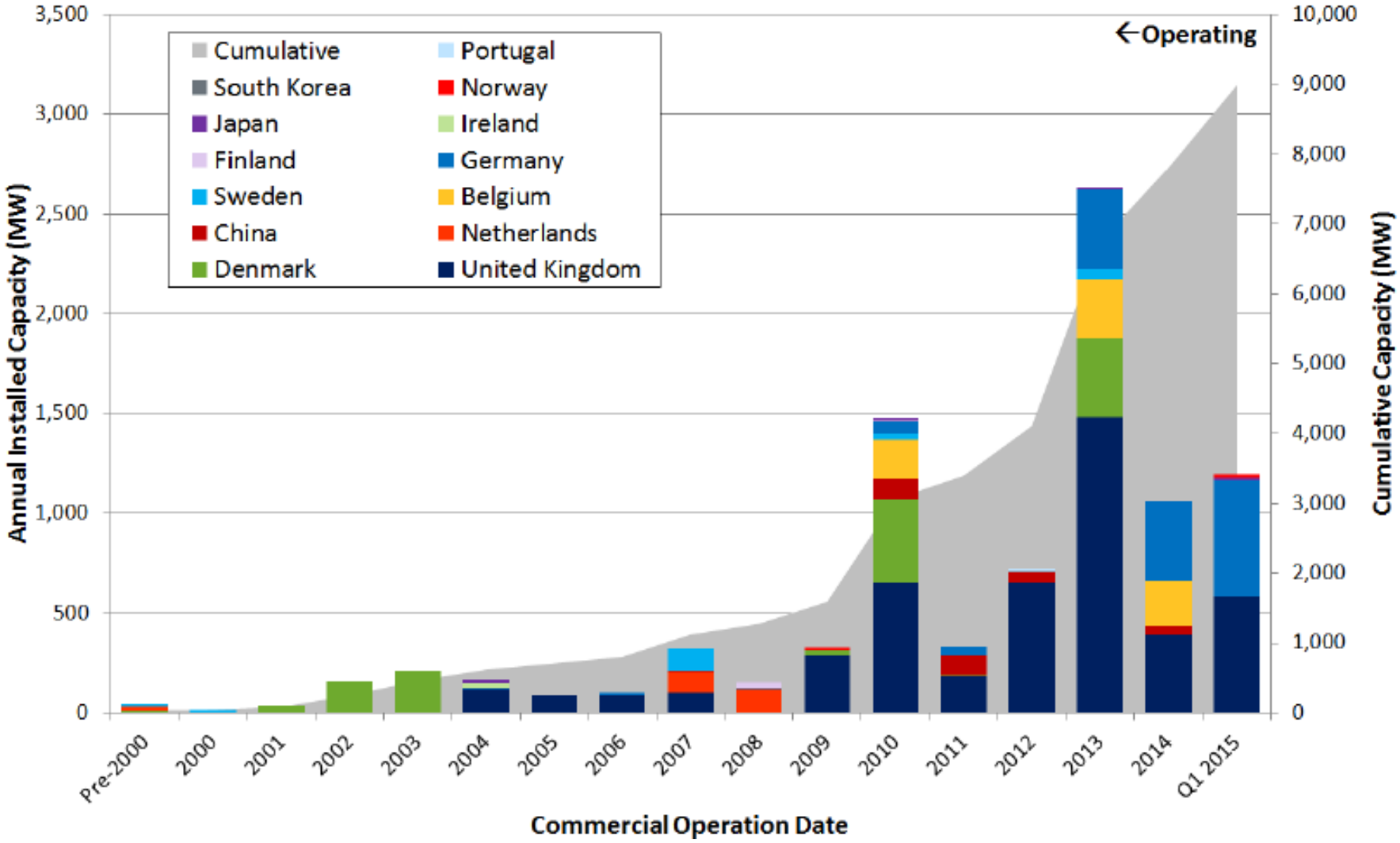
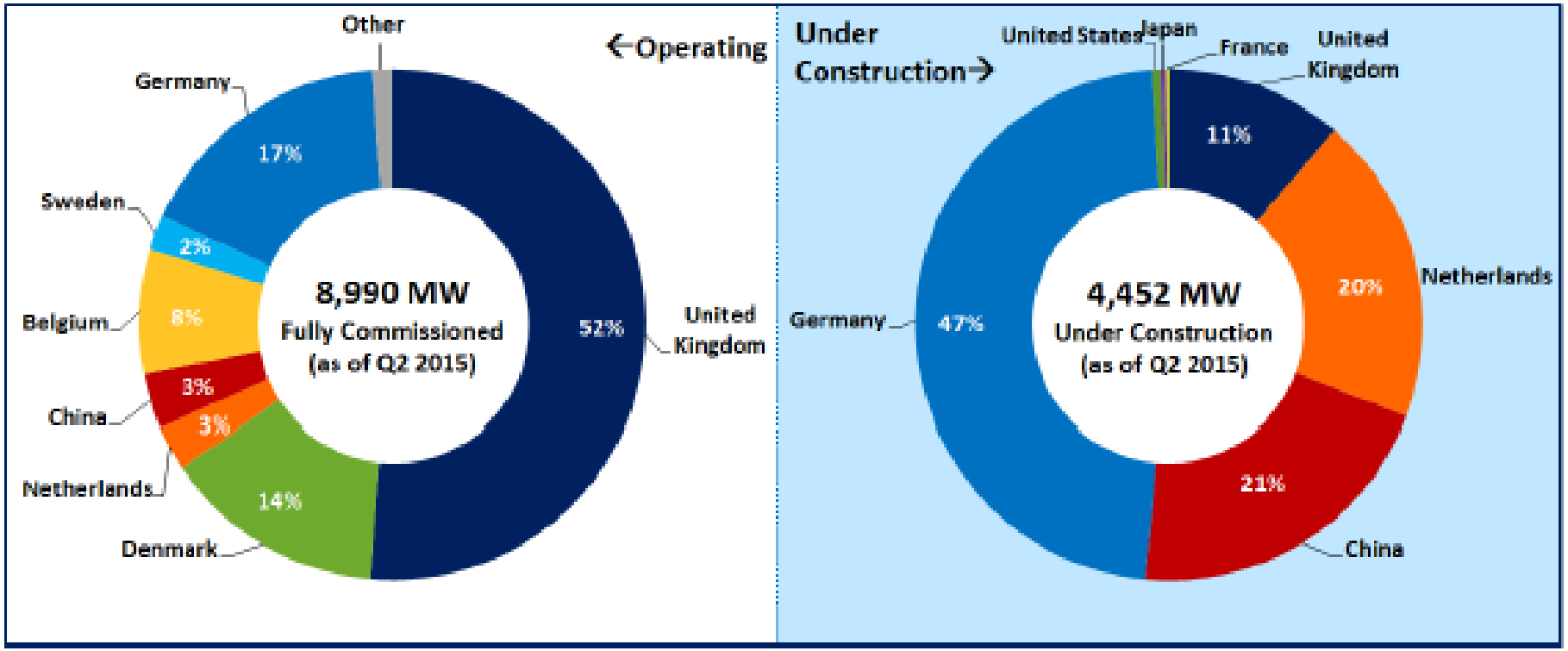
An introduction to offshore wind

