



# The offshore transition to renewables

Plural offshore wind technology insights

June 2020

# Agenda

## **Plural expertise**

Offshore wind

Appendix



# Plural has extensive expertise across offshore technologies

## Wind



- Development
- Production facilities
- Subsea / transmission
- Installation
- O&M

## Oil and gas



- Exploration
- Production facilities
- Subsea

## Marine



- Oceanic shipping
- Offshore support vessels
- LNG
- Commercial brownwater
- Fishing
- Passenger

# Within our market platforms we focus on the convergence of digitally-enabled and best-in-class process technologies, and supporting services

Our technology expertise:

## 1. Mechanical process technology

- Power drive and motion
- Flow control
- Inline process equipment



## 2. Digital-enabled technology

- Test and measurement
- Process automation
- Workflow software



## 3. Industrial services

- Value-add services
- Data / analytics
- Distribution



# Agenda

Plural expertise

**Offshore wind**

Appendix



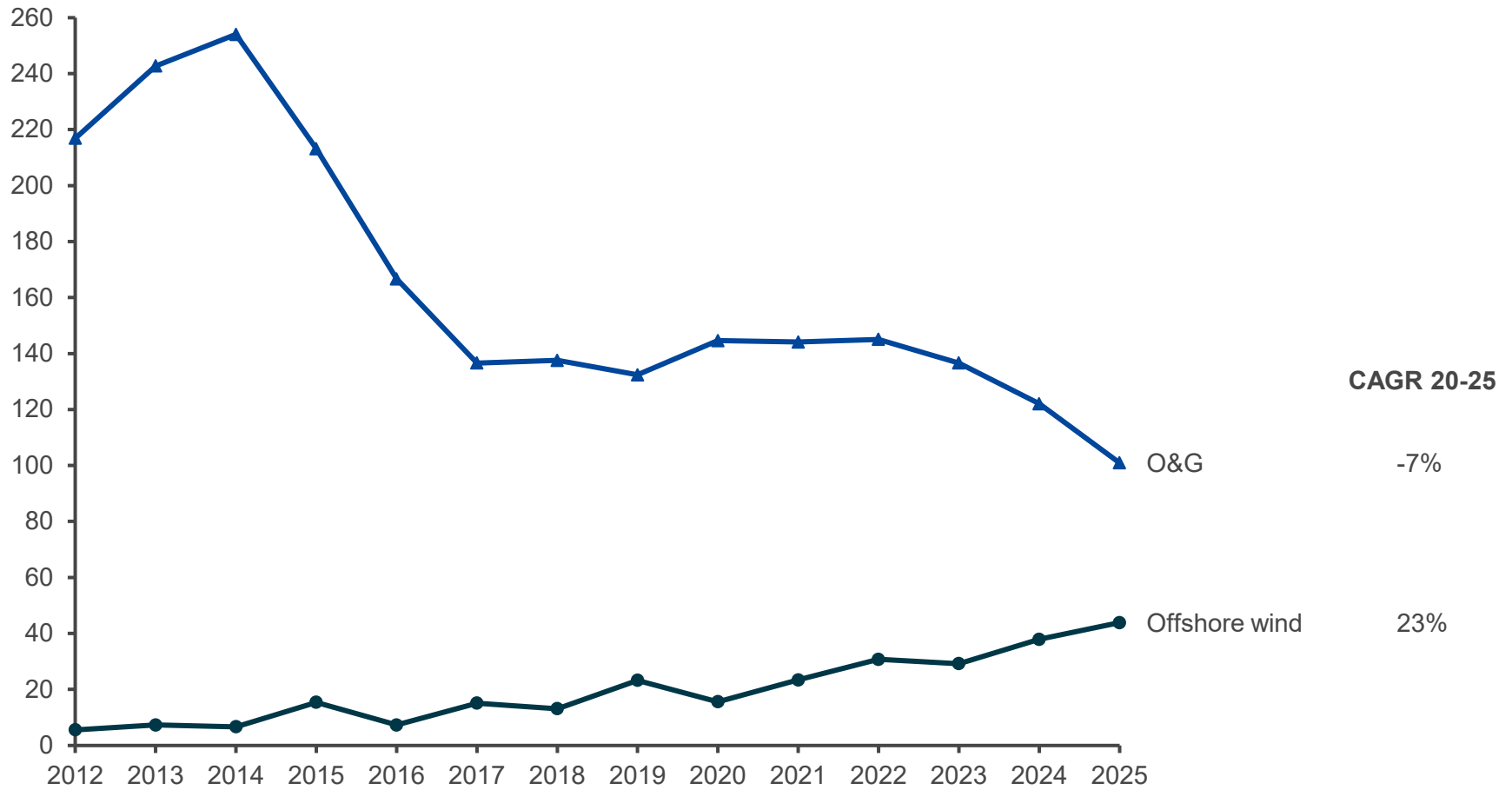
# Wind is an increasingly attractive offshore segment for energy corporations, technology manufacturers and investors

## Summary

- Global capacity in offshore wind is increasing globally. This is driven by:
  - Increasing cost competitiveness with other forms of clean power generation
  - Practical benefits of offshore wind, i.e. negligible land usage and constant power generation
  - Oil companies' desire to diversify
  
- The offshore wind sector is fundamentally changing, moving further from the shore and into deeper waters. This will have implications for supply chain spending and therefore investors:
  - Foundations will become bigger and more expensive
  - There will be higher amounts of transmission equipment installed
  - Digital technology uptake will be accelerated

# Globally, offshore O&G CAPEX has declined sharply; offshore wind is in early stage growth with a strong outlook

Upstream O&G and offshore wind, CAPEX \$bn



Source: Wood Mackenzie [March 2020]

© Plural Strategy Group 2020



# Offshore wind has many potential synergies with other industries, offering a strategic transition from a challenged O&G sector

