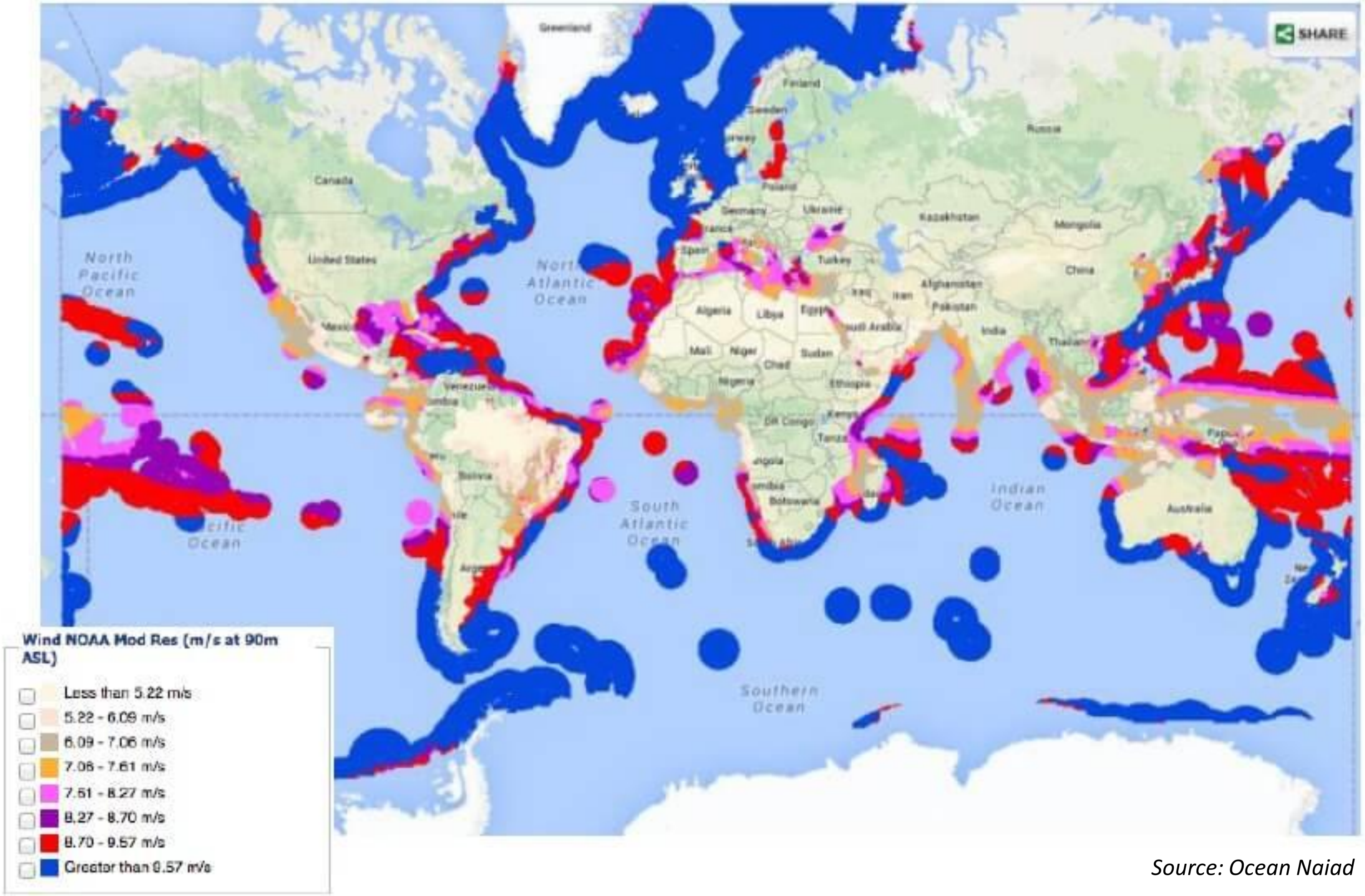
Globalisation -

market views and supply chain challenges

Jon Dugstad
Director Wind & Solar

Meeting coastal power demand

Global average wind speeds at 90 m



Source: Ocean Naiad

Presently about 40% of the **world's population lives** within 100 kilometers of the **coast**.

As **population density** and economic activity in the **coastal** zone increases, pressures on **coastal** ecosystems increase.

Concentrations in major coastal cities.

Norwegian Energy Partners


Bloomberg
Markets
Big Oil Replac
Rigs With Wind Turbine
By Jess Shankleman
23 March 2017, 01:01 CET Update
Offshore wind gets investments from S
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Provincial governments' ambitious plans for more than
The New York Times
Orsted, a Giant in Offshore Wind Farms, Makes a Move in the U.S.
The Walney Extension wind farm, operated by Orsted off Blackpool, England. Northern Europe has dominated offshore generation, which until recently required large subsidies to be economically viab
Phil Noble/Reuters
By Stanley Reed
Oct. 8, 2018
Orsted, a Danish company that is one of
energy developers, said on Mond
rival, Deepwater Wind, for $510
becoming an attractive market f
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UK Offshore wind capacity set to double following Government announcement
23 July 2018 (0 Comments)
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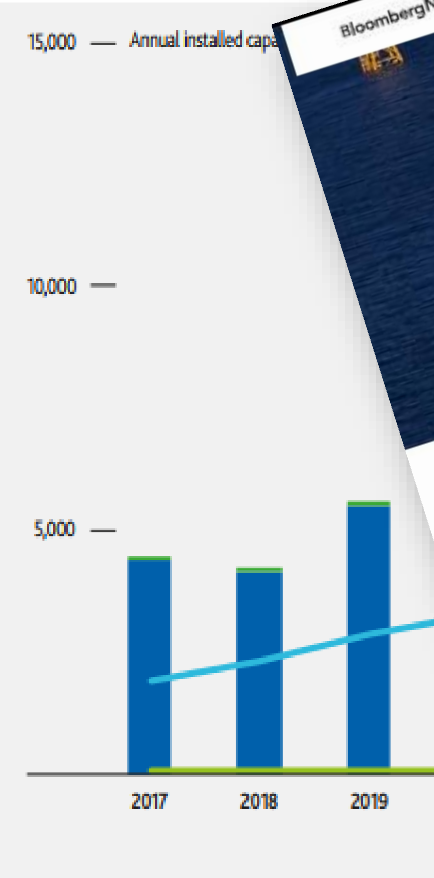
Linchpin of Green Energy Policy
Korean Gov't to Kick Off Offshore Wind Power Genera
Michael Herh
June 27, 2018, 16:28
The Moon Jae-in administration will kick off the final part of the Renewable Energy 3020 Implementation Plan with an offshore wind power generation project.
IRENA
International Renewable Energy Agency
ABOUT
OUR WORK
RENEWABLES
Floating foundations: A game changer for offshore wind
FLOATING FOUNDATIONS: A GAME CHANGER FOR OFFSHORE WIND POWER
Offshore wind turbines, rooted to the seabed by monopile or jacket foundations, are restricted to waters less than 50 metres deep. This rules out sites with the strongest winds and, often, access to big markets. Some of the largest electricity markets Japan and the United States possess few shallow-water sites suitable for offshore wind development. Floating foundations could

