

17-21 JUNE 2019
EU SUSTAINABLE ENERGY WEEK
SHAPING EUROPE'S ENERGY FUTURE

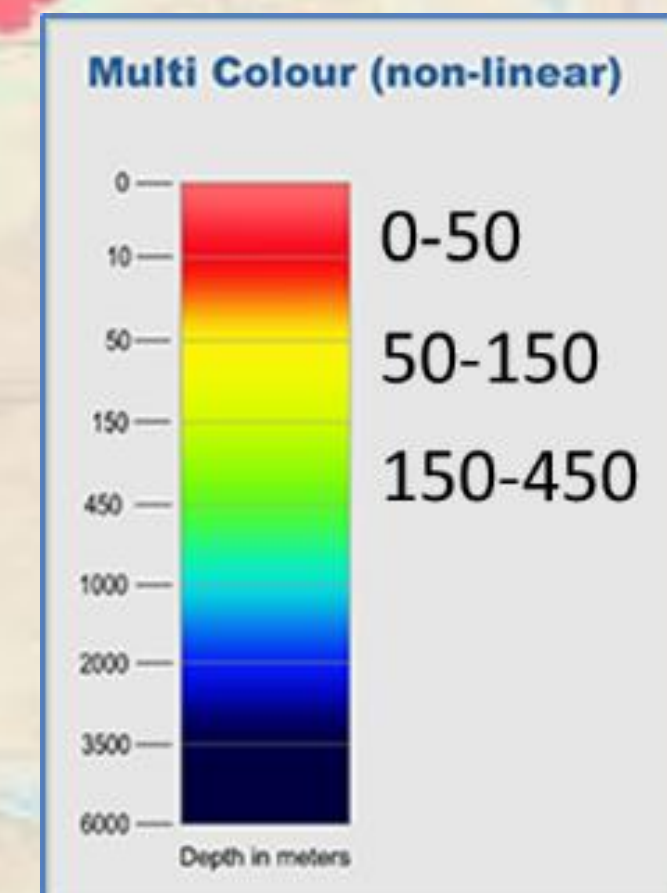


#EUSEW19

How can we move beyond shallow waters?

Floating Wind Turbines

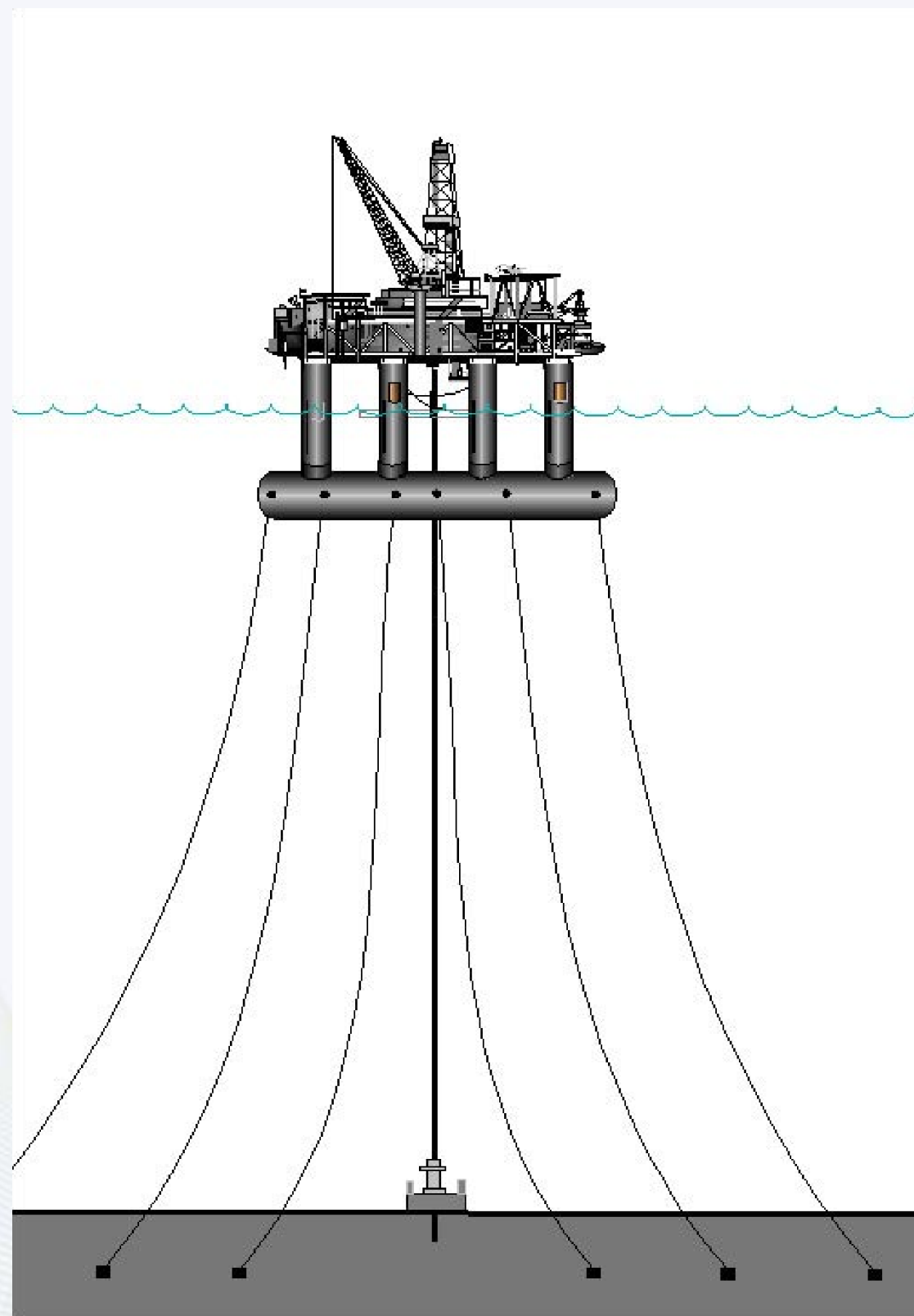
Why floating?