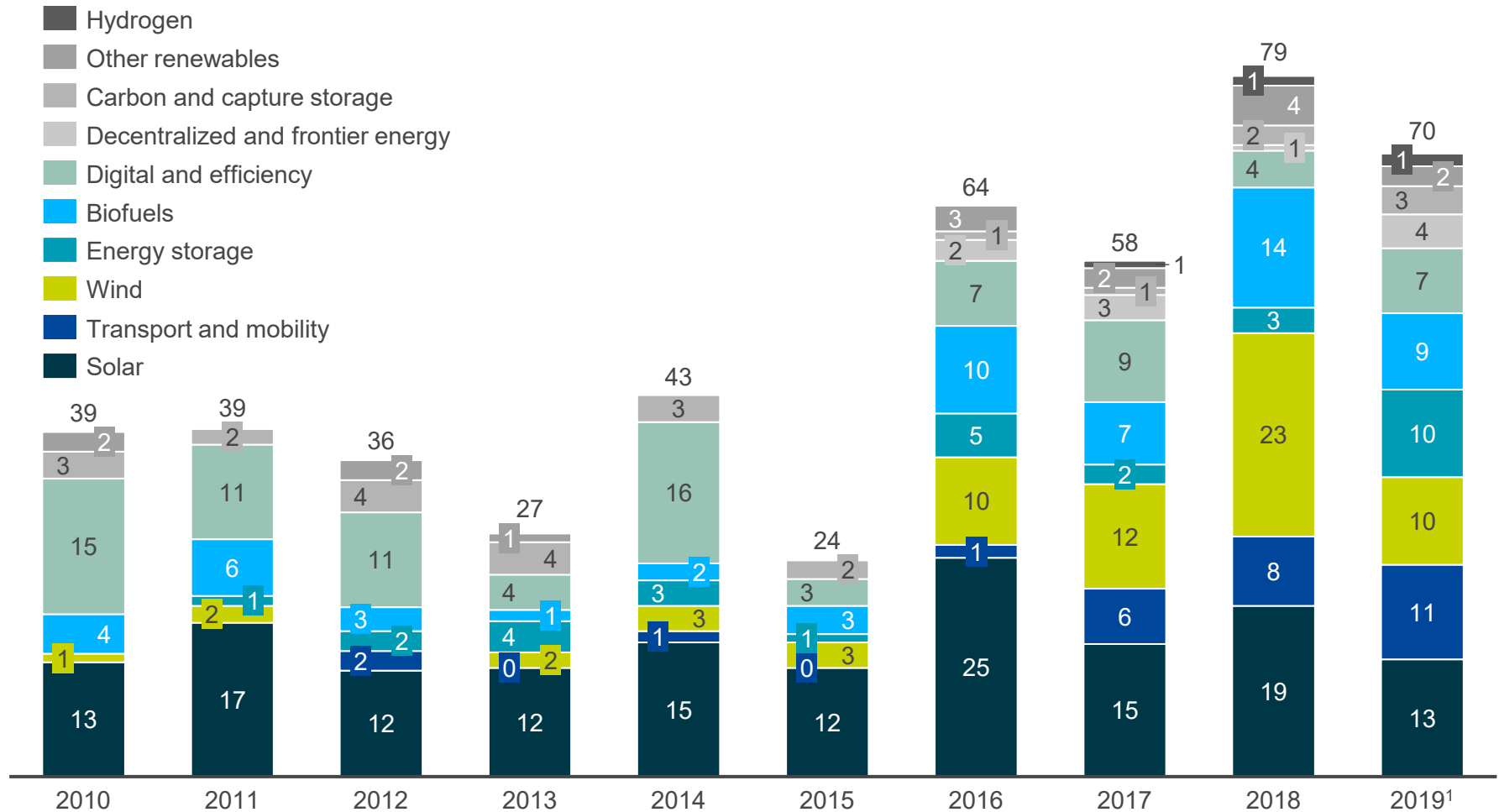
Cross-sector technology transfer opportunities

	Oil & Gas	Aerospace	Conventional power gen
Materials	✓	✓	✓
Manufacturing	✓	✓	✓
Robotics	✓		✓
Health and Safety	✓	✓	✓
Asset management		✓	
Harsh environments	✓		✓
Vessels	✓		



# Oil companies have been diversifying into renewables since the 2014 oil crash. The oil crash of April 2020 will accelerate this change

Diversified investments of oil companies, \$bn



1. As of September 2019  
Source: Bloomberg NEF

# Offshore wind has a number of practical benefits compared to other low carbon power sources

Practical benefits of low carbon power generation

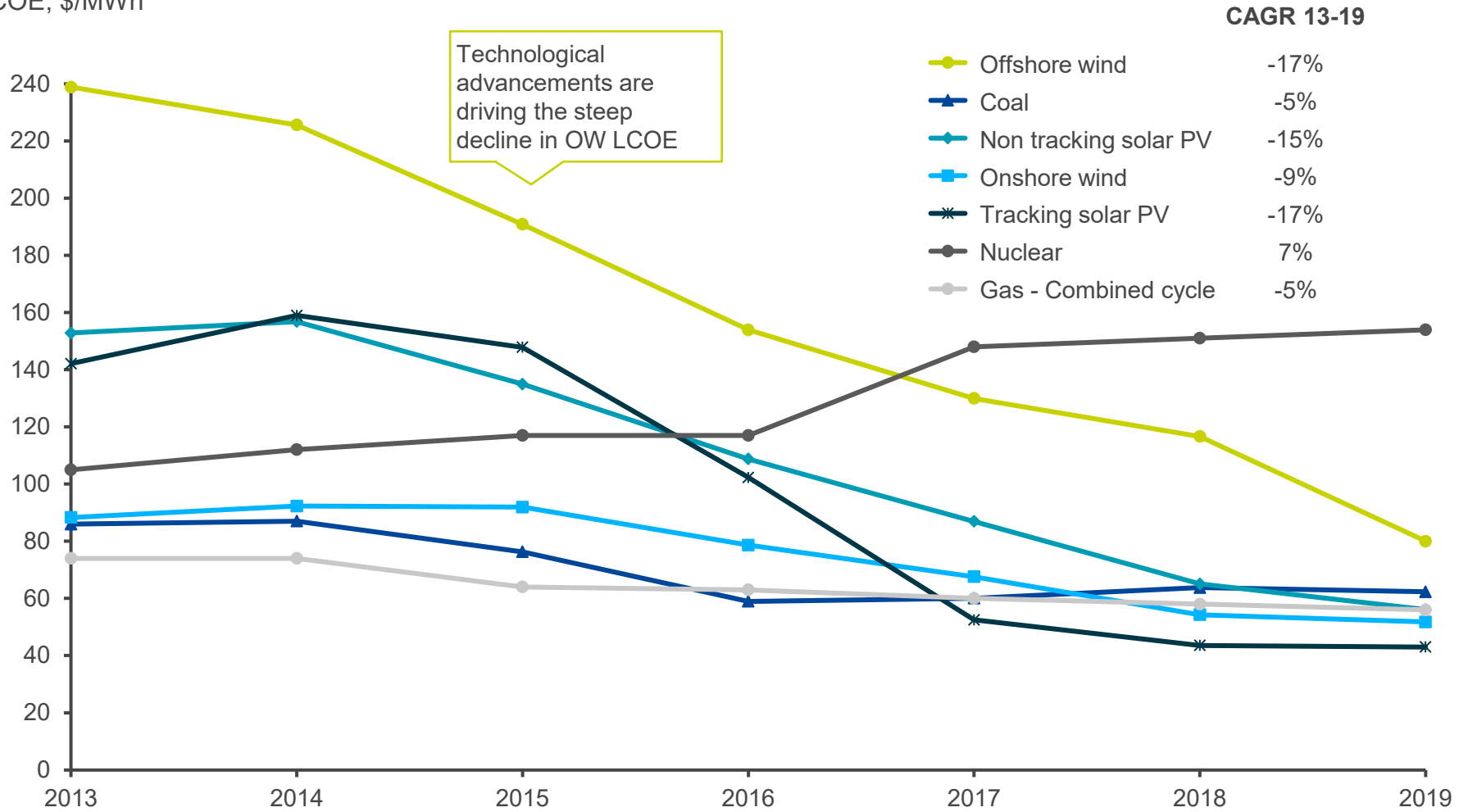
	Capacity factor <sup>1</sup>	Ability to meet peak demand	Planning restrictions <sup>2</sup>	Public perception
Offshore wind				
Onshore wind				
Solar PV				
Nuclear				