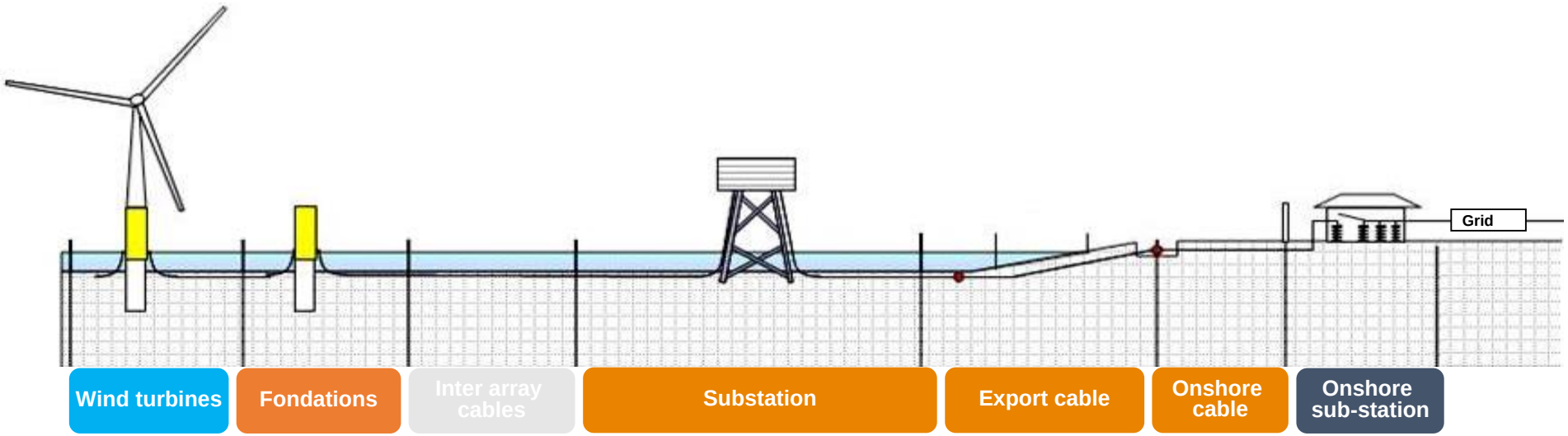
Wind offshore: around 10 GW in operation at end of 2015
Europe is leading the way….