Source: EMODNET

The idea of floating

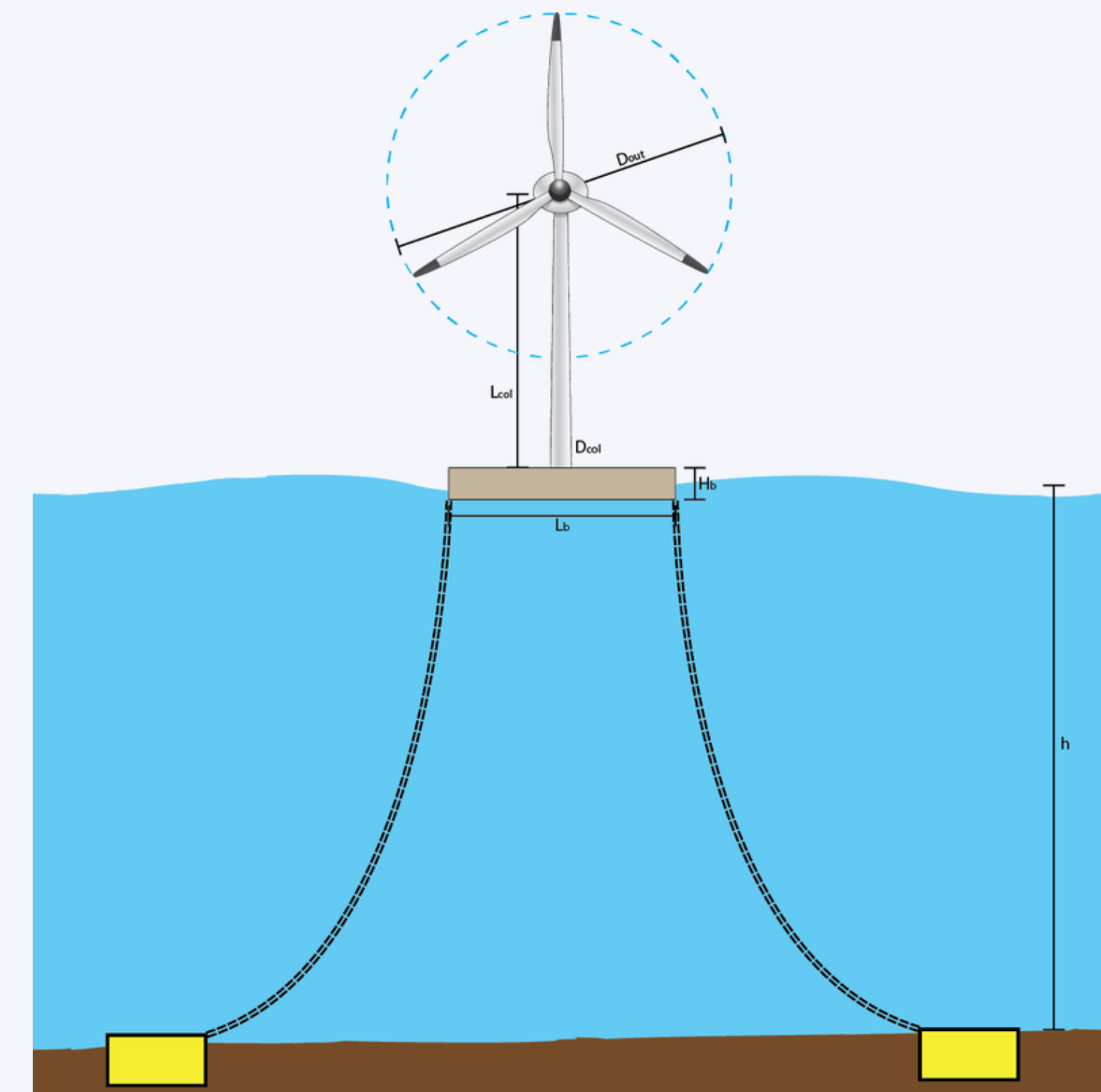
Inspired by other industry sectors



Up to 1800m depth



Intercontinental shipping



Floating Wind Timeline

From idea to reality

Demonstration phase

Hywind
Norway
2.3MW

Fukushima
Forward I
Japan
2MW

SeaTwirl S1
Sweden
0.3MW

Sakiyama
Japan
2MW

Floatgen
France
2MW

Kitakyushu NEDO
Japan
2MW

2009

2016 2017