1. % of the time the infrastructure is producing power  
Source: Plural analysis

2. Inverse

# Offshore wind is fast becoming cost competitive with other renewables and carbon emitting power generation

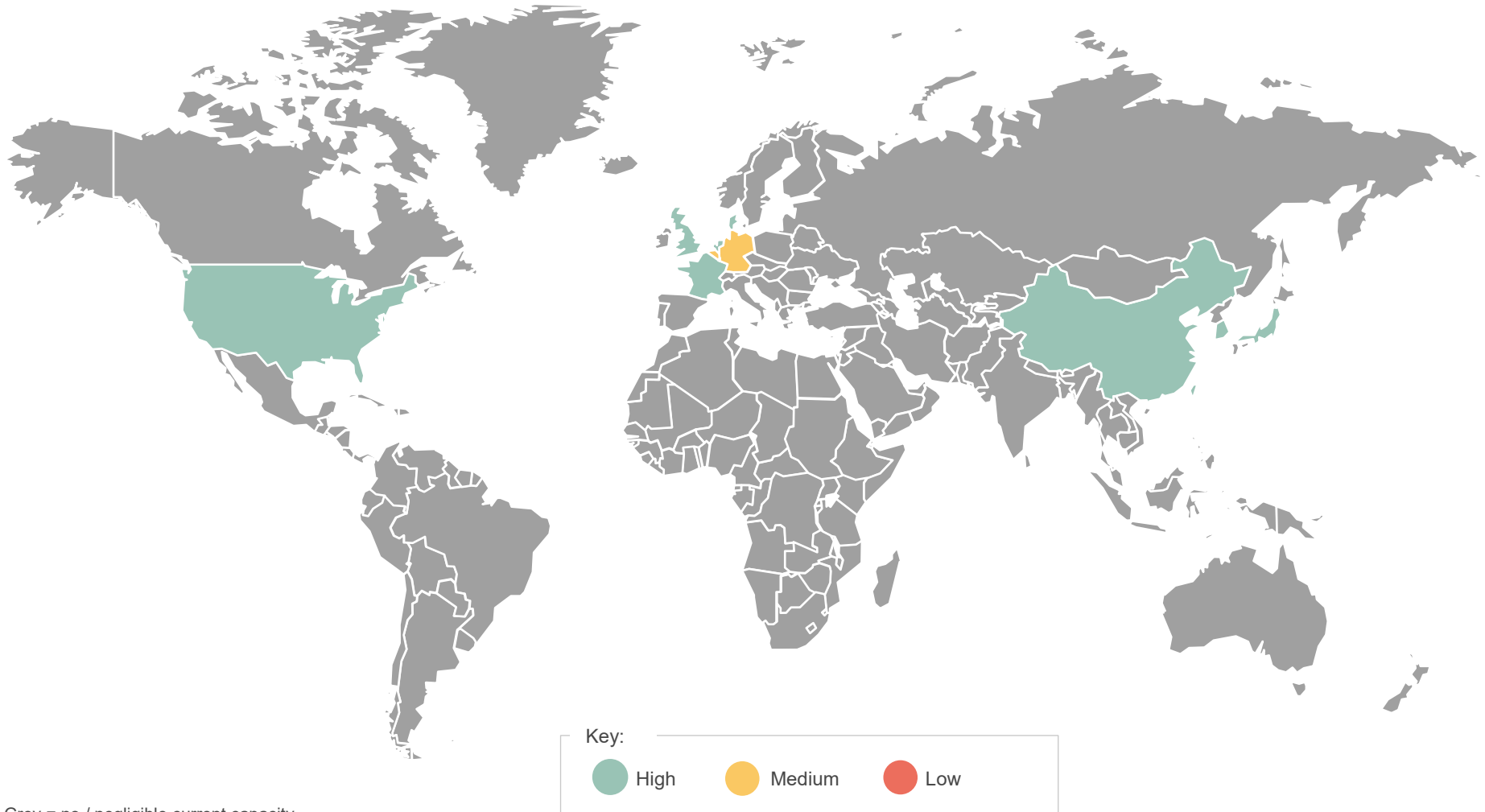
LCOE, \$/MWh



Source: Bloomberg NEF, Lazard, Plural analysis

# The majority of countries that currently have offshore wind infrastructure will experience high growth in capacity

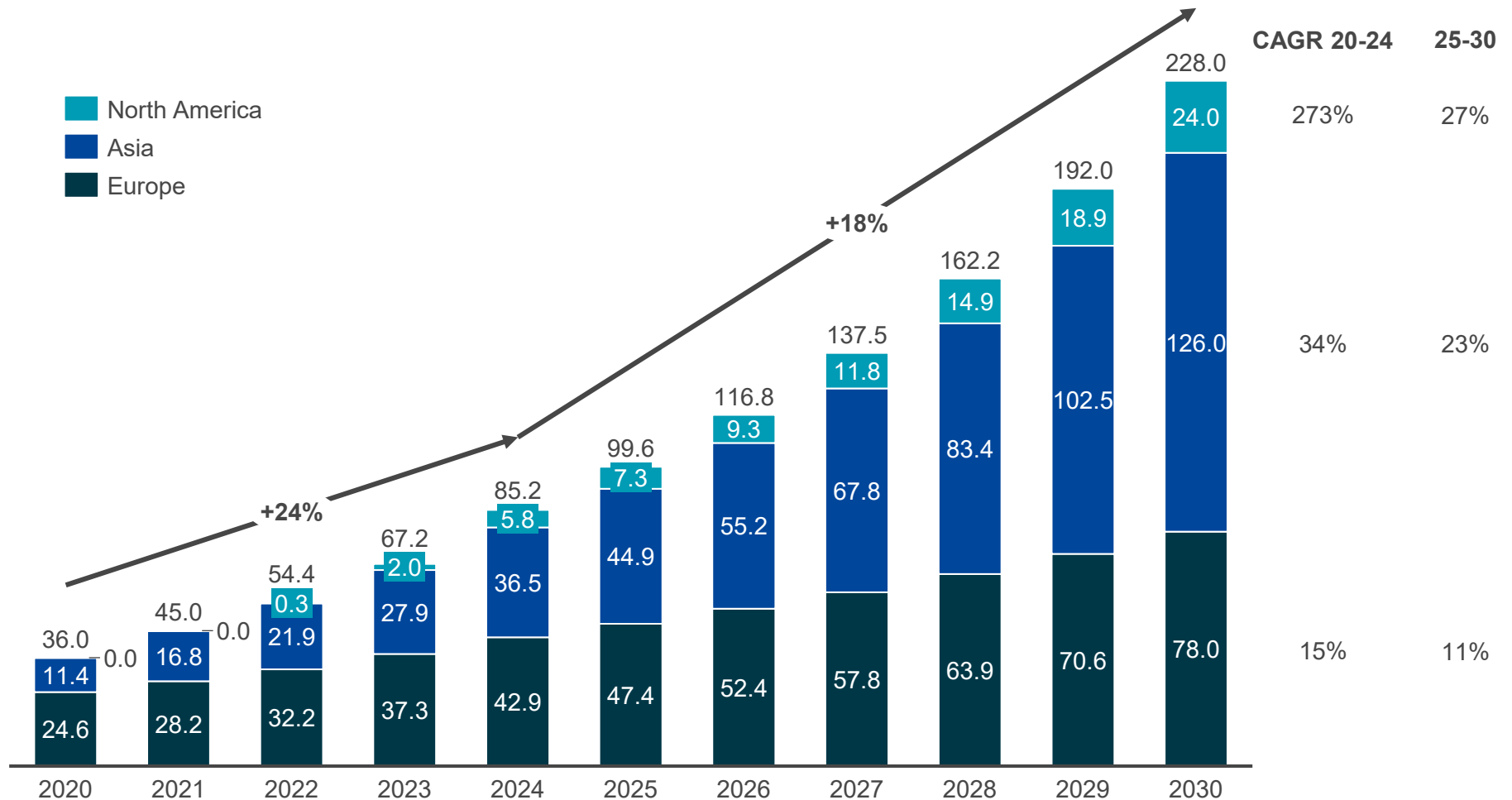
Offshore wind capacity growth by country, 2020-25