120 GW in 2030




BloombergNEF

PRODUCT BLOG ABOUT SUMMITS CONTACT LOGIN SEARCH

Global Offshore Wind Market Set to Grow Sixfold by 2030

January 8, 2018

This article first appeared on the BNEF mobile app and the Bloomberg Terminal.

- China to overtake U.K. and lead installations by 2022
- BNEF increases U.S. forecast by 85% on new state targets

Global offshore wind cumulative installation forecast

Norwegian Energy Partners

350 GW by 2040

Offshore Wind Journal

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IEA chief predicts potential 350-GW market for offshore wind

Tue 25 Sep 2018 by David Foxwell reporting from Global Wind Summit, Hamburg

Print story   Email us

IEA executive director Fatih Birol expects the offshore wind market to grow quickly, driven by ongoing cost reduction

The offshore wind industry could reach 200 GW by 2040, International Energy Agency executive director Fatih Birol told the Global Wind Summit in Hamburg, Germany, but with support from governments it has even greater potential.

Speaking in the opening session of the event, a ministerial session entitled 'Breaking new ground: the wind industry and the global energy transition,' the IEA's executive director said the agency anticipated that by 2030 wind would be Europe's leading source of power.

He said the IEA anticipates that global offshore wind capacity could reach 200 GW by 2040, with the EU as the market's largest player. There is currently around 20 GW of installed offshore wind capacity.

Recent whitepapers

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By MAN Diesel and Turbo

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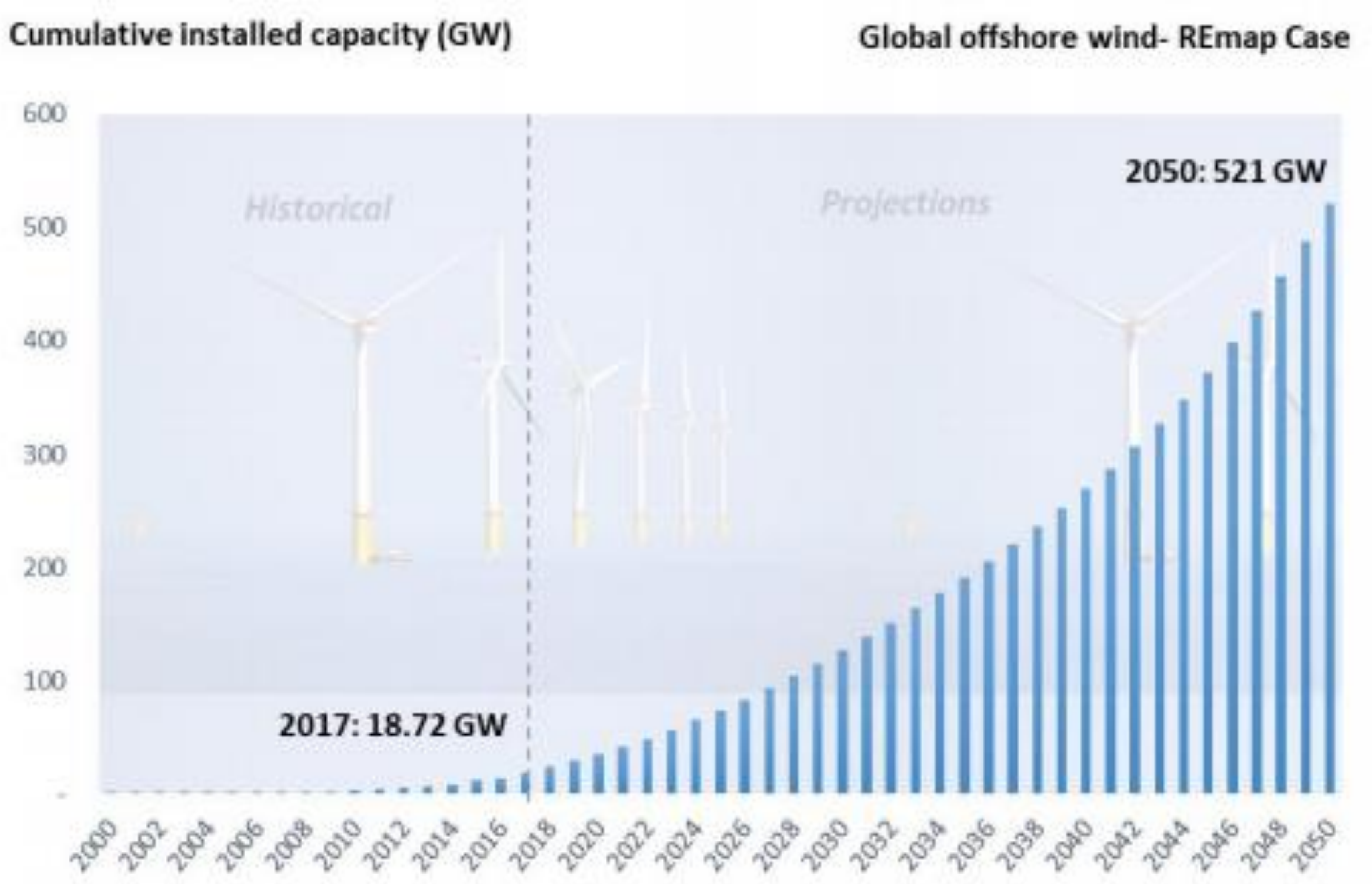
521 by 2050