2020

Fukushima
Forward II
Japan
7MW

Hywind
Scotland
30MW
5x6MW

WindFloat
Portugal
25MW
3x8.4MW

Kincardine
Scotland
50MW
6x8.4MW

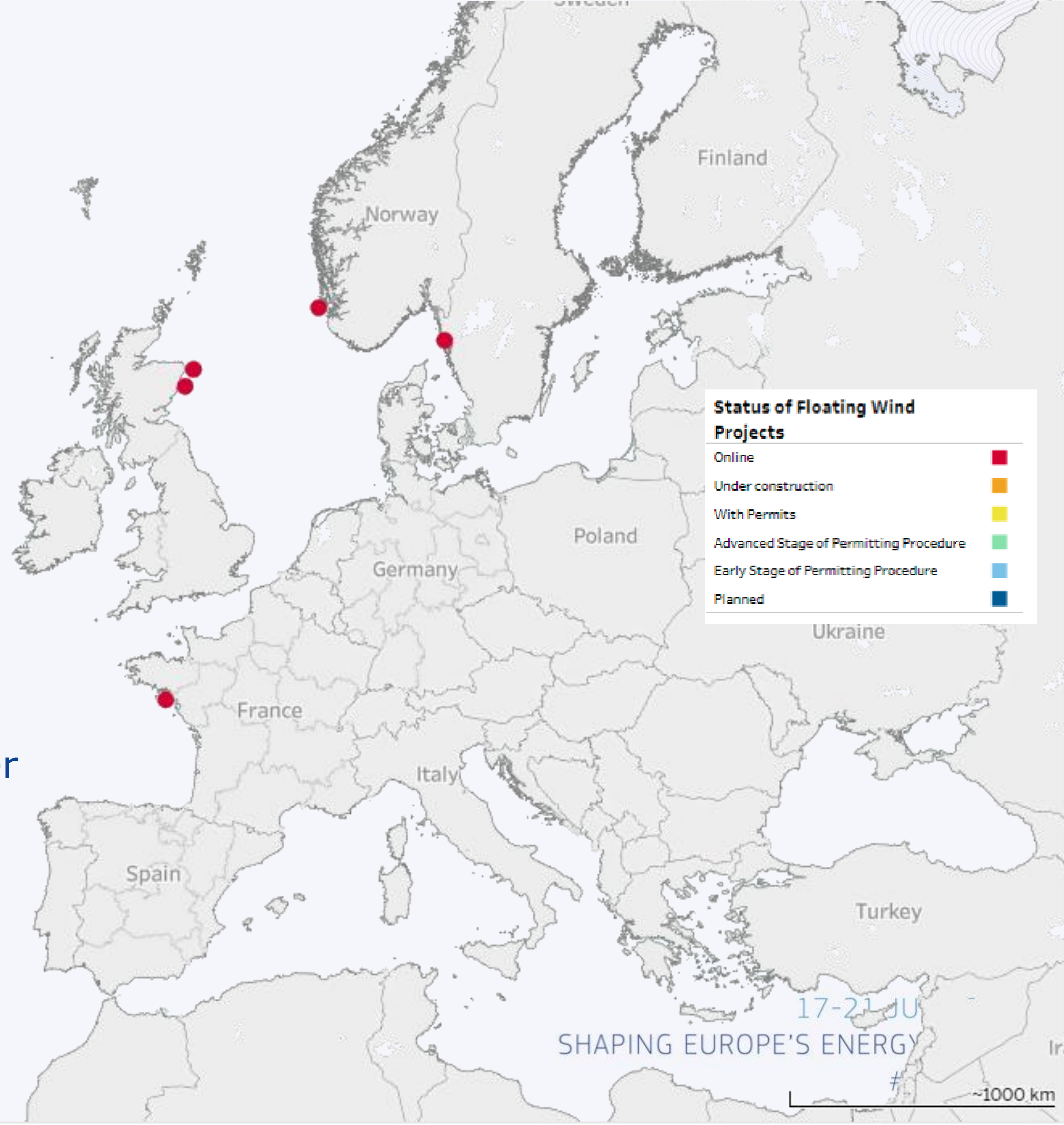
Pre-commercial scale

Europe's Floating Wind Farms

1 pre-commercial project online

9 floating wind turbines in the water

36.6 MW online
<1% of Europe's offshore wind

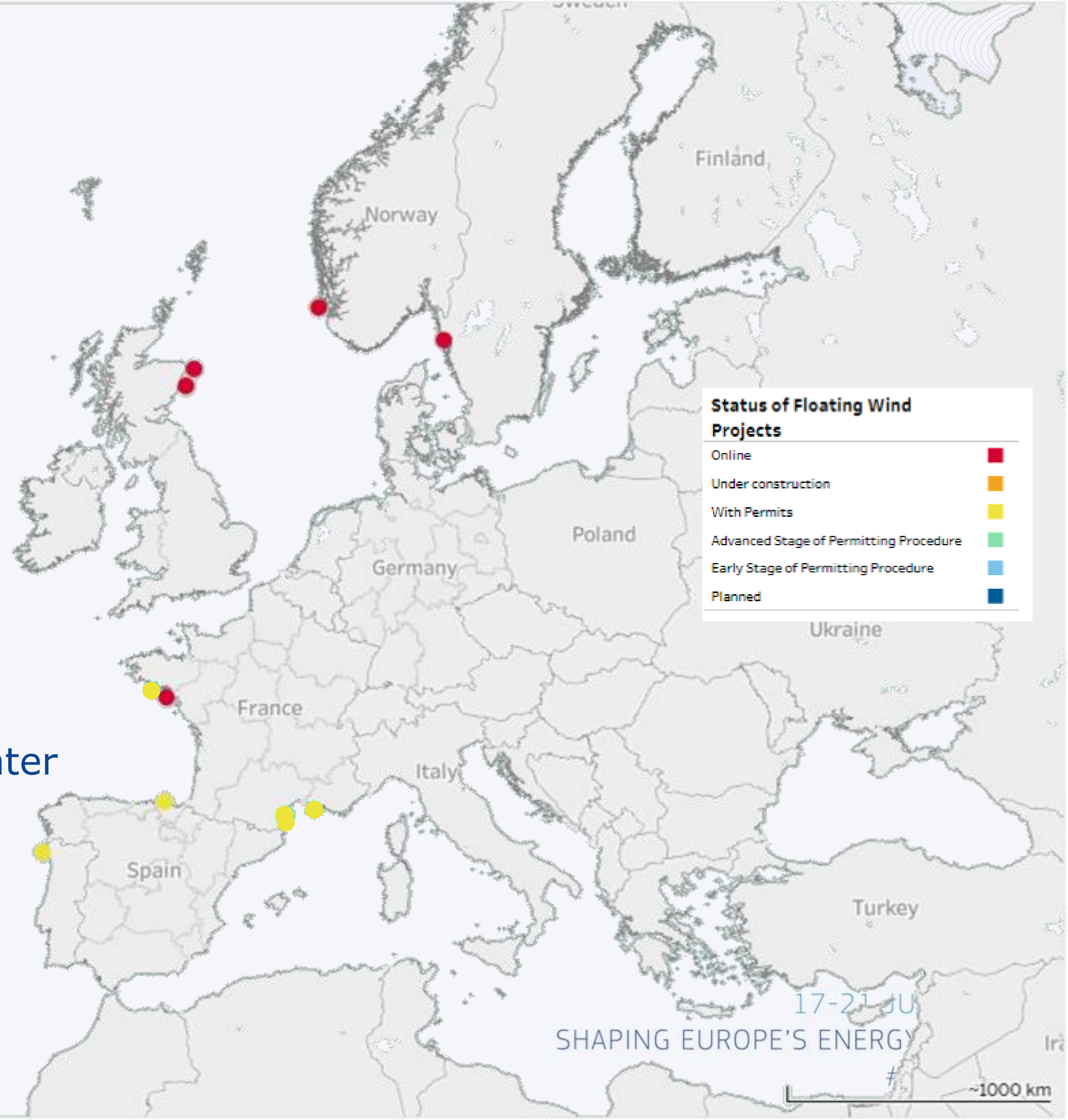