Grey = no / negligible current capacity  
Source: Plural analysis

# Global offshore wind capacity is forecast to grow at 24% CAGR to 2024. Most of the growth is likely to come from Asia

Capacity by region, GW



Source: BVG Associates, GWEC, IRENA, Plural analysis

© Plural Strategy Group 2020

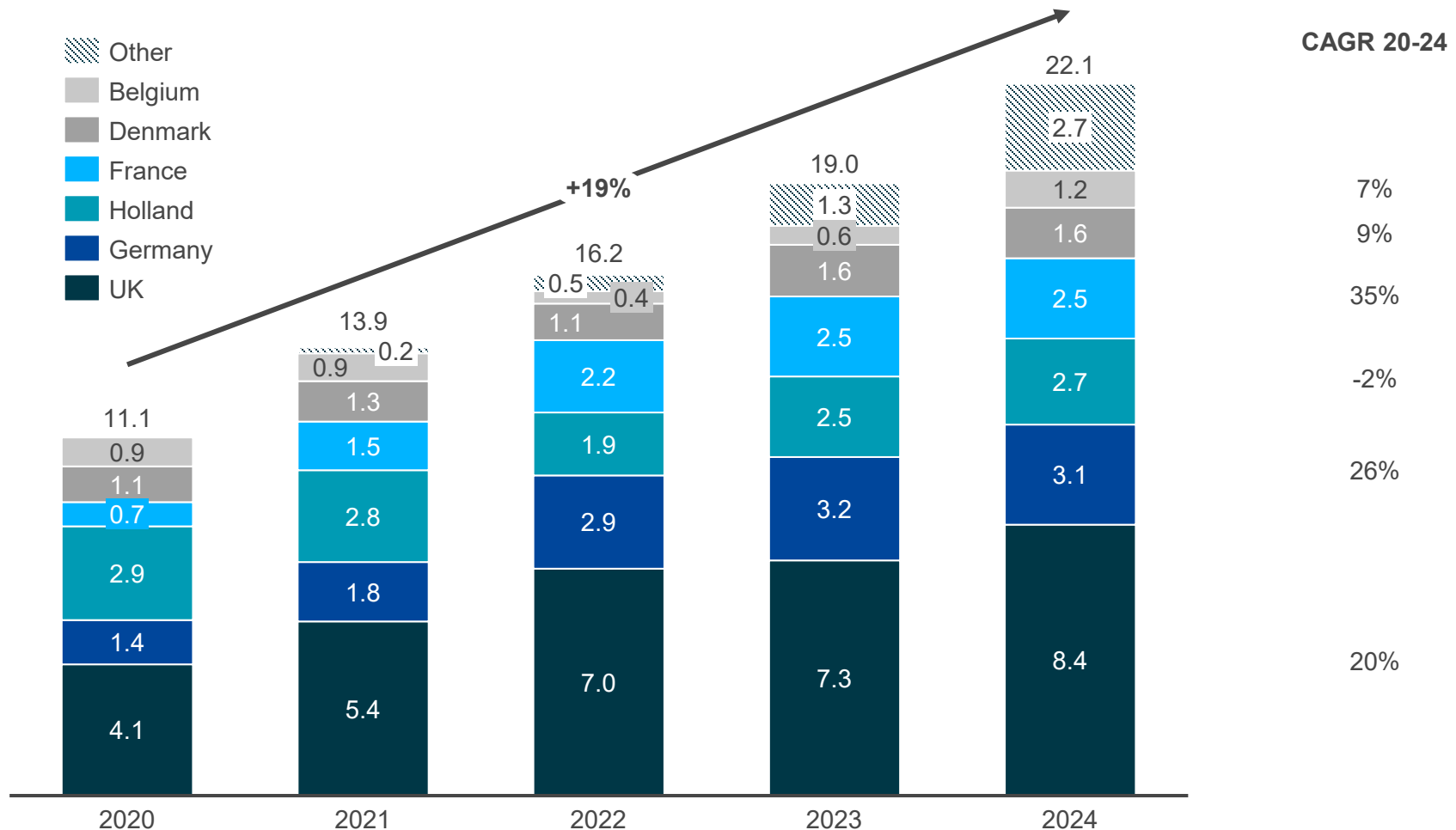
# The supply chain can be split out into 5 main segments

Supply chain map

Development	Turbine supply	Balance of plant	Installation	OPEX
<ul style="list-style-type: none"> <li>Environmental surveys</li> </ul>	<ul style="list-style-type: none"> <li>Turbine manufacture</li> </ul>	<ul style="list-style-type: none"> <li>Foundations</li> </ul>	<ul style="list-style-type: none"> <li>Turbine and foundation installation / vessels</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance and inspection services</li> </ul>
<ul style="list-style-type: none"> <li>Consenting &amp; development services</li> </ul>	<ul style="list-style-type: none"> <li>Rotor supply</li> </ul>	<ul style="list-style-type: none"> <li>Array cables</li> </ul>	<ul style="list-style-type: none"> <li>Offshore substation installation / vessels</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance, inspection and monitoring technology</li> </ul>
<ul style="list-style-type: none"> <li>Engineering studies, consulting &amp; project management</li> </ul>	<ul style="list-style-type: none"> <li>Tower supply</li> </ul>	<ul style="list-style-type: none"> <li>Export cables</li> </ul>	<ul style="list-style-type: none"> <li>Offshore cable installation / vessels</li> </ul>	<ul style="list-style-type: none"> <li>Vessels &amp; equipment</li> </ul>
	<ul style="list-style-type: none"> <li>Drive train supply</li> </ul>	<ul style="list-style-type: none"> <li>Offshore substation</li> </ul>	<ul style="list-style-type: none"> <li>Installation ports and logistics</li> </ul>	<ul style="list-style-type: none"> <li>Decommissioning</li> </ul>
	<ul style="list-style-type: none"> <li>Power conversion</li> </ul>	<ul style="list-style-type: none"> <li>Onshore substation</li> </ul>	<ul style="list-style-type: none"> <li>Installation equipment</li> </ul>	
	<ul style="list-style-type: none"> <li>Large fabrications</li> </ul>	<ul style="list-style-type: none"> <li>Electrical systems</li> </ul>		
		<ul style="list-style-type: none"> <li>Secondary steel work</li> </ul>		