Source: IRENA, 2018b, 2018c

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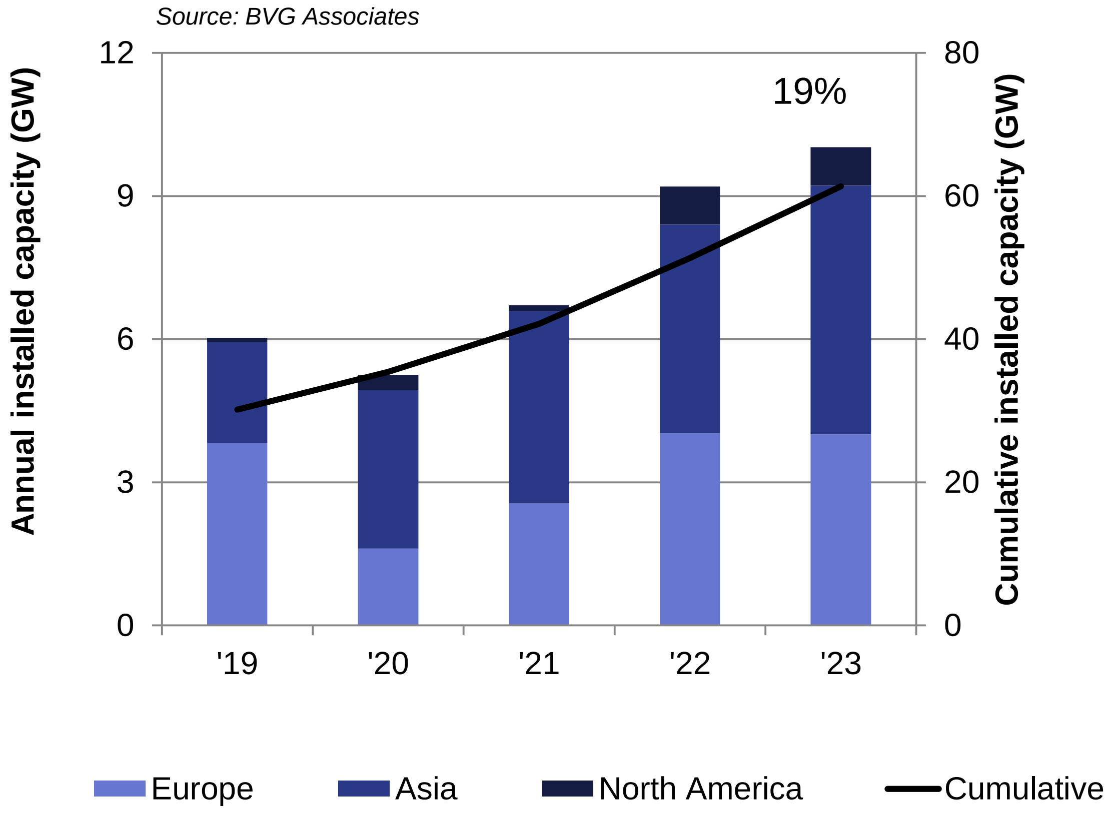
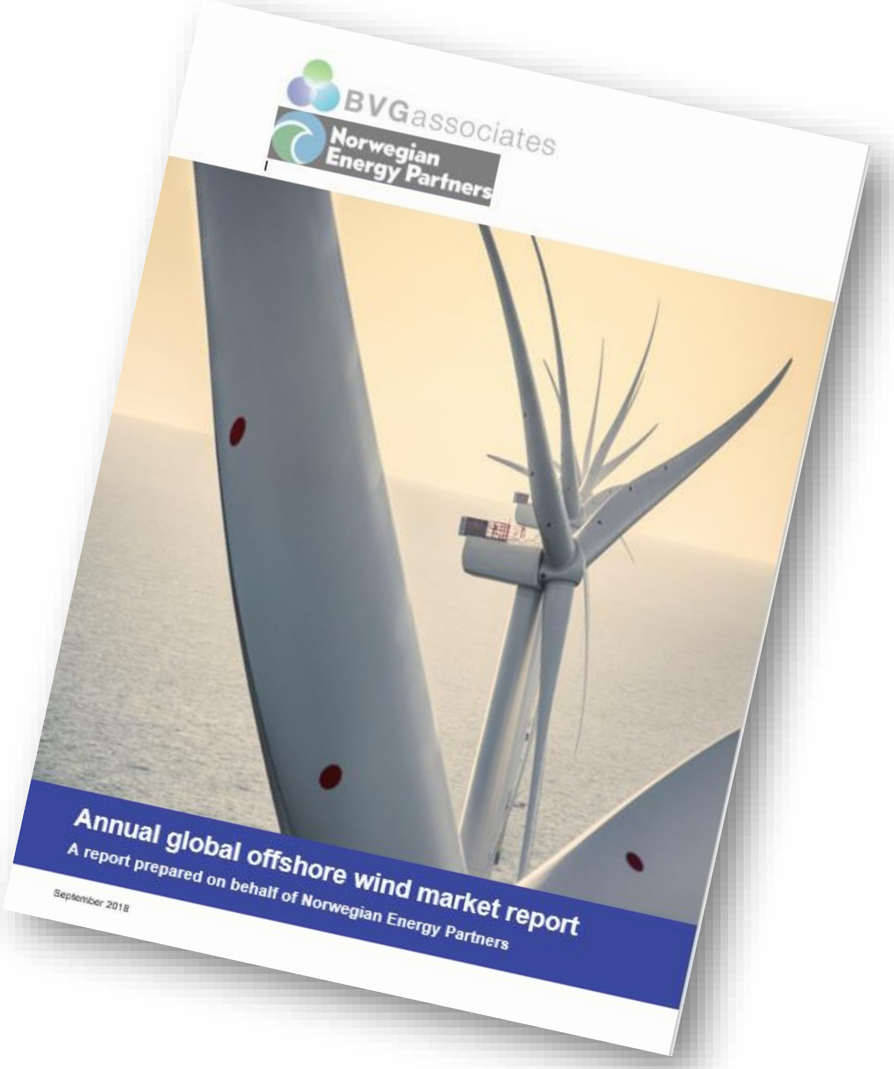
Annual Market Report 2018 – 2023 forecast