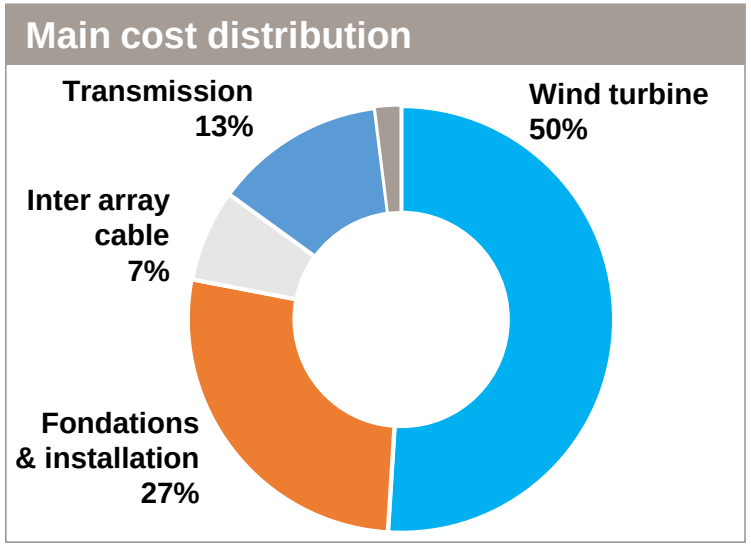


Wind offshore: around 10 GW in operation at end of 2015
….but China is coming



Wind offshore : what are we talking about ?