# European supply chain spending is set to almost double by 2024; driven by the UK, German and French markets

European expenditure across all offshore wind supply chain activities, Euro bn

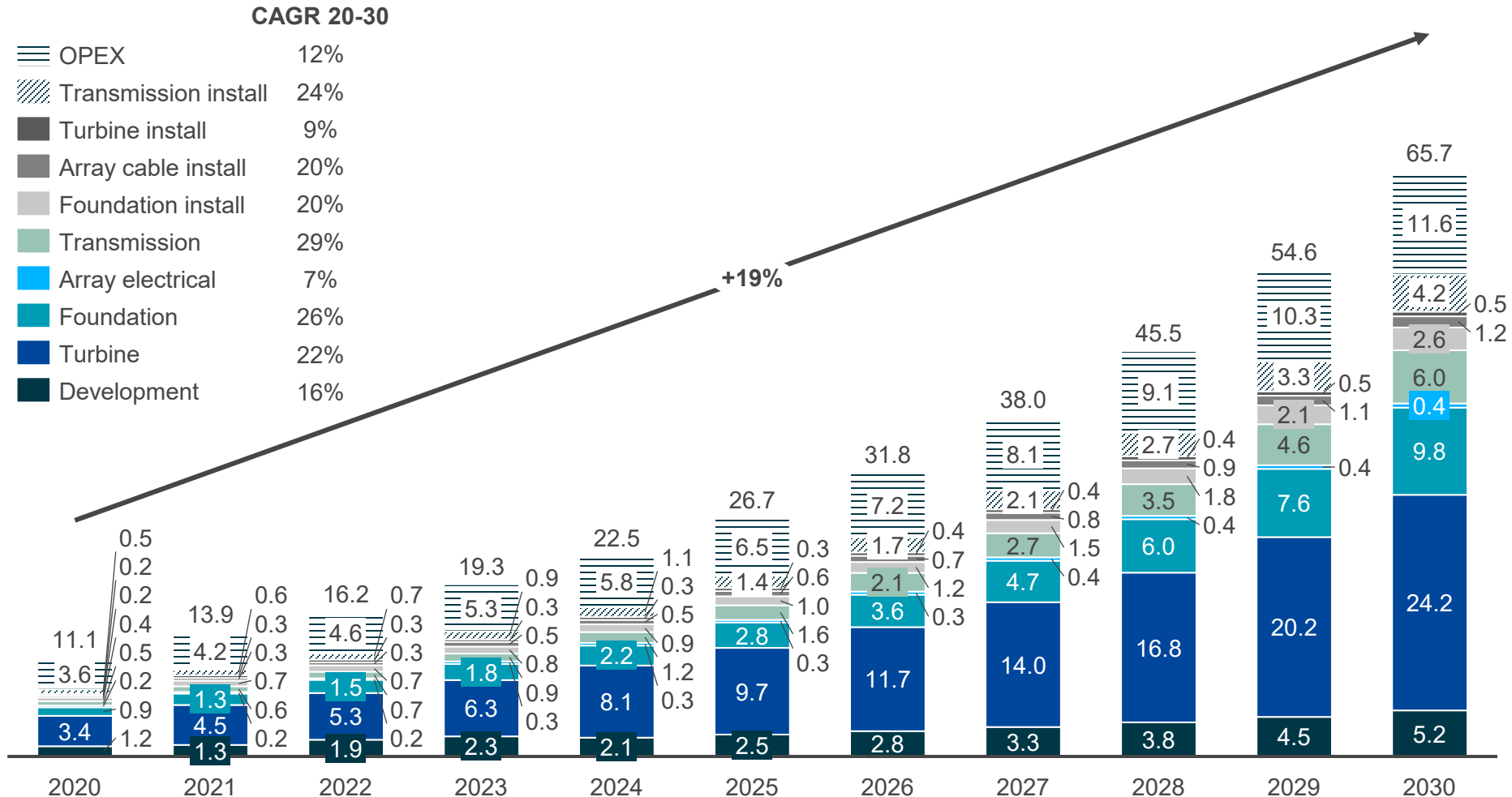


Source: BVG Associates

© Plural Strategy Group 2020

# The most promising technology segments are transmission, transmission installation and foundations driven by a shift towards deeper water farms

European expenditure across all offshore wind supply chain activities, Euro bn






Source: BVG Associates, Plural analysis

© Plural Strategy Group 2020



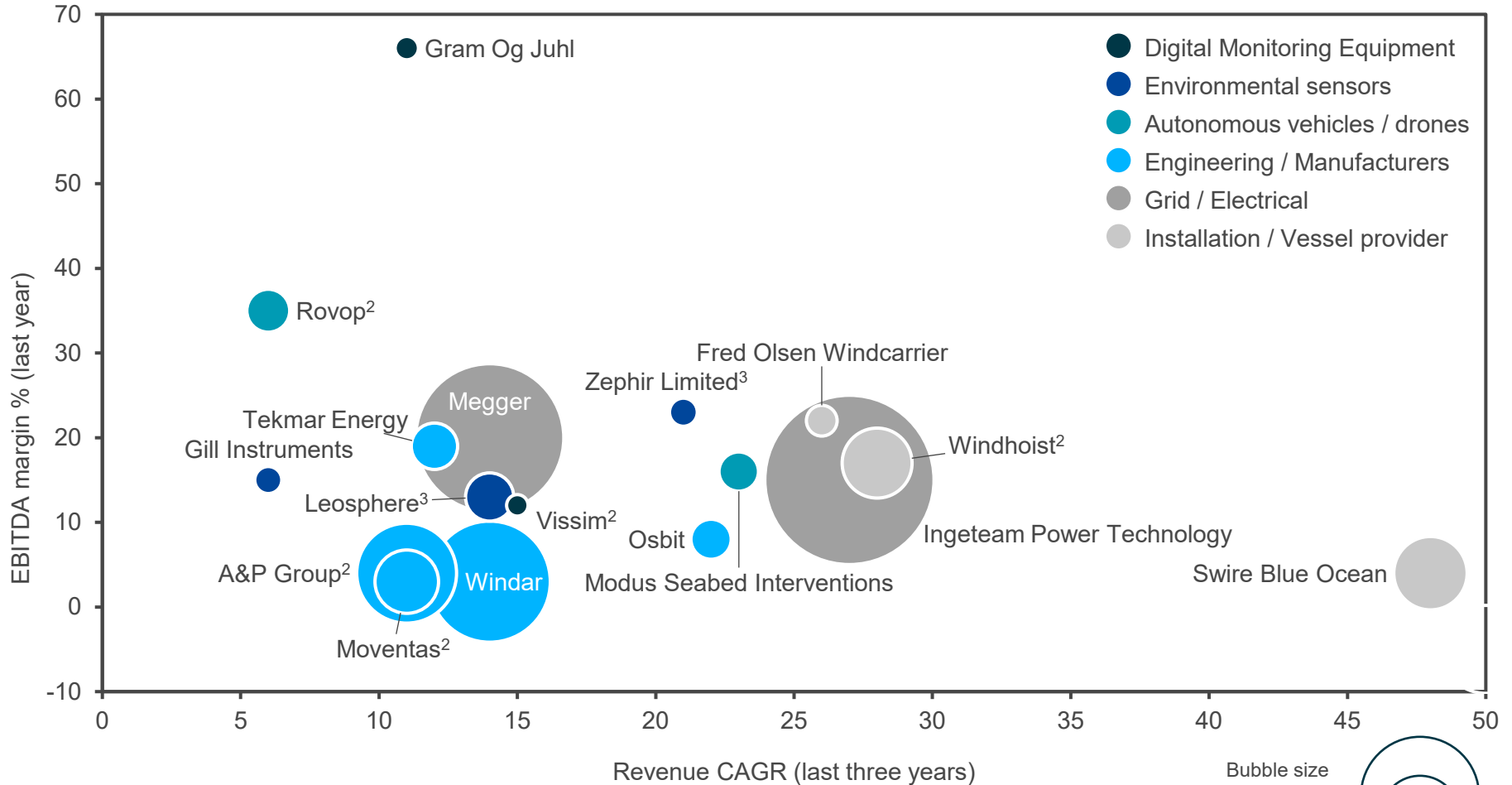
# Emerging digitally-enabled tech segments are being driven by wind farms moving further from the shore and into deeper waters

Key technology trends in offshore wind

Technology	Expected outlook 2020-30	Comment
Digital monitoring equipment		<ul style="list-style-type: none"> <li>• With the shift to windfarms being further out to sea and sitting in deeper waters, it is becoming more cost efficient to monitor wind farms using digital technology, rather than paying for expensive surveys to be carried out</li> <li>• The development of floating wind farms and the subsequent accelerated shift of wind farms to be further away from the shore will help to drive uptake in these technologies</li> </ul>
Autonomous vehicles / Drones		<ul style="list-style-type: none"> <li>• This shift is also increasing the uptake of autonomous vehicles and drones</li> <li>• Instead of using divers in deeper water, an autonomous vehicle can carry out the inspection more safely and efficiently</li> <li>• Drones can be quickly deployed to inspect turbines that may have suffered damage</li> </ul>
Predictive analytics		<ul style="list-style-type: none"> <li>• Using increasing levels of data from sensors and other monitoring equipment, O&amp;M costs can be driven down by using predictive analytics for fault prediction</li> <li>• This reduces downtime of the turbine and need for costly inspections</li> <li>• Services seem to be provided by start ups or the big turbine suppliers</li> </ul>

# A number of installation / vessel providers and digital connectivity / monitoring players look attractive

Selected potential targets in the European offshore wind supply chain, Euro<sup>1</sup>