Doubling its capacity by the end of 2019

2 pre-commercial project online

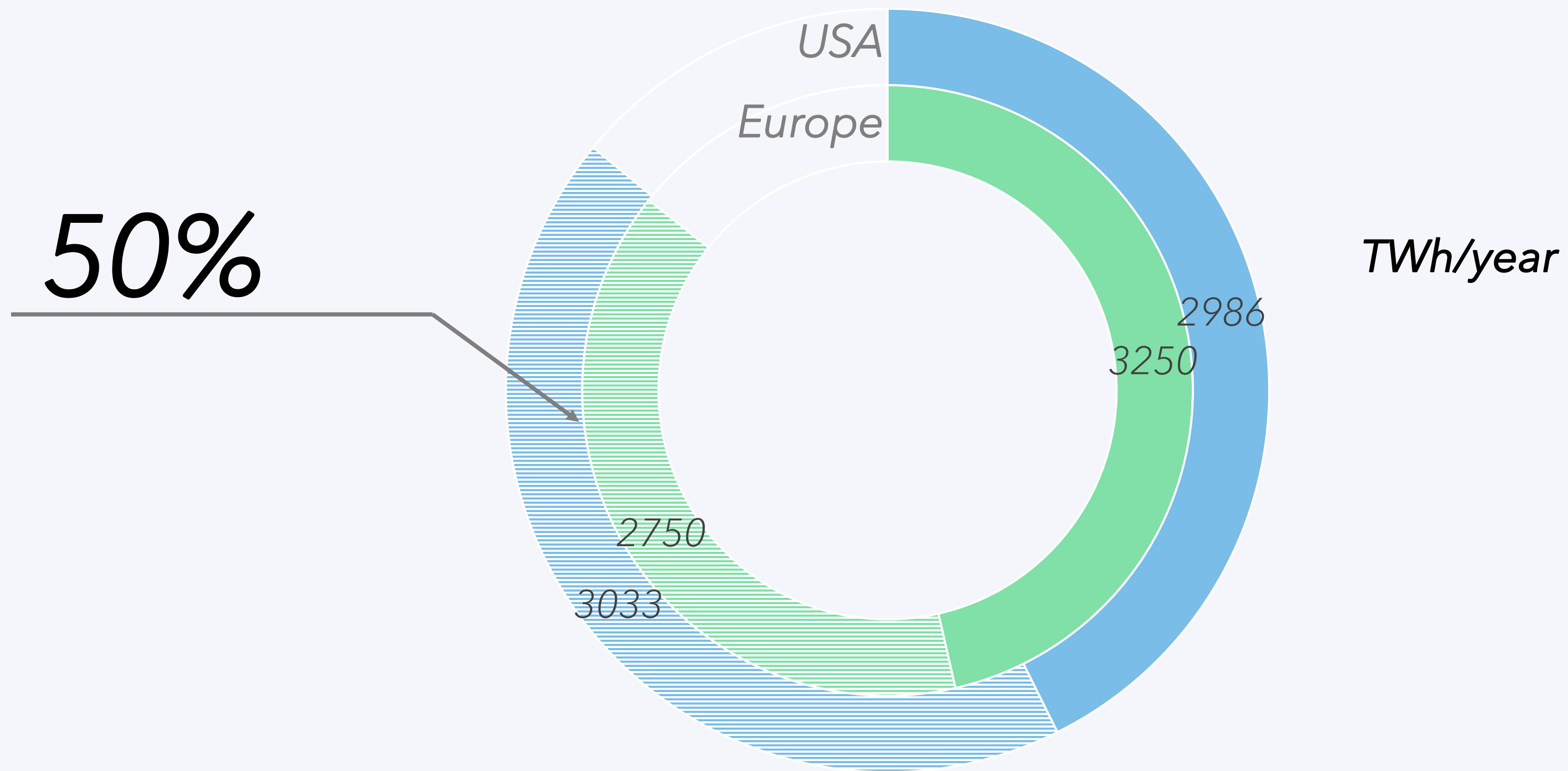
14 floating wind turbines in the water

73.8 MW online



Offshore potential

Floating to unlock deep waters



<60m depth potential
 >60m depth potential

Source: US technical potential by W. Musial, 2016 & Europe's upside scenario by BVG, 2017 [both up to 700m water depth and 200nm (EEZ)]

