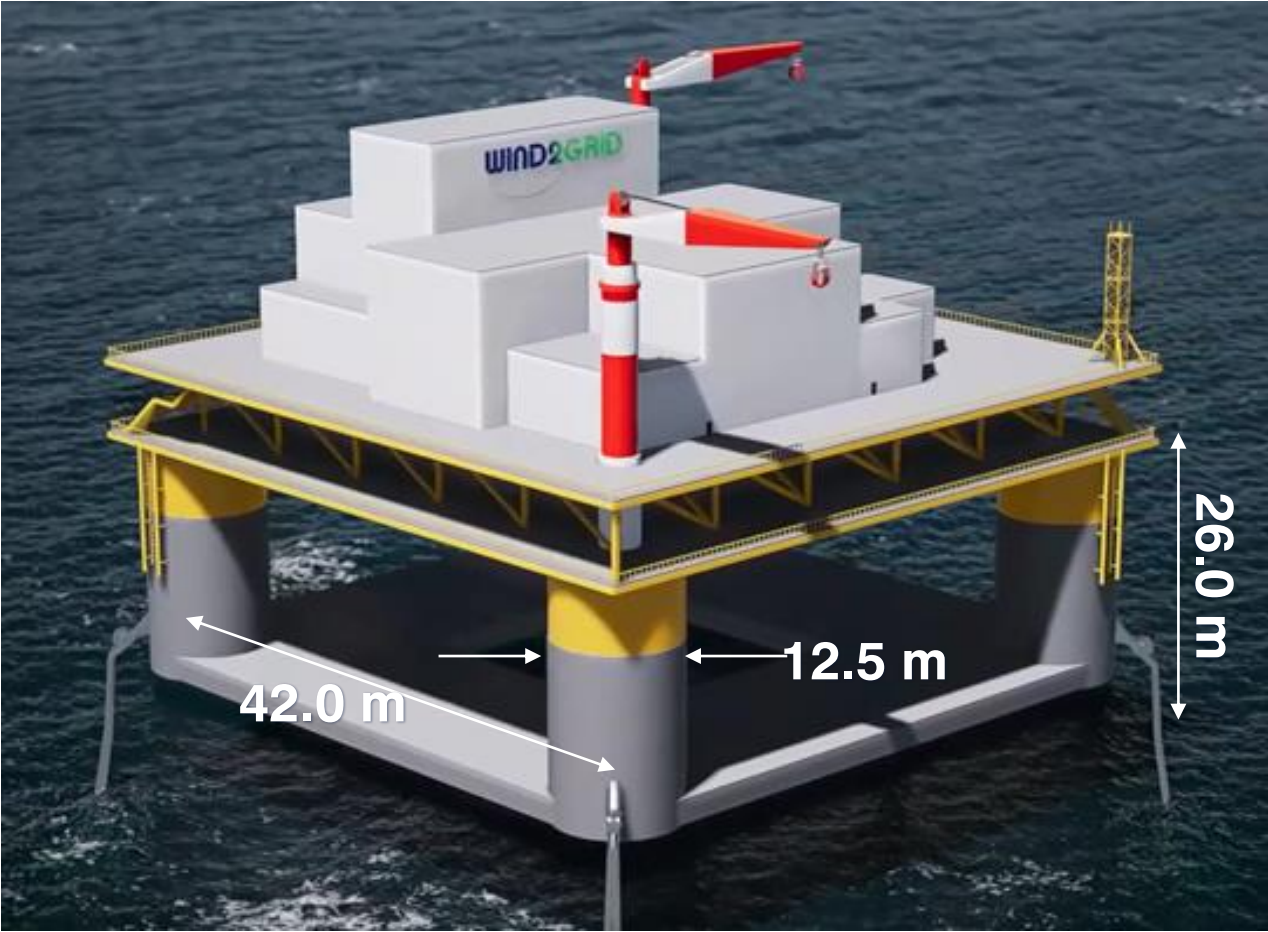
- Tilt angle & accelerations levels
- Natural periods with relation to metocean conditions
- Cable deck airgap clearance to accommodate for wave heights
- Station keeping system using 8 lines (CC1)
- IAC Cables @66kV and 2 export cables @220kV

