Offshore Wind Supply Chain: Stock take briefing

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Offshore Wind Supply Chain: Stock take briefing

Demand, supply and UK benefit

Contents

Customers

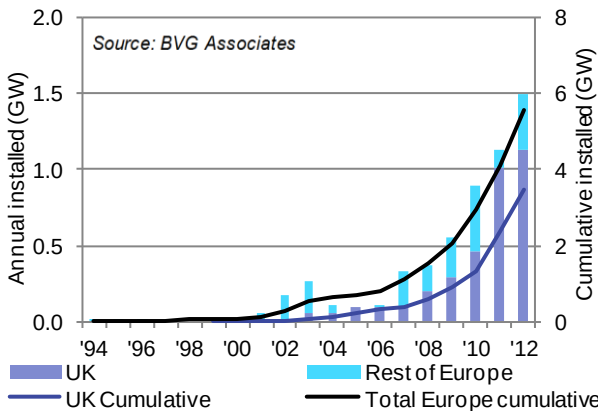
BVG Associates

- Market analysis and business development
  - Supply chain development
  - Economic impact assessment
  - Support to industrialisation
- Technical innovation & engineering analysis
  - Support to investment in technology
  - R&D programme management
  - Design and engineering services
- Project implementation
  - FIT project development (UK only)
  - SCADA & condition monitoring
  - O&M technical support

Demand

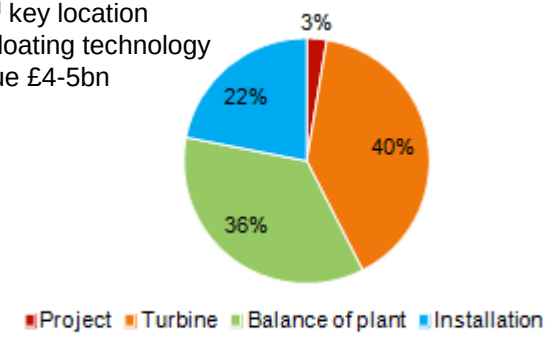
Offshore wind market history

EU Offshore wind market



Demand headlines

- 34% CAGR (last 8 years)
- Comparable to global onshore wind during growth of 1990's
- UK 60% of global market to date
  - Strongest development frameworks
  - Most consistent demand
  - Best offshore wind resource in EU
- Germany, Denmark, Benelux, Baltic, France progressing
- China likely to be 2nd key location
- Other nations need floating technology
- 2012 UK market value £4-5bn



Supply chain characteristics

- Turbine supply dominated by two key suppliers
- Costs risen significantly 2007-2011 – much explainable:
  - Moved to deeper water, further from shore, higher winds
  - Little competition
  - Exchange rate – continental supply
  - Commodity prices
- Cost of energy reduced due to higher wind resources
- Low margins compared to investment and risk - and hence business failures
- Industry moved from single EPC contract to multi-EPC – moving towards alliancing

Demand

UK Offshore wind market forecast

Supply chain ready, but for what? Little consensus on demand, even out to 2020

Market maker - DECC

- Stated 13GW repeatedly as central scenario
- Provides framework and lets market decide how much to construct
- Advised intent to facilitate up to 18GW if cost of energy reduced to £100/MWh by 2020 (i.e.. around 40%)

Landlord – The Crown Estate

- Licensor of projects with commitments from tenants to have started construction of 25 GW
- 20GW used in 2012 gap analysis forecast by BVG Associates Jun 2012
- Led industry to evidence pathways to £100/MWh given an 18GW market matched by rest of EU

Trade Body – RenewableUK

- 35 GW as aggregate of timelines provided by industry and published Jun 2012
- 18 GW by BVG Associates in State of the Industry report published Oct 2011
- Likely 18 GW as mid scenario in update to *UK Offshore Wind: Building an Industry* to be published Jan 2013
- Chaired CRTF, exploring how to deliver the cost reductions evidenced

What demand to invest for?

Milestone cumulative 'targets'?

- DECC, The Crown Estate and Industry agree vision to 2020
- What beyond 2020?
- Milestone targets often get superseded well before reaching

Annual run-rate 3GW in UK?

- 3GWpa in UK by 2020; similar for rest of EU
- As turbine rating grows, number of foundations and mass of steel pa drops
- 500 pa in 2020; 350 in 2030

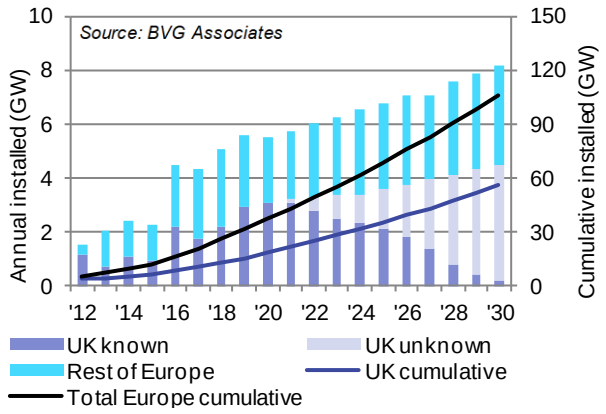
Annual run-rate 500 turbines in UK?