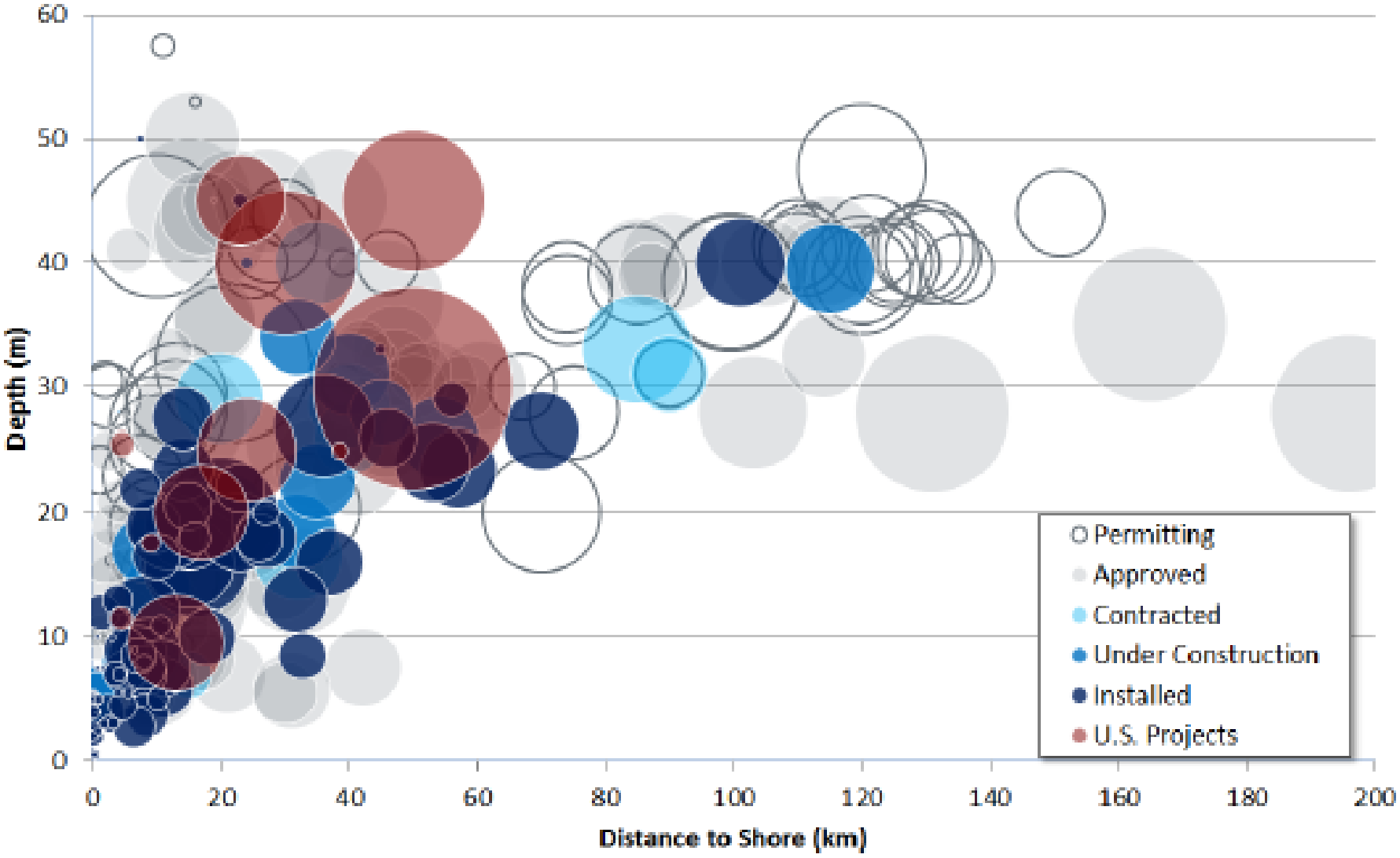


An overall investment of around 3/4 M€/MW

Investment are getting higher with water depth and distance to shore

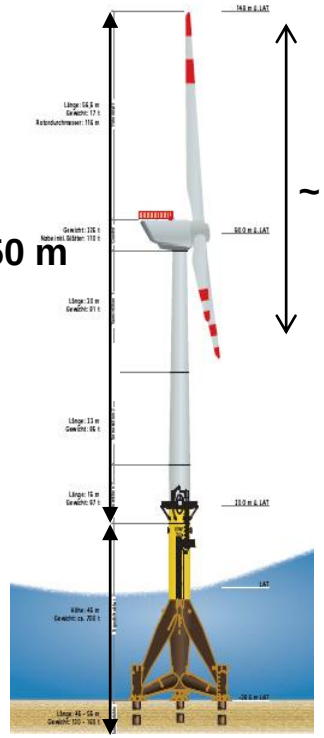
A value chain optimisation is needed with in particular the importance of contractual scheme evolution (larger packages)

Wind offshore : Main market evolution
Projects are getting bigger, going deeper, at a longer distance to shore

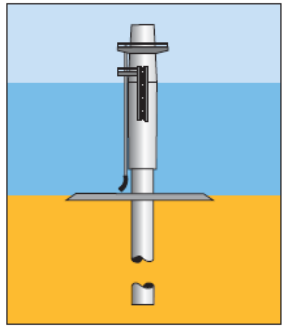


Wind offshore : Main market evolution
Project are getting bigger, going deeper, at a longer distance to shore

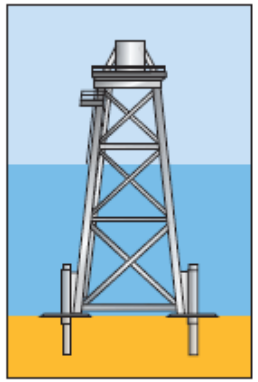
Larger turbines (6 MW,7 MW, …)