Wind farm size

- 32 WTGs x 15MW = 480MW
- IAC @ 66kV
- Export cable @ 220 kV
- No Power-To-X solution



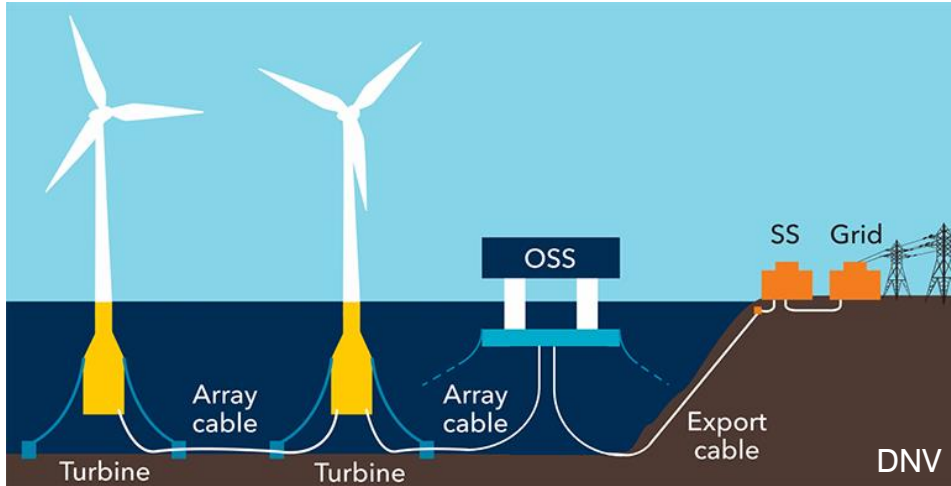
480 MW FOSS design (for Scotland)