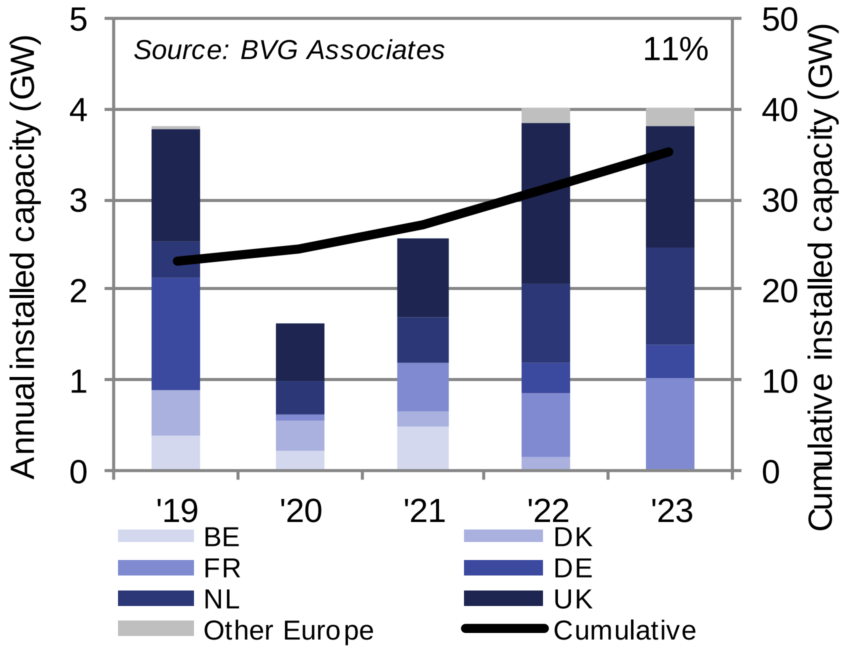
© BVG Associates 2018



“There will be huge demand for new innovative offshore solutions and expertise with a global reach as offshore wind is expanding into new markets.”

Large developer

The European market



Europe leads globally

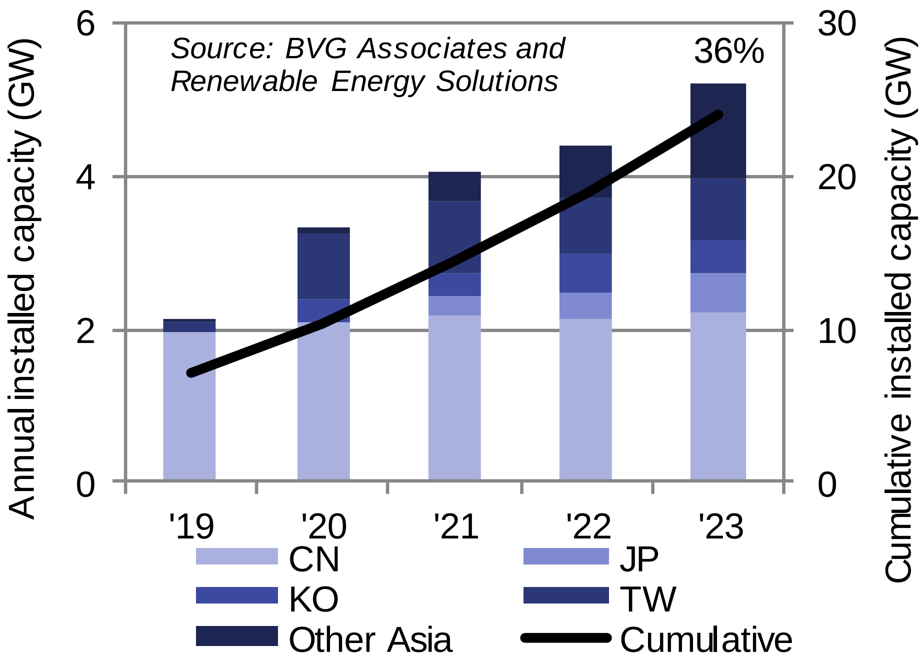
- 19.2 GW total installed capacity in 2018, reaching 35.2 GW by 2023

- CAGR of 11%

Industry & supply chain challenges

- Margin pressure – supplier inclusion
- Standardisation
- Technology and development integration
- Volume - bottlenecks
- H&S