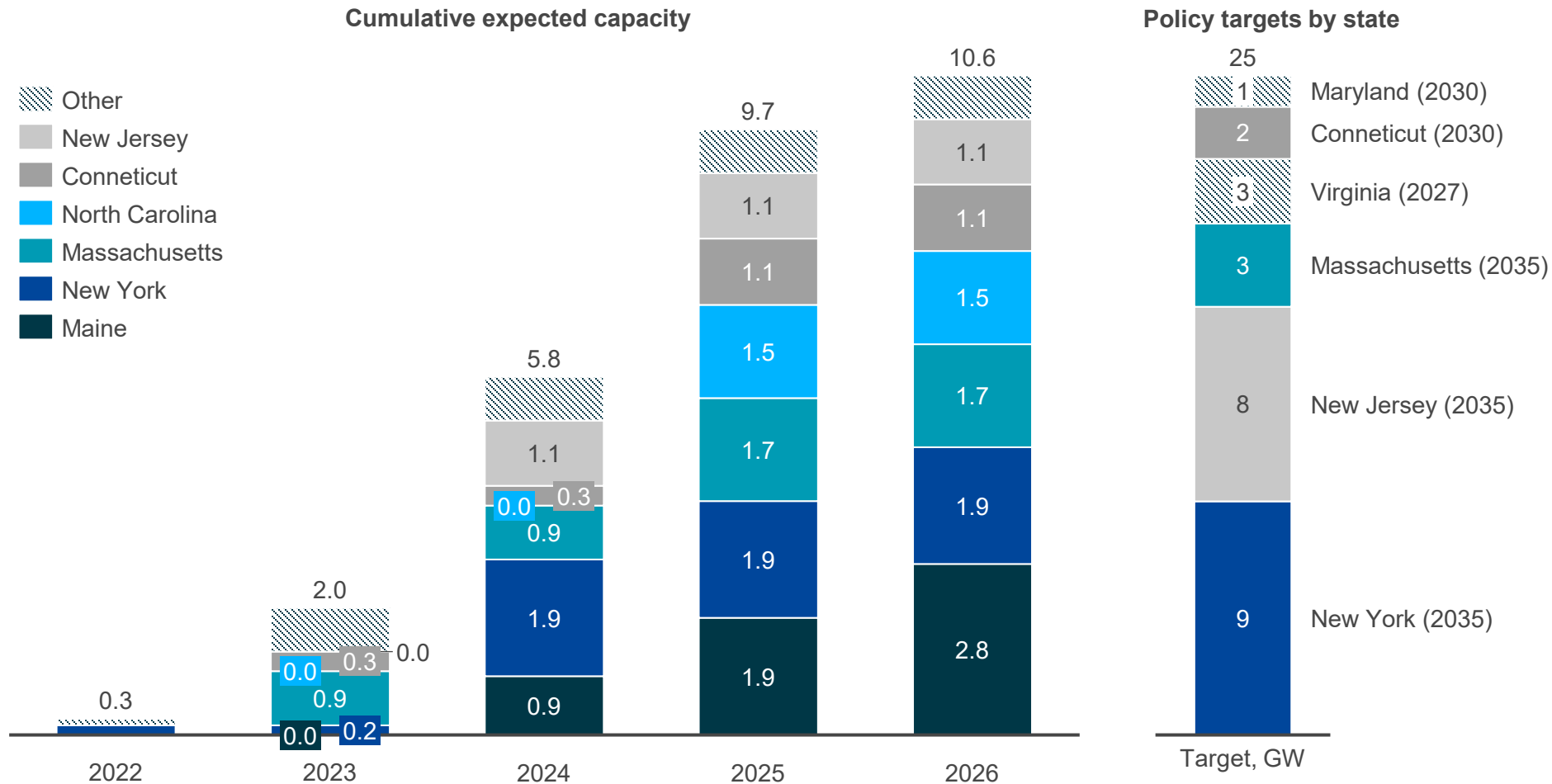


1. Currencies converted on 18.04.20 2. PE owned 3. Corporate owned  
Source: Plural analysis

Bubble size reflects revenue size 70m-130m

# North American capacity is likely to sharply increase from 2023 and concentrate in the North East

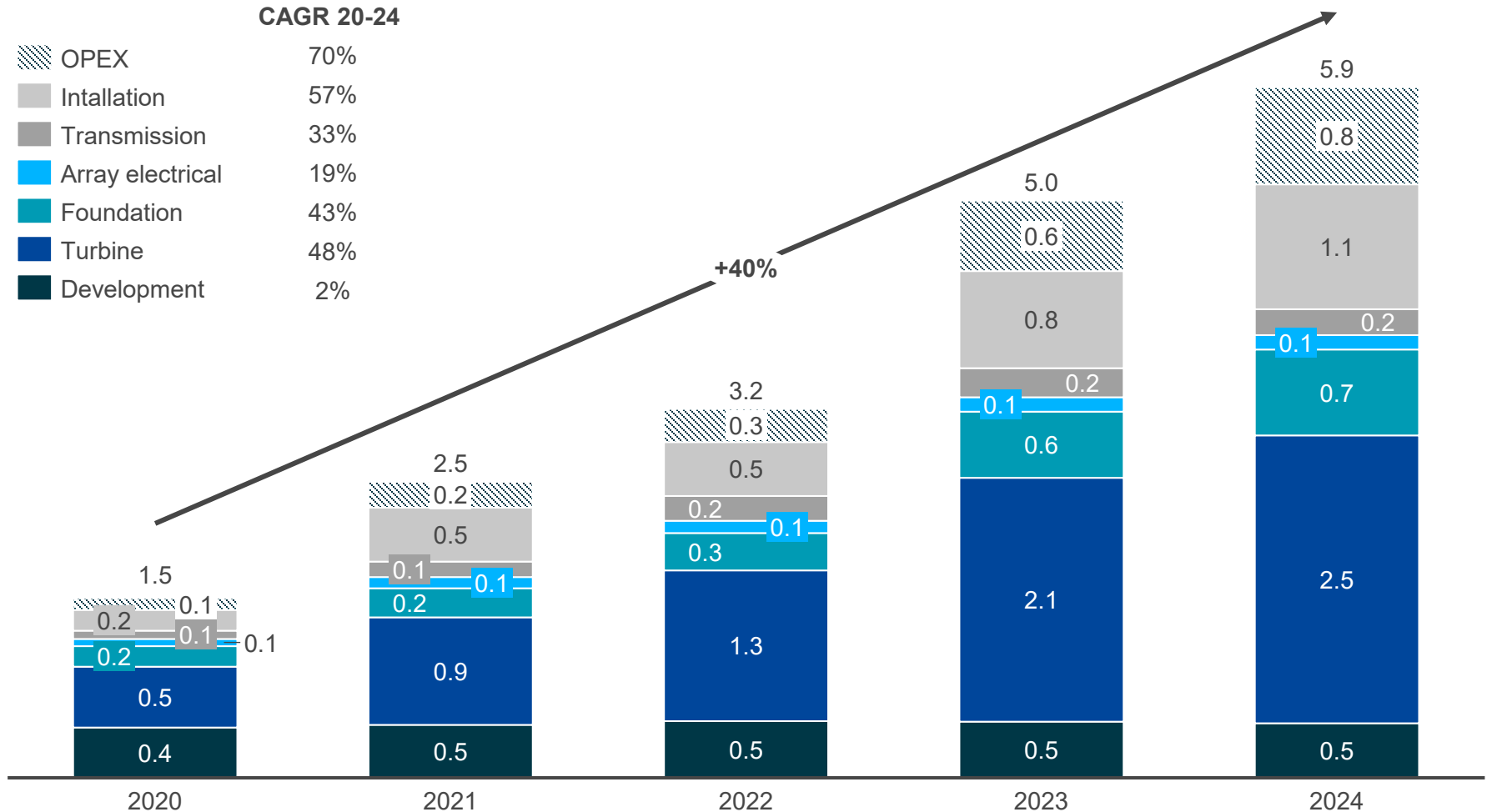
Capacity by state, GW



Other = Delaware, Maryland, Rhode Island  
Source: GWEC

# North American supply chain Capex spending is likely to rapidly grow, with an OPEX market establishing from 2023

North American expenditure across all offshore wind supply chain activities, Euro bn