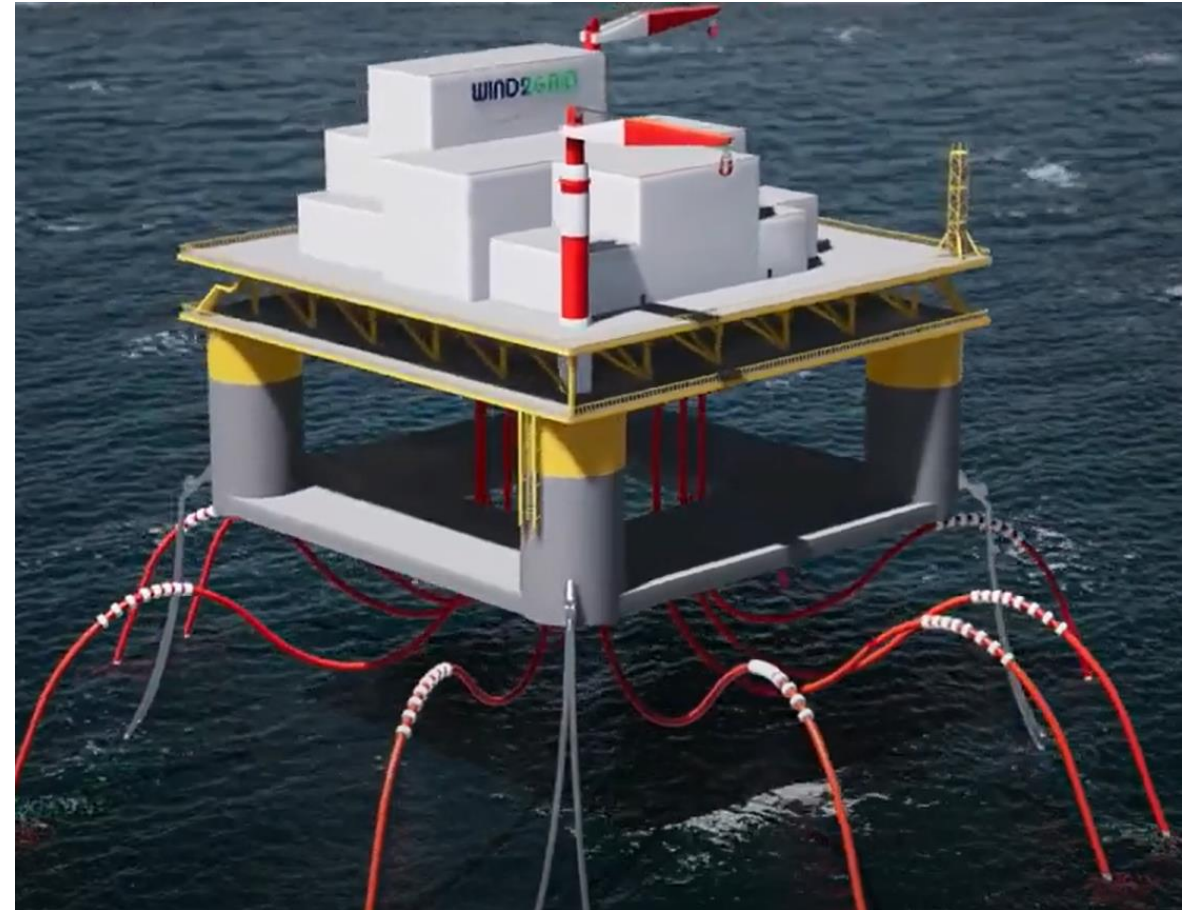
FOSS COMPONENT	Mass [t]
Support substructure	5,574.5
Top side equipment	2,131.6
Mechanical and auxiliary systems (MAS)	133.7
Mooring connectors	36.3
General outfitting	57.2
Total FOSS w/o ballast and w/o mooring	7,933.2
Vertical Weight of the suspended mooring lines	626.0
Total FOSS w/o ballast	8,559.2
Sea water passive ballast	3,287.7
Total FOSS displacement	11,846.9