The Asian Markets



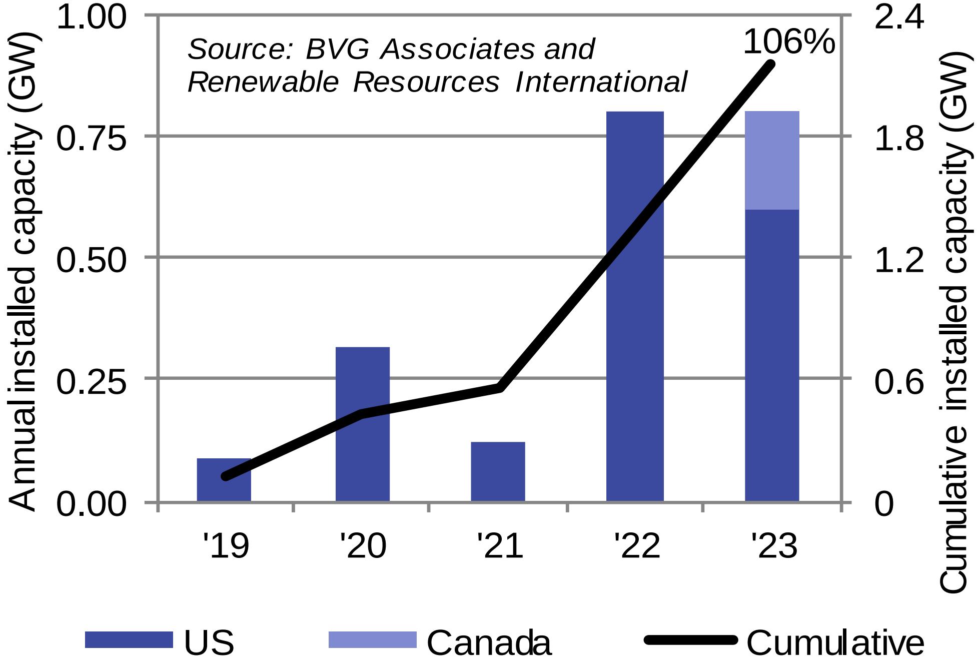
Capex & Opex

- Multicontracting preferred by developers to gain experience, developers tend to contract a greater number of individual contracts
- Government involvement in projects coupled with support from major local conglomerates – changing support environment
- Large SOE's dominate the industry – with supply chain loyalty
- Chinese entry into Europe

Industry & supply chain challenges

- The balance of plant and logistics supply chains are generally less developed than in Europe
- Strong local content requirements – independent of local competencies and resource
- Various market specifics – typhons – subsea structure – H&S
- Silo supply chain development
- Need for capacity building and volume markets

The North American Market



Capex & Opex

- Ørsted and Equinor etc are likely to multicontract with mature, global suppliers, which may collaborate with North American partners
- EPCI contracting is likely to be preferred by less experienced US developers

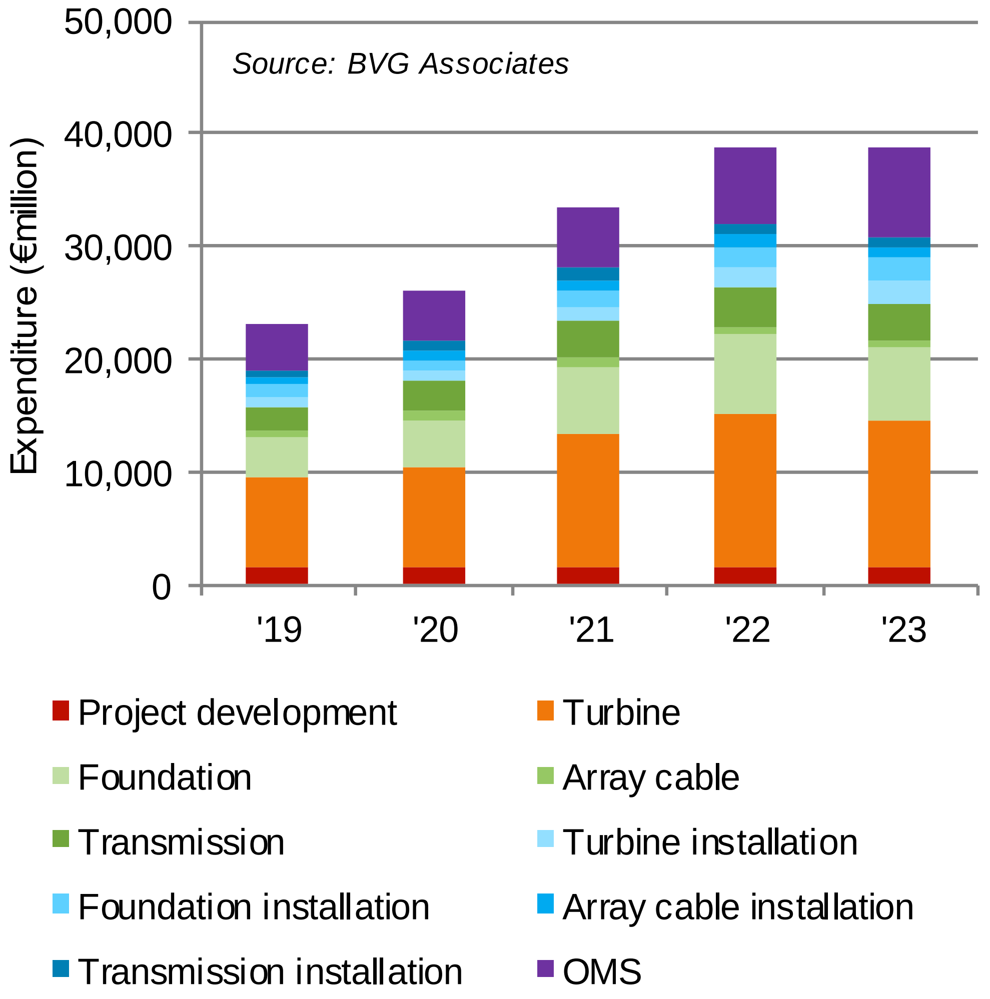
Main Players

- Orsted
- Dominion Energy
- Massachusetts Clean Energy Centre
- Equinor
- Avangrid Renewables
- US Wind
- CiP
- GE

Industry & supply chain challenges

- The balance of plant and logistics supply chains are generally less developed than in Europe
- Strong local content expectations – independent of local competencies and resource
- Jones Act
- Ports
- Individual state driven supply chain development
- Need for capacity building and volume markets

A € 160 bn market over the 5 years to 2023



Up from €108 for the period from 2018 to 2022 as reported in the 2017 report

Annual average spend of €30 bn to reach €38 bn in 2023

- Europe : **€68 bn**
- Asia : **€72 bn**
- North America : **€20 bn**

With globalization three key cost reduction drivers are becoming increasingly important:

Technology improvements and deployment

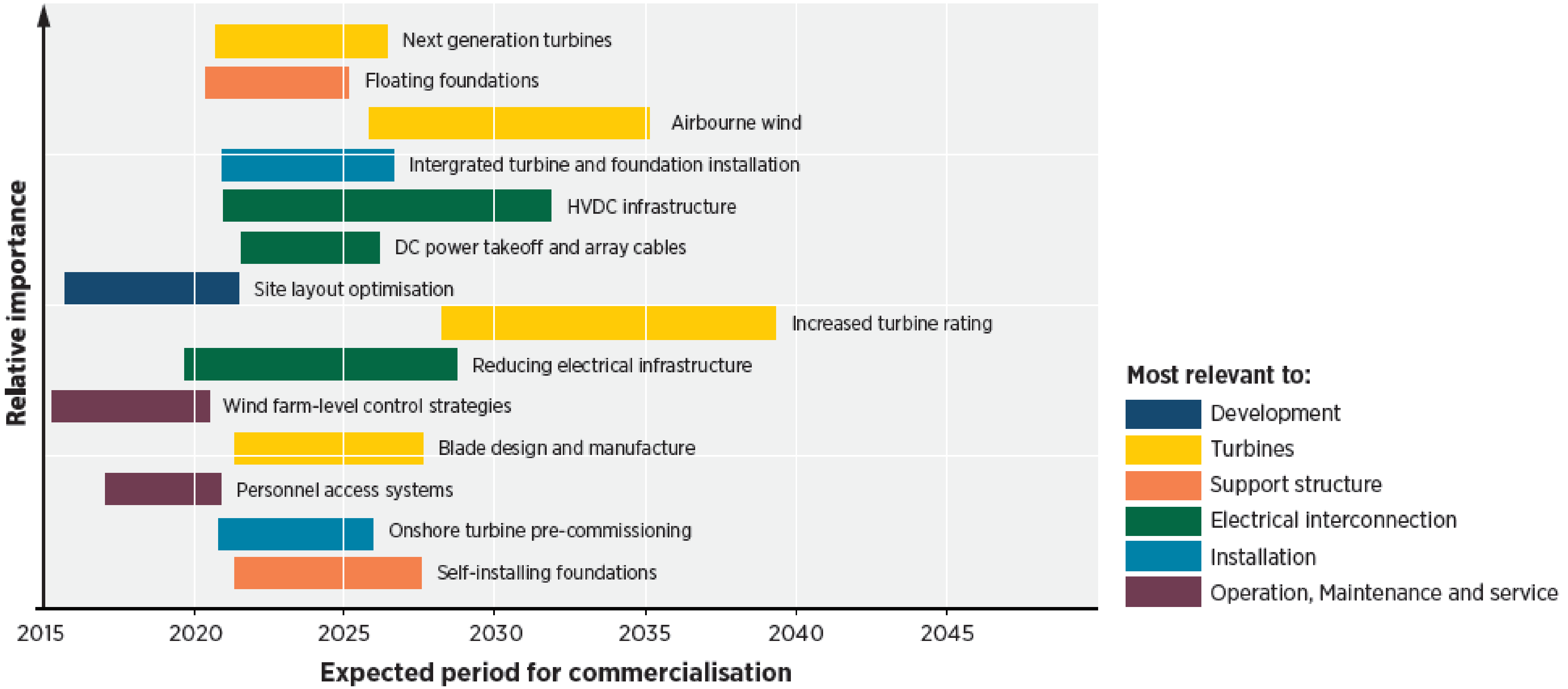
Competitive procurement and supplier inclusion

A large base of experienced, internationally active project developers – and suppliers