Source: BVG Associates, Plural analysis

© Plural Strategy Group 2020

# Both upside scenarios and markets risks in offshore wind are driven by a potential change in government interventions and Covid-19 impact

Upside scenarios and market risk

## Upside

- Governments looking to add stimulus into their economies can use clean energy infrastructure projects as a way to boost demand in their Covid-19 hit economies
  - The UK Chancellor of the Exchequer has already highlighted Offshore Wind as a sector for imminent investment and is likely to include this in a Summer Statement outlining how to boost economic activity
- A potential democratic led government in the United States is likely to increase funding for and change legislation in favour of decarbonisation

## Risks

- Increasing fiscal deficits due to Covid-19 could make governments less willing to subsidise offshore wind projects
- The decrease in oil and LNG price as a result of Covid-19 may make offshore wind less financially attractive compared to these non-renewable alternatives
  - This is less applicable for European countries that are highly committed to decarbonisation
- Increasing farm sizes means that # offshore wind projects in Europe is staying flat
  - Infrastructure suppliers' revenues will still be exposed to relatively high variance

# Agenda

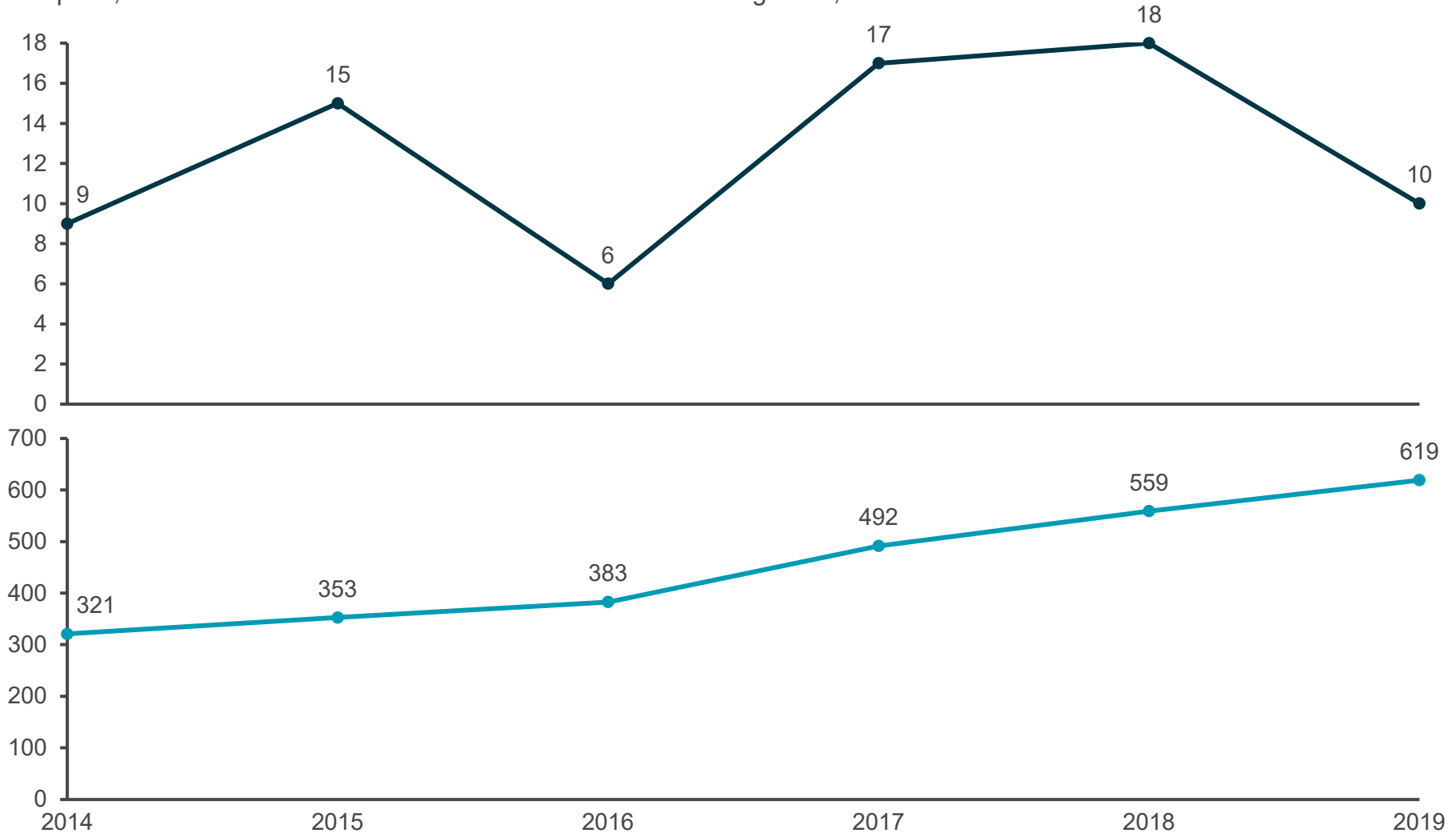
Plural expertise

Offshore wind

**Appendix**

# Wind farm sizes are increasing, but number of new wind farm projects remains low; some sectors are project driven which can lead to high variance in revenue

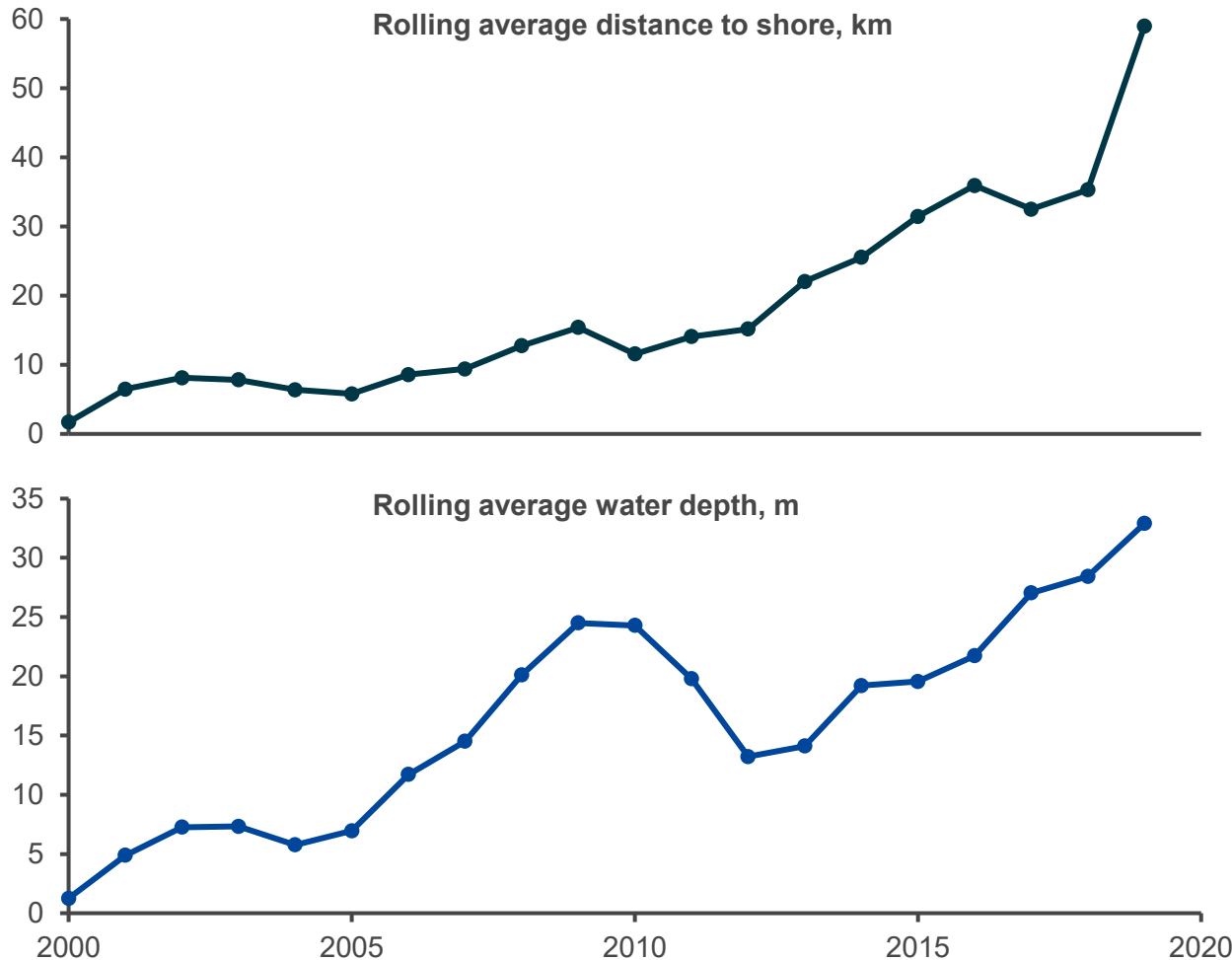
European, offshore wind number of installed wind farms and average size, MW