Evolution towards jacket fondation



Monopile



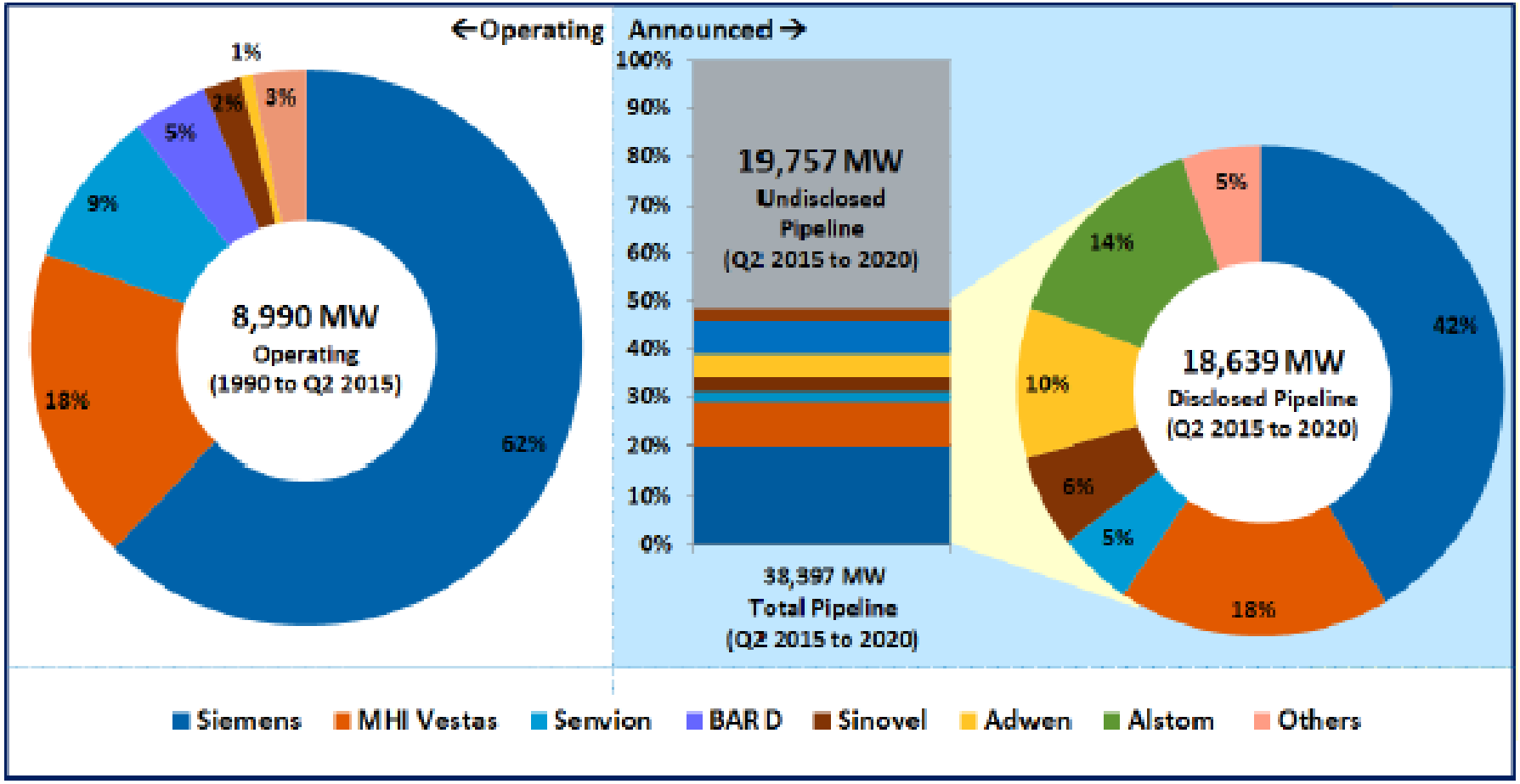
Jacket

Larger and more complex to install sub-station

165 MW
~5 000 t

>600 MW