Barge

IDEOL – Floatgen

Photo by IDEOL



Semi-Submersible EDPR – WindFloat

Photo by Principle Power



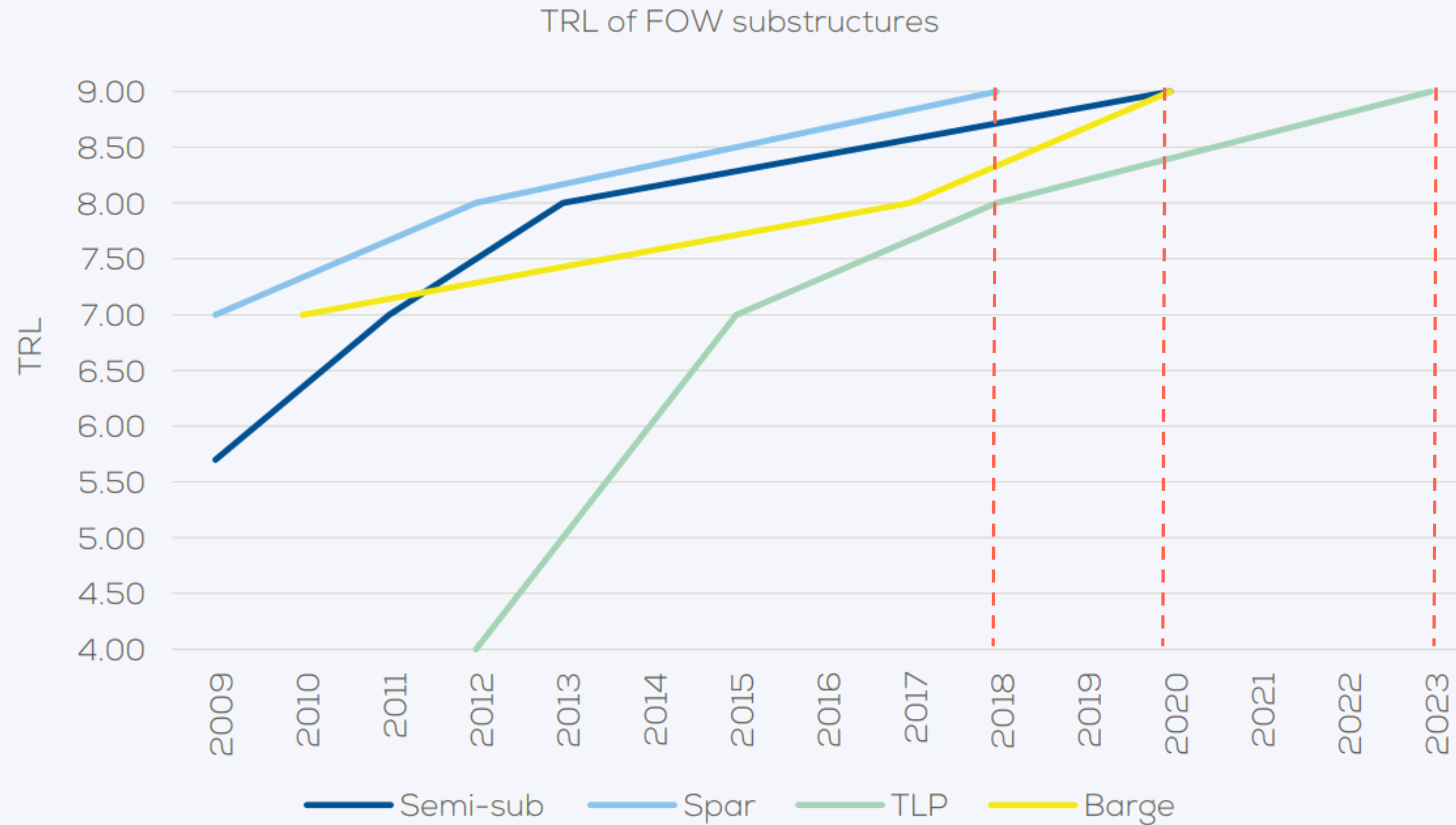
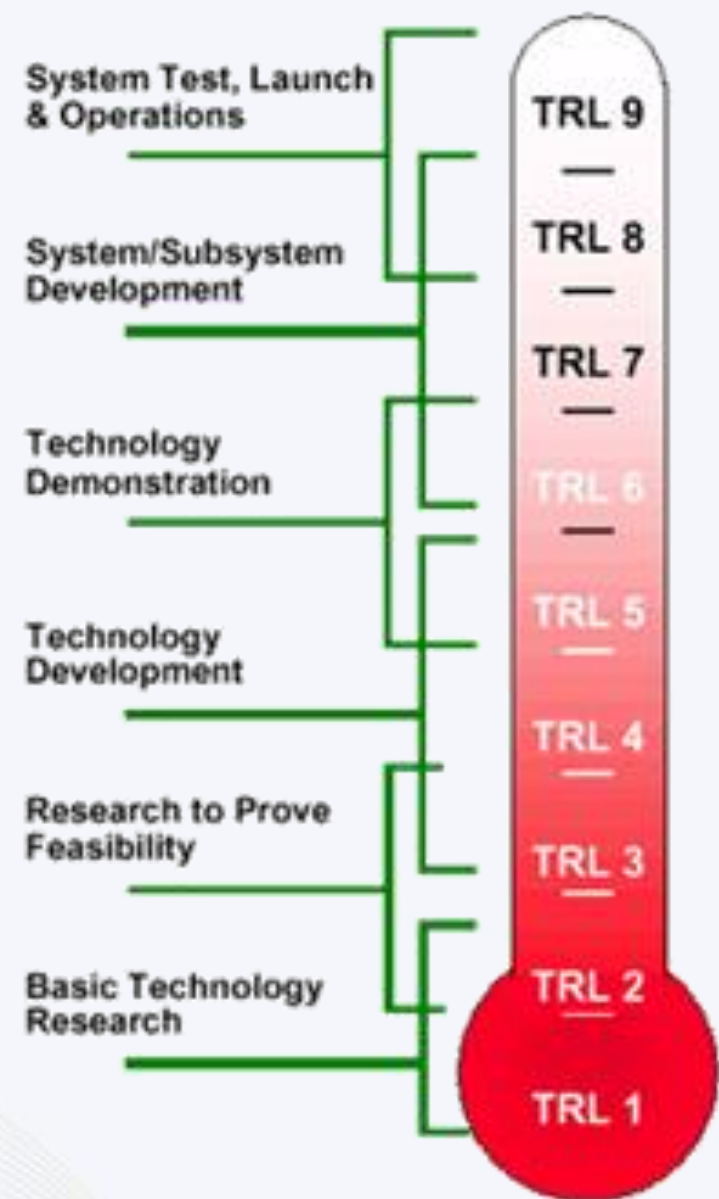


Spar-buoy

Equinor - Hywind Scotland

Photo by Øyvind Gravas

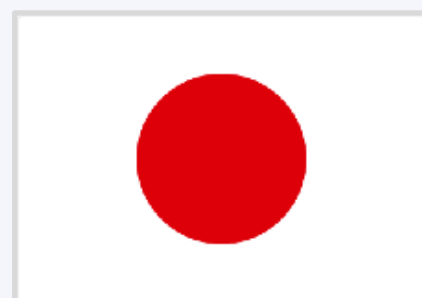
Technologies in a different Technology Readiness Level (TRL)



- Spar-buoy:**
Hywind Scotland (30MW)
- Semi-sub:**
WindFloat Atlantic (24MW)
Kinkardine (50MW)
- Barge:**
EolMed (24 MW)
- TLP:**
Gicon (Tank Test)