Source: WindEurope

# European wind farms are moving further away from the shore and into deeper waters, creating new supply chain opportunities

European offshore wind farms, rolling average water depth and distance to shore



## Commentary

- This shift enables wind developers to target more productive areas of water with a higher consistency of wind speed
- The development of floating wind turbines could accelerate this change
- Transmission infrastructure, particularly export cables, will increase in proportion of spend because of the increasing distance from the shore
- Digital monitoring equipment will become more necessary, as will the need for vessels that can withstand higher wind speeds and carry larger foundations
- Foundations will become more expensive with the transition to deeper water. Jackets are expected to be used more frequently since monopiles are currently unsuitable for use in deeper waters

Source: Wind Europe

© Plural Strategy Group 2020



# In Europe, the turbine supply sector is dominated by a handful of large players

European offshore wind supply chain map, development and turbine

Segment	Sub-segment	Example suppliers
Development	Environmental surveys	<ul style="list-style-type: none"> <li>Niras, IMARES, Fugro EMU, MMT, Gardline, Hi Def</li> </ul>
	Consenting and development services	<ul style="list-style-type: none"> <li>Typically specialised firms in country where the wind farm is installed</li> </ul>
	Engineering studies, consulting and project management	<ul style="list-style-type: none"> <li>DNV-GL, Ode, RES</li> </ul>
Turbine supply	Turbine manufacture	<ul style="list-style-type: none"> <li>GE, MHI Vestas, Senvion, Siemens</li> </ul>
	Rotor	<ul style="list-style-type: none"> <li>GE, MHI Vestas, Senvion, Siemens-Gamesa, LM Wind Power</li> </ul>
	Towers	<ul style="list-style-type: none"> <li>Ambau, CS Wind, Titan Wind Energy, Valmont SM, Windar</li> </ul>
	Drive train	<ul style="list-style-type: none"> <li>Bearings: SKF, Timken, Rothe, Erde, Schaeffler</li> <li>Gearbox: ZF, Winergy, Moventas, GE</li> </ul>
	Power conversion	<ul style="list-style-type: none"> <li>ABB, The Switch, Siemens and GE</li> </ul>
	Large fabrications	<ul style="list-style-type: none"> <li>Grup Euskal, Liebherr, Sakana, Siempelkamp</li> </ul>

Source: BVG Associates

© Plural Strategy Group 2020

# There are numerous SME providers of installation services and vessels

European offshore wind supply chain map, balance of plant and installation

Segment	Sub-segment	Example suppliers
Balance of plant	Turbine foundations	<ul style="list-style-type: none"> <li>• Bladt, BiFab, Navantia, Sif Group, Smulders Projects</li> </ul>
	Subsea cables (array and export)	<ul style="list-style-type: none"> <li>• JDR Cables, Nexans, NKT Cables, NSW, Prysmian, Trelleborg Offshore</li> </ul>
	Electrical systems	<ul style="list-style-type: none"> <li>• ABB, CG Power, GE Grid Sol., Siemens</li> </ul>
	Substation structures (offshore and onshore)	<ul style="list-style-type: none"> <li>• Babcock, Bladt, Fabricom, Hollandia, Navantia</li> </ul>
	Secondary steel work	<ul style="list-style-type: none"> <li>• Hutchinson Engineering, MTL, Wilton Engineering</li> </ul>
Installation	Turbine and foundation installation / vessels	<ul style="list-style-type: none"> <li>• Windhoist, Fred Olsen Windcarrier, Eide Marine Services (See wind Europe)</li> </ul>
	Offshore substation installation / vessels	<ul style="list-style-type: none"> <li>• Seaway Heavy Lifting, Heerema, Scaldis</li> </ul>
	Offshore cable installation / vessels	<ul style="list-style-type: none"> <li>• DeepOcean, Jan De Nul, Siem Offshore Contractors, Tideway, Van Oord, VBMS</li> </ul>
	Installation ports and logistics	<ul style="list-style-type: none"> <li>• Ostend, Hull, Ebsjerg, Eemshaven, Vlissingen</li> </ul>
	Installation equipment	<ul style="list-style-type: none"> <li>• IHC, Mench, Oceanteam, Sepro Technology</li> </ul>

Source: BVG Associates

# Operations and maintenance technology is playing an increasingly important role down the LCOE of the industry

European offshore wind supply chain map, operations and maintenance

Sector	Sub-segment	Example suppliers
OPEX	Maintenance and inspection services	<ul style="list-style-type: none"> <li>Global Wind Service, Ziton, 3Sun Group, Briggs Marine, CWind</li> </ul>
	Maintenance, inspection and monitoring technology	<ul style="list-style-type: none"> <li>Argus remote systems, Wirescan, Gram Og Juhl, ABB, UPTIME Engineering, 4 Subsea, Anemo Analytics, ONYX InSight, Ingeteam</li> </ul>
	Vessels & equipment	<ul style="list-style-type: none"> <li>SOVs: Havyard, Rolls Royce, Ulstein</li> <li>CTVs: Bibby Offshore, Cwind, Dalby Offshore</li> <li>Equipment: Cranemaster, ACE Winches</li> </ul>

**Matthew Vellacott**

Partner

[matthew.vellacott@pluralstrategy.com](mailto:matthew.vellacott@pluralstrategy.com)

**Matthew Stott**

Manager

[matthew.stott@pluralstrategy.com](mailto:matthew.stott@pluralstrategy.com)

**Matthew Buffoni**

Analyst

[matthew.buffoni@pluralstrategy.com](mailto:matthew.buffoni@pluralstrategy.com)

**Plural Strategy Group Ltd**

2 Park Avenue, 20<sup>th</sup> Floor  
New York, NY 10016, USA

**E** [info@pluralstrategy.com](mailto:info@pluralstrategy.com)

**T** +1 917 472 1466

[pluralstrategy.com](http://pluralstrategy.com)

**Plural Strategy Group Ltd**

25 Bedford Street  
London WC2E 9ES, UK

**E** [info@pluralstrategy.com](mailto:info@pluralstrategy.com)

**T** +44 203 958 7350

[pluralstrategy.com](http://pluralstrategy.com)