~10 000 t

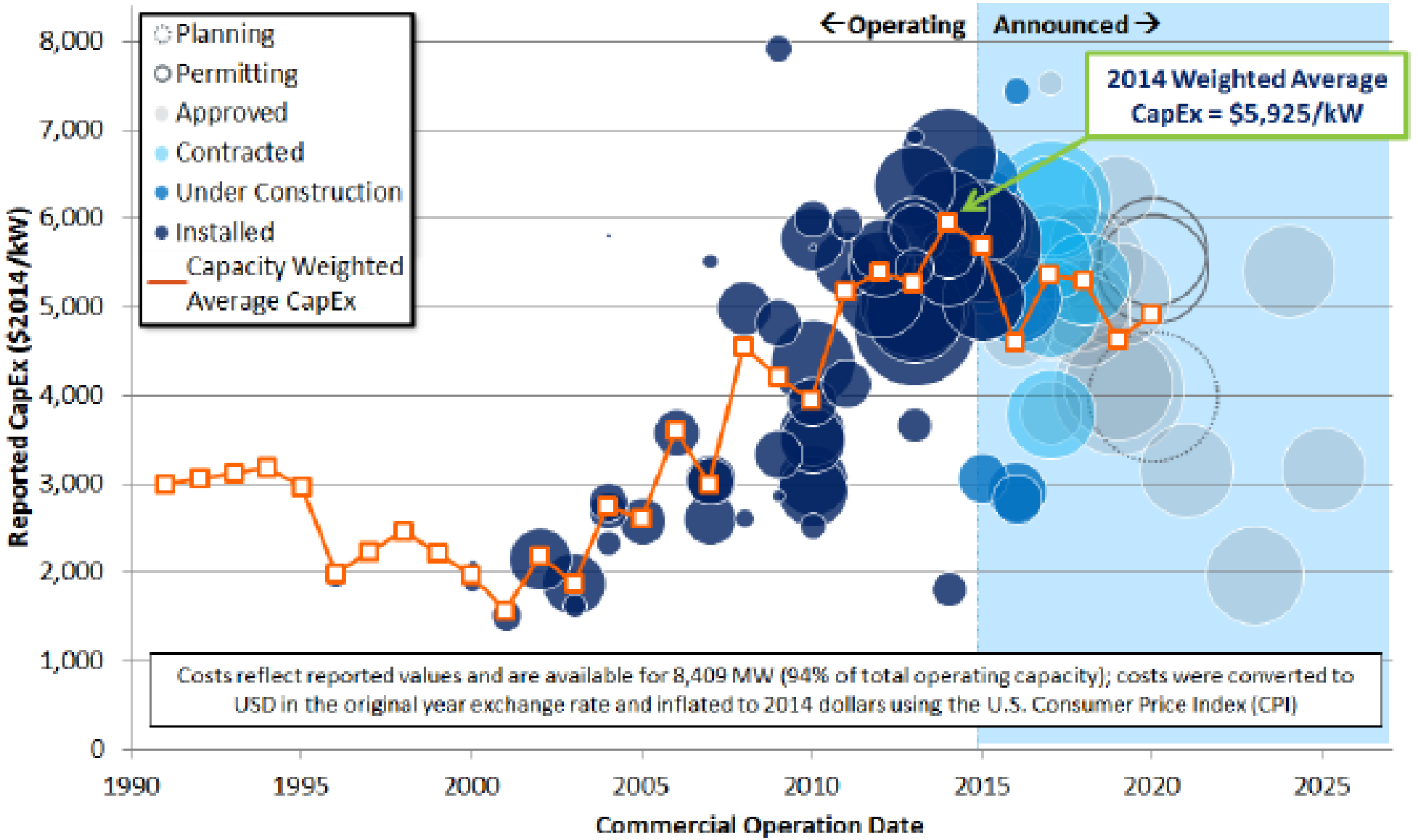
Wind offshore : Main market evolution
Siemens is leading the market….but the competition is arriving (at last !)