Source: The Crown Estate¹ and WindEurope

Other markets looking into floating



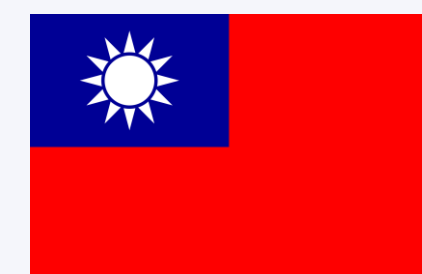
- Home of 5/8 demonstrations sites worldwide ranging from 2 MW- 7 MW



- Ulsan's government signed MoU to build 1 GW floating with 5 consortiums (200 MW each)



- Up to 15 GW offshore; attractive for Hawaii, California and Northeast due to high RES ambition and water depth



- Target 4 GW of bottom-fixed by 2030 and considering 1 GW of floating in the timeline



- Target 30 GW of offshore by 2030, floating might address water depths and seabed conditions

Cost reduction trajectory

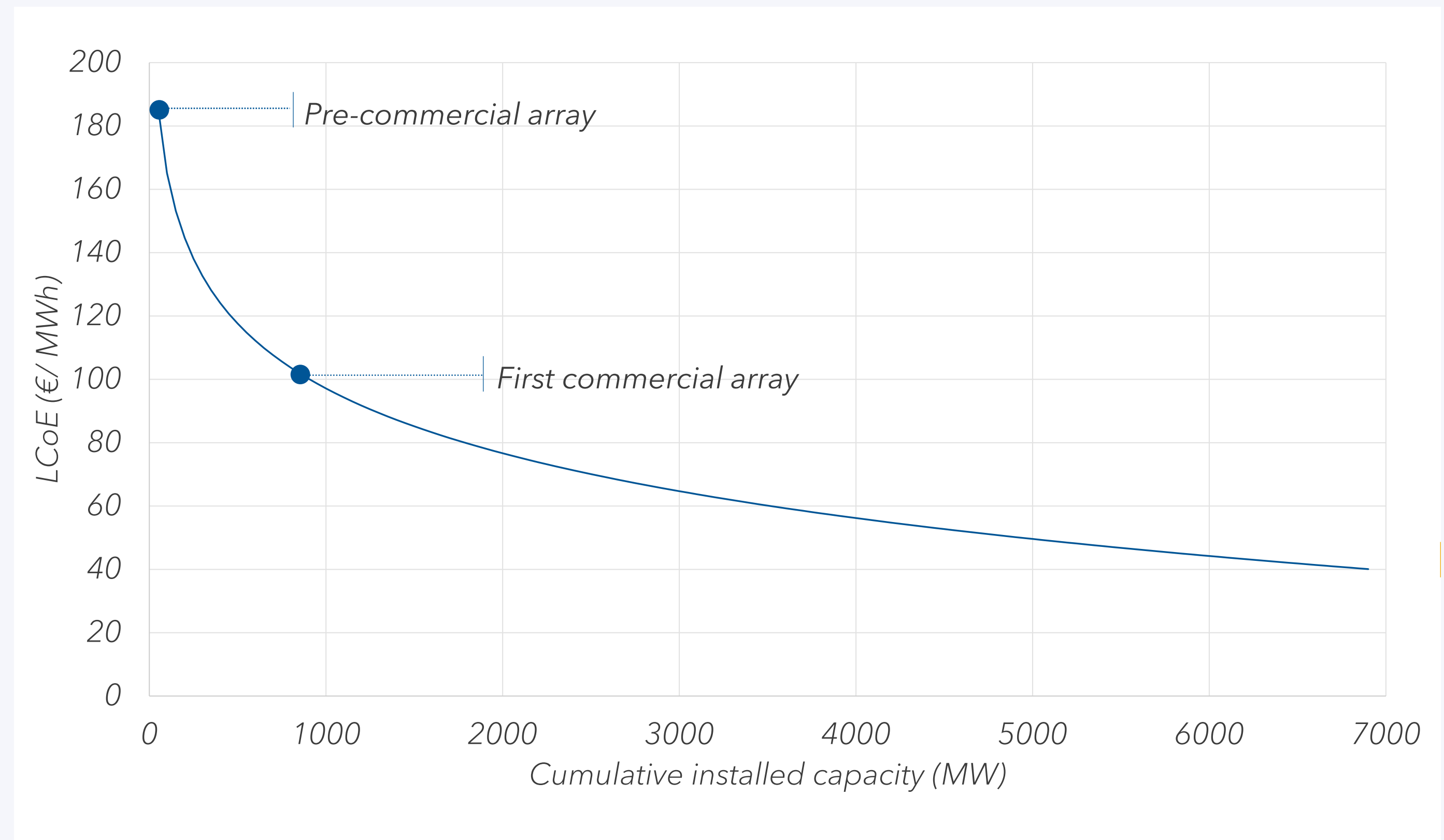
The road to commercialization

Targets:

Pre-commercial:
€180 - 240/MWh

First commercial array:
€80 - 100/MWh

Commercial:
€40 - 60/MWh

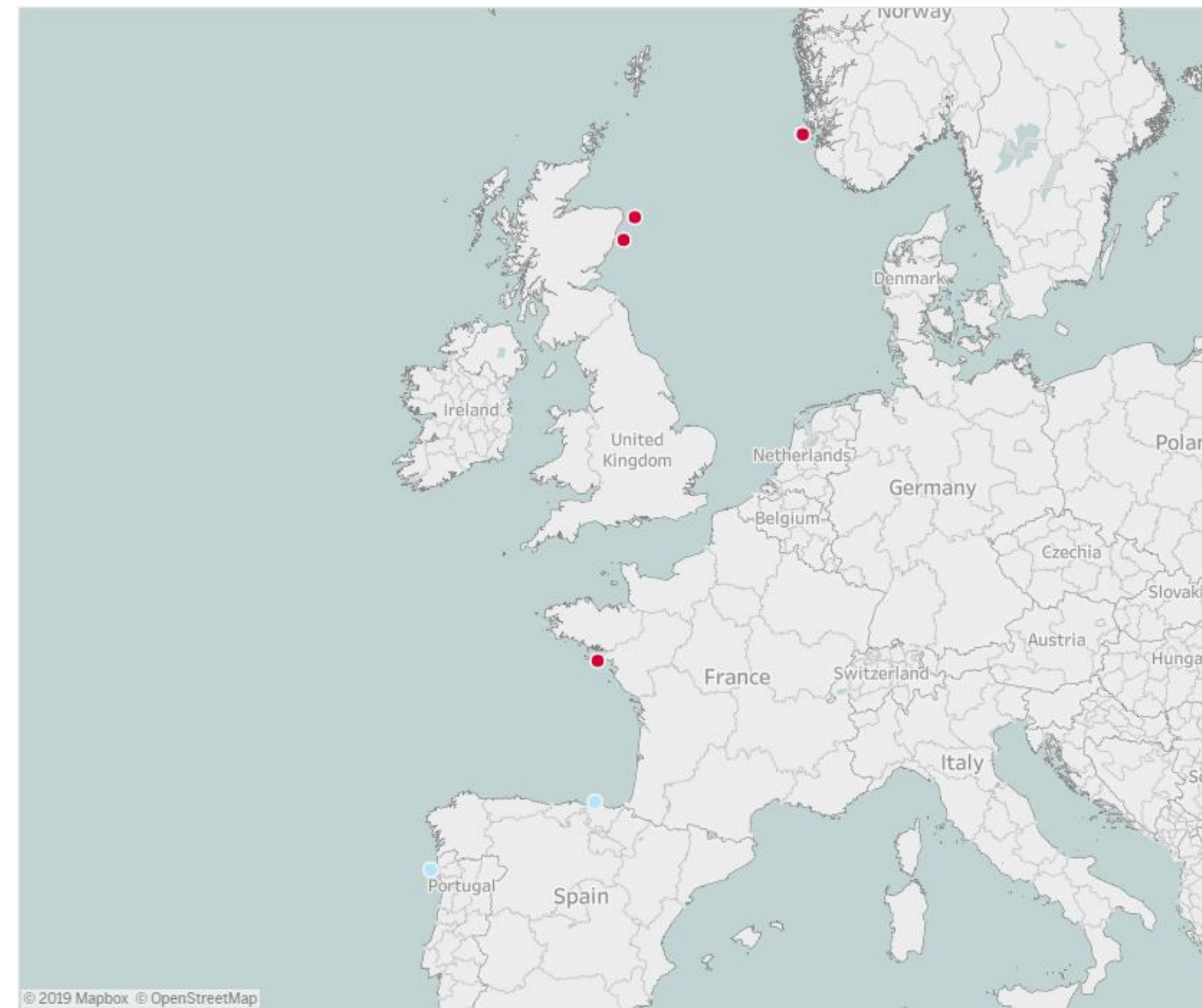


Publications and other tools



June, 2017

International Floating Wind Projects Map



Status

Online	■
Under construction	■
With Permits	■

Floating cumulative capacity

Country	Project Name	MW
UNITED KINGDOM	Hywind Scotland	30.0
	Kincardine	50.4
	Kincardine Pilot	2.0
PORTUGAL	Windfloat Atlantic Phase 1	25.2
JAPAN	Fukushima Forward I	2.0
	Fukushima Forward II	7.0
	Fukushima Forward III	5.0
	Kitakyushu NEDO	3.0
	Sakiyama	2.0
SPAIN	DemoSATH	2.0
	Plocan	15.0
NORWAY	Hywind Demonstrator	2.3
	TetraSpar Demo	3.6
FRANCE	Floatgen	2.0
SWEDEN	SeaTwirl S1	0.3



Updated every half year

 EUSEW.EU
 [EUENERGYWEEK](https://www.facebook.com/EUENERGYWEEK)
 [@EUENERGYWEEK](https://twitter.com/EUENERGYWEEK)

17-21 JUNE 2019
SHAPING EUROPE'S ENERGY FUTURE
#EUSEW19