Complexities in the Cable System Design

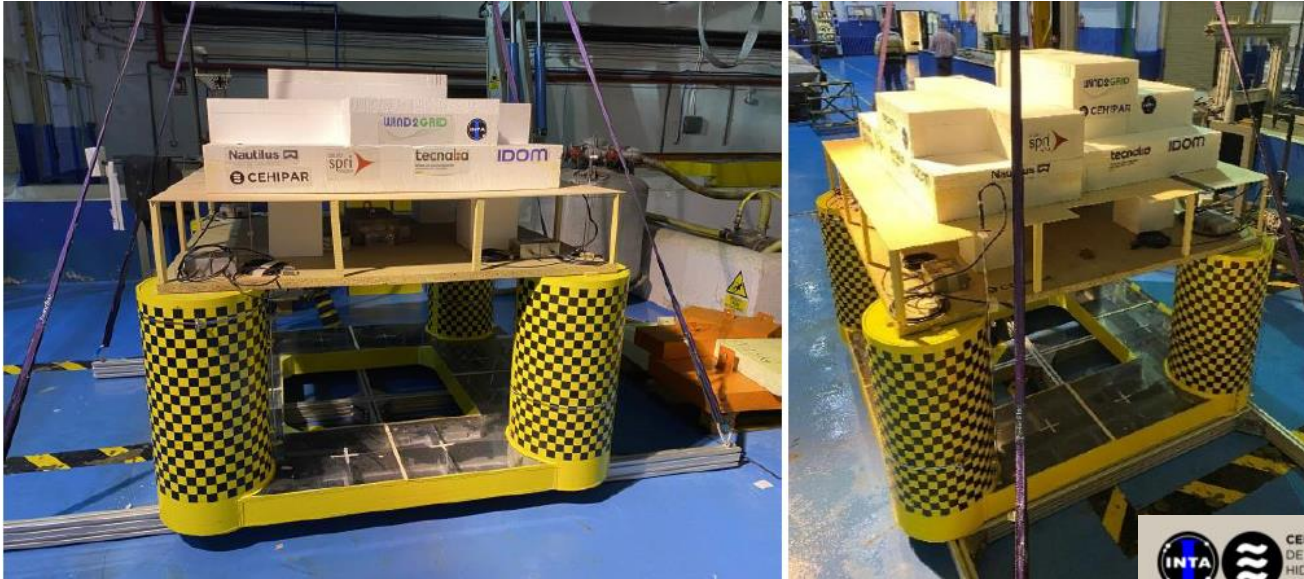


- **Several umbilical cables** coming from WTG arrays of a windfarm.
- **Lazy Wave design** of the cables to support platform offset.
- **Avoid clashing** between cables
- **Avoid clashing** with mooring lines
- **Cable installation can be difficult**





Tank Testing (Reduced Scale Model)



- **Model Scale 1 : 31.35**
- Made of **PVC**
- Various tests performed:
 - **Dynamic response** for several irregular sea states
 - **Towing test** with different drafts and velocities



CEHIPAR CANAL
DE EXPERIENCIAS
HIDRODINÁMICAS
DE EL PARDO

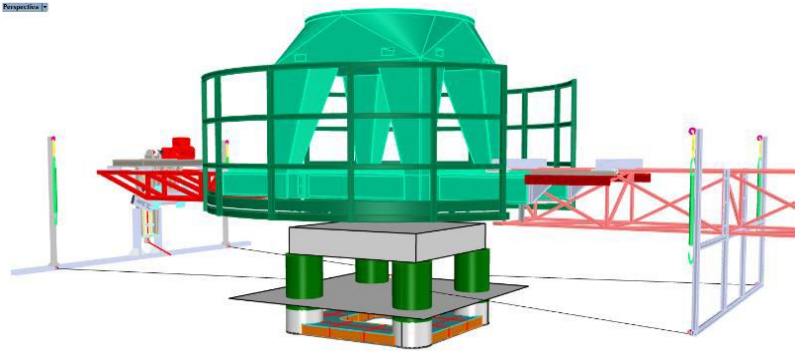
Madrid, Spain





Tank Testing

Dynamic response

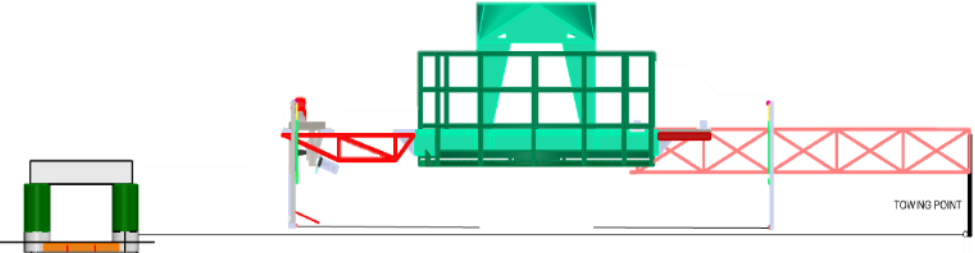


The objectives:

- Assess the viscous damping of the floater
- Assess the FOSS behaviour in waves



Towing tests



The objectives:

- Assess the floater behaviour when being towed
- Determine the platform drag/resistance





Results

- **W2G FOSS** design complies with the requirements for the selected sites.
- Towing tests showed floater **good stability** for T&I purposes.
- **Hydrodynamic real behavior well represented** in Orcaflex.
- **Nautilus design is well suited for Floating Offshore Substations**
- **Wind2Grid** Project gave **Nautilus** the opportunity to progress in FOSS market positioning

Nautilus



**WE DESIGN
OFFSHORE WIND
FLOATING SOLUTIONS**

Nautilus 

P +34 944 678 052
E info@nautilusfs.com

Parque Científico y Tecnológico de Bizkaia, Bldg. 612
48160 Derio, Bizkaia, Spain

nautilusfs.com