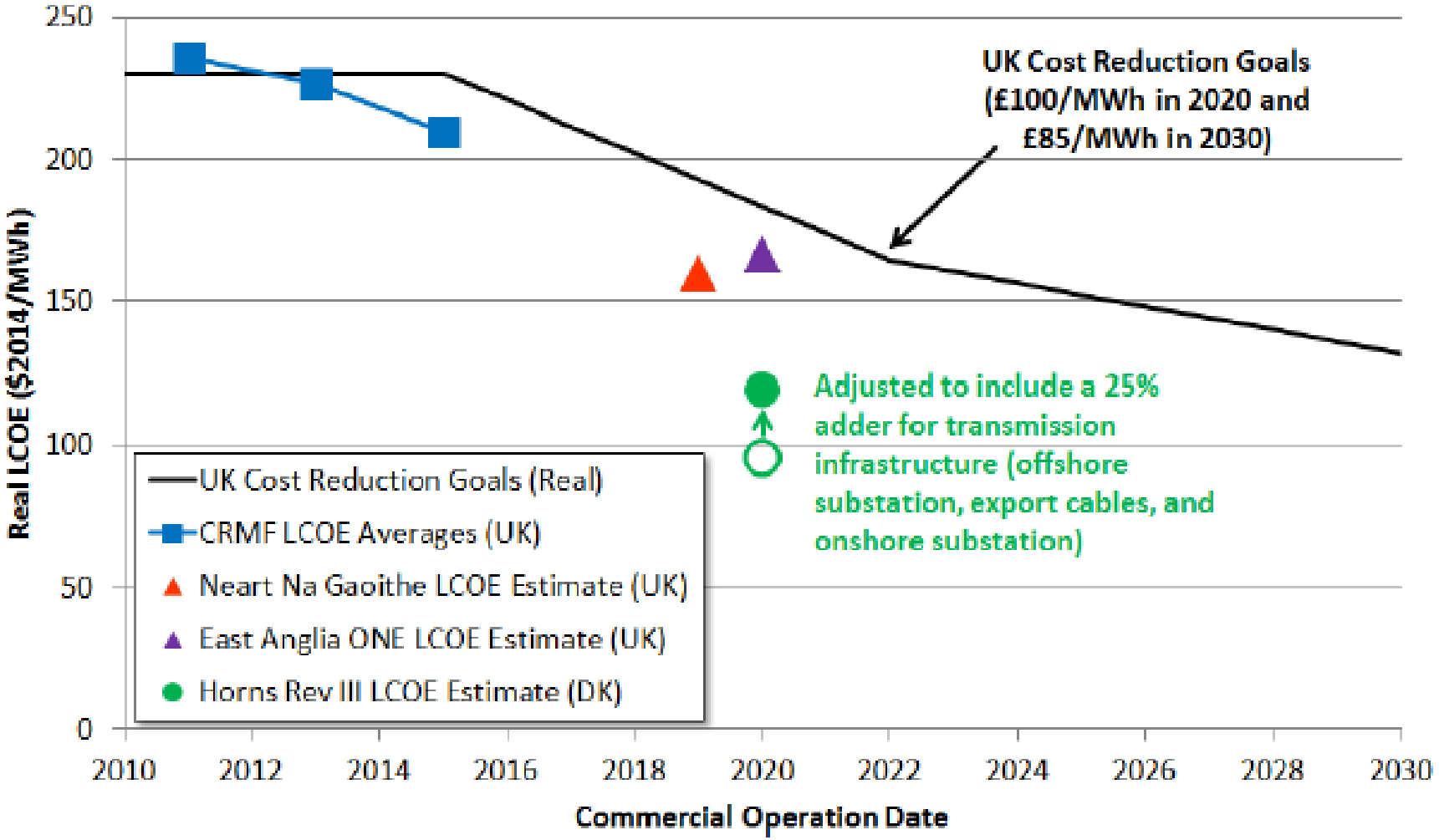
Wind offshore : Main market evolution
Monopile has 75% of market share…but jacket should come as the main alternative