Local supply chain development – capacity building

Project risk & financing cost

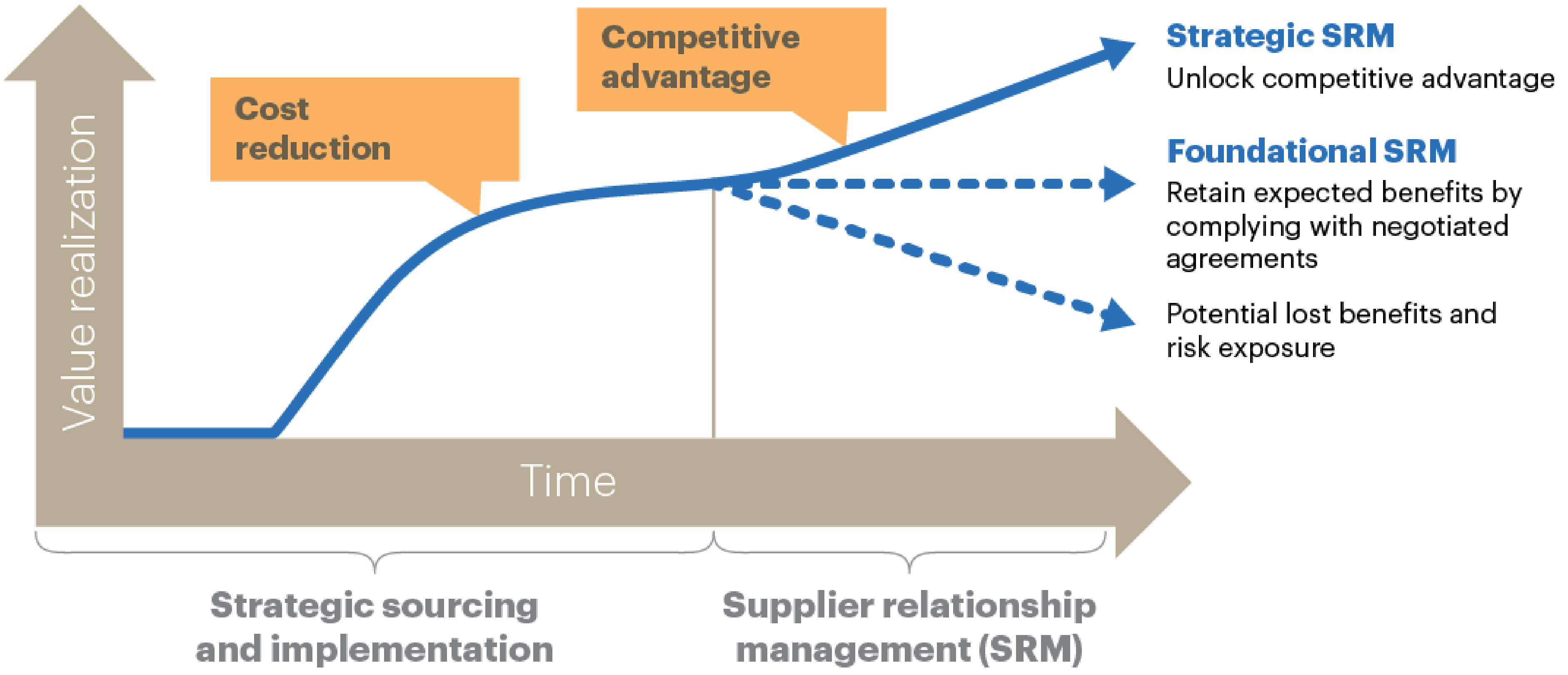
A gale of innovations…



Source: IRENA Innovation Outlook; Offshore Wind

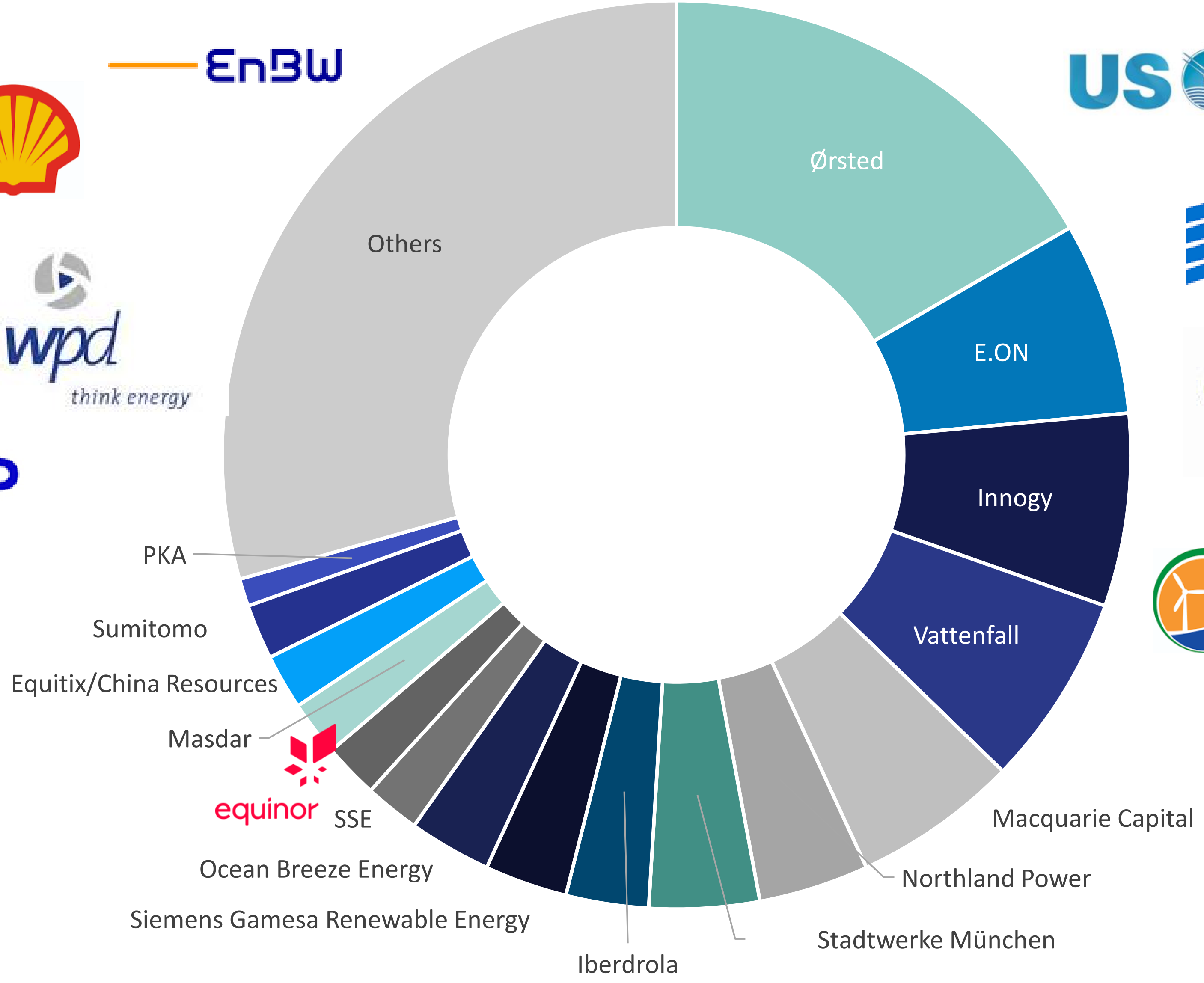
Norwegian Energy Partners

Competitive procurement and supplier inclusion..



Source: A.T. Kearney analysis

A large base of experienced, internationally active project developers



Source: WindEurope

..and their suppliers

Seaway Heavy Lifting
A Subsea 7 company

ATKINS
Member of the SNC-Lavalin Group

ABB

GeoSea
Geotechnical Offshore Contractor

SIEMENS Gamesa
RENEWABLE ENERGY

MHI VESTAS OFFSHORE WIND

aibel

Boskalis

Fred. Olsen Windcarrier

RAMBØLL

Prysmian Group

BLADT INDUSTRIES

Jan De Nul GROUP

EEW

HITACHI
Inspire the Next

DOOSAN

GOLDWIND

Nexans

LAFARGE

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Local supply chain development – capacity building

ØRSTED AND CHANGHUA COUNTY GOVERNMENT TEAMS UP TO ESTABLISH LOCAL OFFSHORE WIND POWER NETWORK

- Knowledge sharing
- Procurement – creating competitive and sustainable supply chains
- Quality assurance
- H&S
- Collaboration efforts – government – suppliers - developers

STATES
Policy / market drivers / regulations

US BOEM / US BSEE
Leasing and approval of plans / regulators

PRIVATE DEVELOPERS / LEASEES
Dong Energy, Statoil, Avangrid / Iberdola, Copenhagen Offshore Partners, Deepwater Wind, US Wind, Fishermen's Energy

SUPPLY CHAIN

BUSINESS NETWORK OSW

STRONGER TOGETHER

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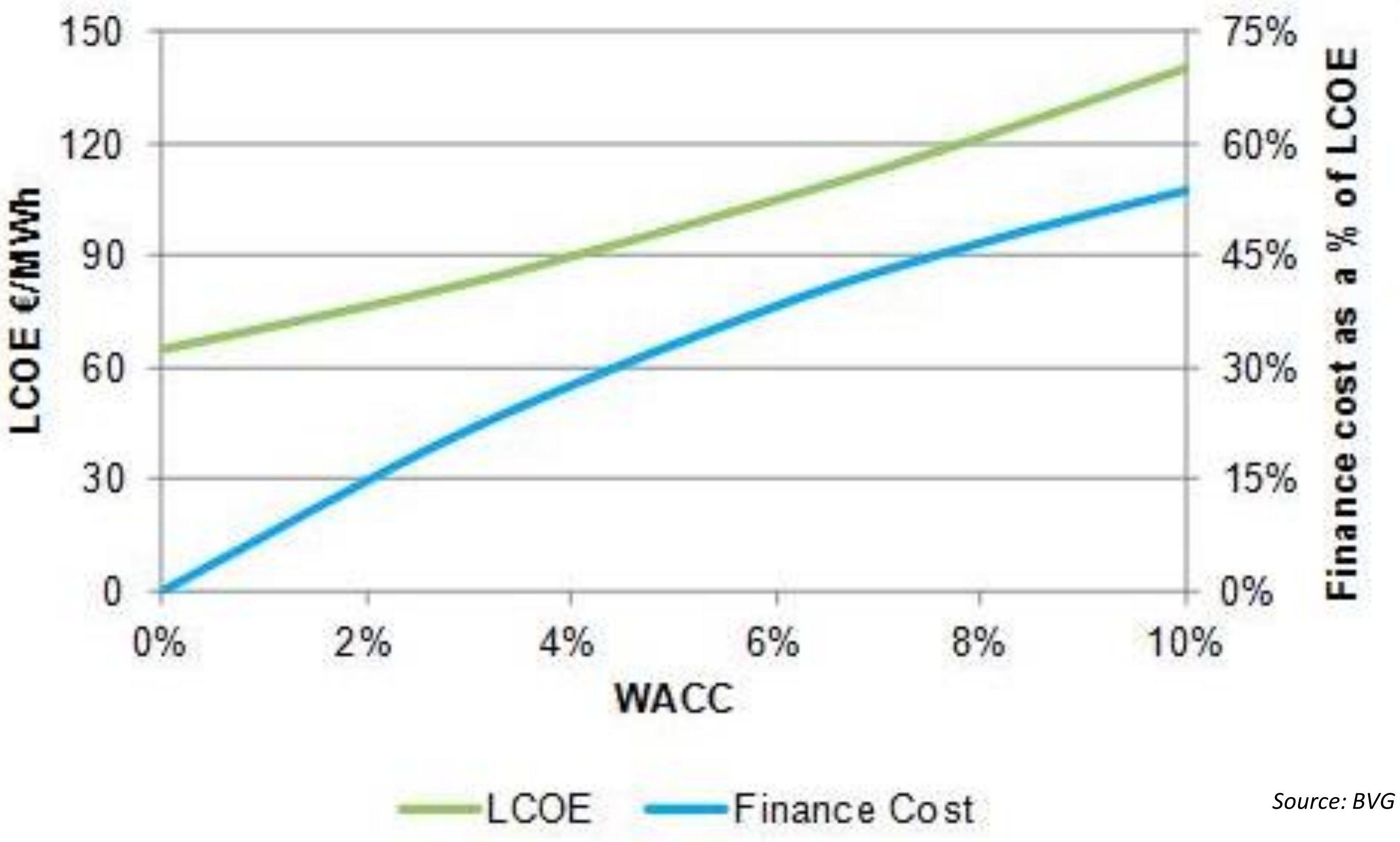
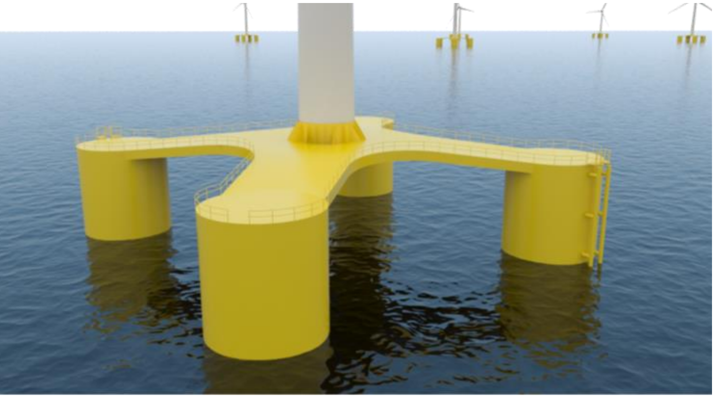
The importance of cost of finance



Source: BVG Associates

Floating wind will boost offshore wind deployment

- adding complexity to the supply chain development



But just emerging.. more tech and business development needed!

Wind Farm Name	Country	Capacity (MW)	Commissioning date
Hywind Scotland	United Kingdom	30	2017 (in operation)
Windfloat Atlantic	Portugal	25	2019
Flocan 5 Canary	Spain	25	2020
Nautilus	Spain	5	2020
SeaTwirl S2	Sweden	1	2020
Kincardine	United Kingdom	49	2020
Forthwind Project	United Kingdom	12	2020
EFGL	France	24	2021
Groix-Belle-Ile	France	24	2021
PGL Wind Farm	France	24	2021
EolMed	France	25	2021
Katanes Floating Energy Park -Array	United Kingdom	32	2022
Hywind Tampen	Norway	88	2022

Wind Farm Name-	Country	Capacity (MW)	Commissioning date
SeaTwirl S1	Sweden	0.03	2015 (in operation)
EOLINK	France	0.1	2018 (in operation)
Floatgen	France	2	2018 (in operation)
TetraSpar	Norway	3.6	2019
FLOWocean Demonstrator	Norway		2019
DemoSATH	Spain	2	2020

Thank you!

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