Floating offshore wind:
the new frontier

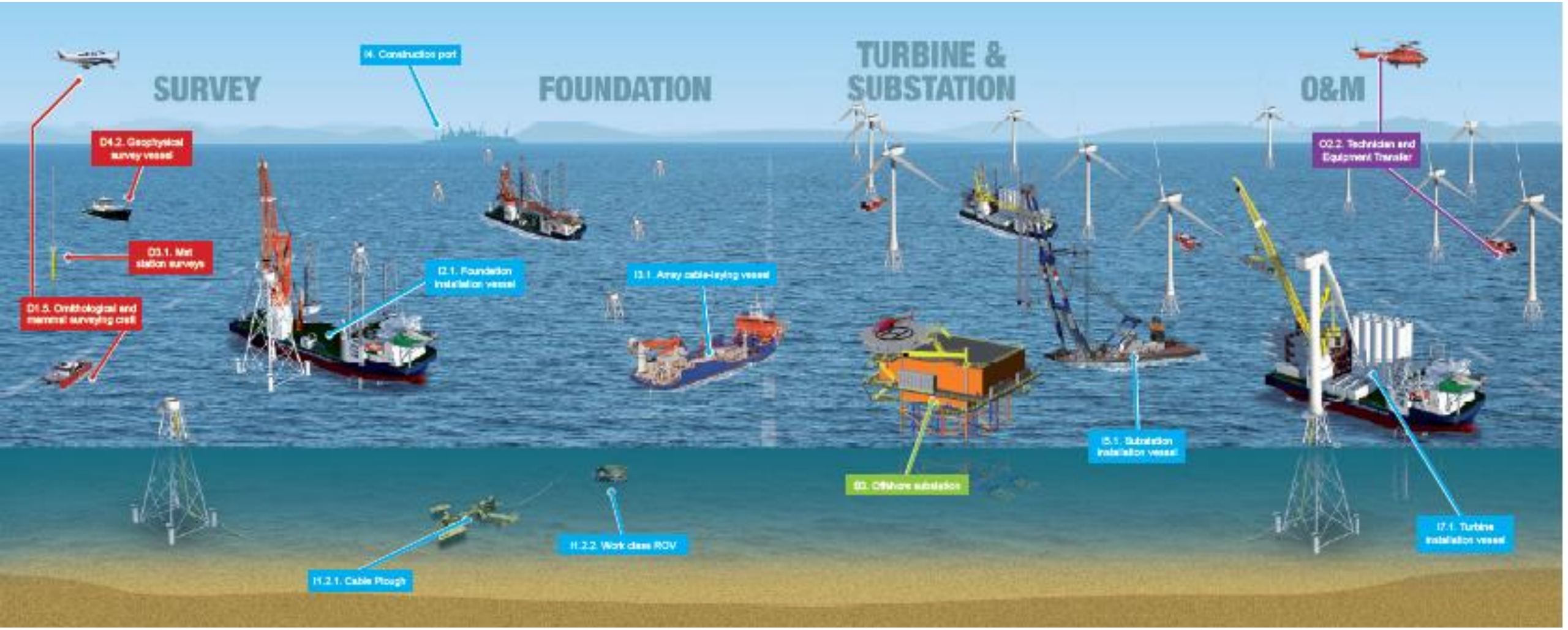
Wind offshore : Main market evolution
Offshore wind: still an expensive technology (capex)



Wind offshore : Main market evolution
Offshore wind: still an expensive technology (LCOE)



Wind offshore : Main market evolution
Offshore wind: a complex value chain



The coming of Europe's offshore wind energy industry

VESSELS

At least 6 different types of vessels are needed to survey the site, carry components and personnel, install substructure, turbines and substations, lay cables and complete the installation of an offshore wind farm.

Total demand 2010: 6 vessels

Total demand 2020: 27.5 vessels

ELECTRICAL INFRASTRUCTURE

SUBSTRUCTURES

Substructures present major opportunities for domestic manufacturing thanks to low technical barriers for entry. Substructure manufacturing also brings a significant amount of supply chain value as it represents a large part of the capital expenditure in an offshore wind farm. It is not essential to have turbine manufacturing to develop an offshore wind industry.

Types of substructures:

PORTS

Two main types of ports:

MANUFACTURING PORTS: where the manufacturing facility is closely located to/or at the port and the components are exported directly to the offshore site.

MOBILIZATION PORTS: where the components and turbines are received ready and transported to either the installation vessels directly or the feeder vessels which take them on the offshore site.

Offshore wind energy is a significant opportunity for ports to counter-balance the downturn hitting traditional activities.

What makes a suitable construction port

Water depth: >10m

Storage area: 25ha

Quayside length: Quay bearing 15-20t/m²

Waterway for: 150-200m diameter rotors

THE SUPPLY CHAIN WILL DELIVER

2020

- Total installed capacity of 40,000 MW
- Annual installations of 6,900 MW
- Total electricity production of 148 TWh
- Meeting between 4% and 4.2% of total EU electricity demand
- Avoiding 102 Mt of CO_2 annually
- Annual investments in offshore wind turbines of €10.4 billion
- Cumulative investments in offshore wind turbines of €66.9 billion in the period 2011-2020

2030

- Total installed capacity of 150,000 MW
- Annual installations of 13,700 MW
- Total electricity production of 562 TWh
- Meeting 13.9% of total EU electricity demand
- Avoiding 315 Mt of CO_2 in 2030
- Annual investments in offshore wind turbines of €17 billion in 2030
- Cumulative investments of €145.2 billion from 2021 to 2030

TURBINES

Four to 12 new wind turbines models are expected to reach some level of market readiness in the next decade. Supply of offshore wind turbines will meet and exceed demand for the next decade, leading to healthy levels of competition within Europe with the potential for export.

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