- 100 to 200-turbine pa assembly facility is relatively efficient scale
- Space per foundation does not increase much for larger turbines
- Slowly growing mass of steel pa

Demand

Offshore wind market forecast

EU offshore wind market forecast



Background

- Demand to 2015 mainly contracted
- Demand to 2020 lower than some trade body forecasts
- Demand post 2020 combines known projects and anticipated future licensing rounds
- Designed to be realistic and facilitate healthy UK sector
- Depends on industry cost reduction AND political support

Supply chain challenge

- UK dip in 2013
- Little installation growth until 2016
- Overall equivalent to 16% CAGR (next 8 years)
- Depends on own cost reduction AND political support
- Evolving technology and project conditions

Technology evolution

	2012	2020
Turbine	4MW	6MW
Rotor diameter	120m	155m
Foundation	Monopile	Jacket
Array cable	33kVAC	66kVAC
Export cable	245kVAC	HVDC

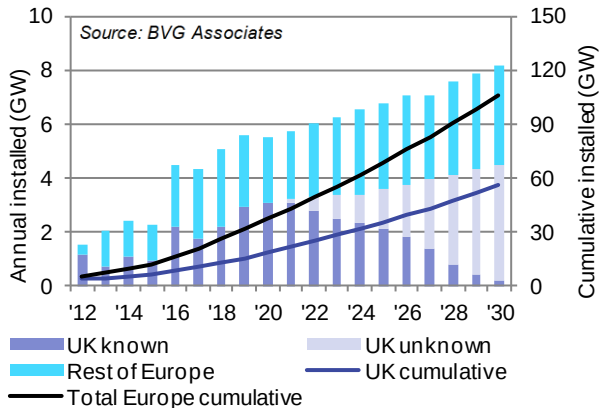
Changing project conditions

	2012	2020
Project size	300MW	600MW
Water depth	25m	40m
Distance to port	20km	100km
Financing	Balance sheet	Project
O&M	Shore-based	Mother ship-based

Supply

Key potential bottlenecks

EU offshore wind market forecast

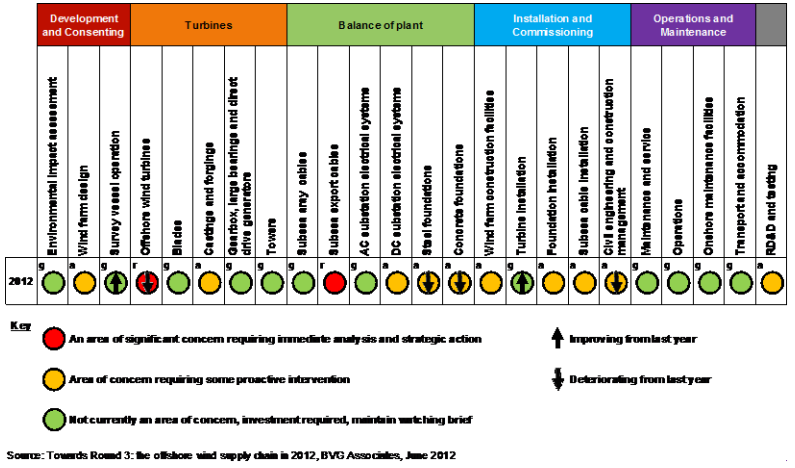


Common messages

- Demand is the problem, not supply
- From continental wind: “can do”
- Sometimes from UK: “I can make higher margins in other sectors - de-risk it for me”
- We have been successful, but now we are empty
- OMS supply chain dynamic different to capital phase

Key potential bottlenecks

	Offshore Wind Turbines	Steel / Concrete Foundations	Export Cables	Foundation Installation Vessels
2009	🔴	🟡🟢	🔴	🔴
2011	🟡	🟢	🔴	🟡
2012	🔴	🟡	🔴	🟡



Supply

Offshore turbine supply

Dynamic situation

2009 Status

- 2 established players at 3-4MW scale
- Onshore wind technology modified
- Largest prototype 5MW, 126m diameter
- 18 players of substance seeking to enter market

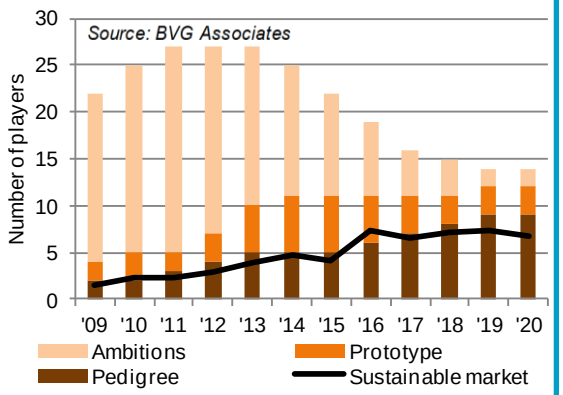
2012 Status

- 4 established players at 3-6MW scale
- Offshore-specific technology coming
- Largest prototype 6MW, 154m diameter
- 20 players of substance seeking to enter market
- Global industrial players
- 50% of players exploring assembly in UK

2020 Status

- 6-8 established players at 5-8MW scale
- All offshore-specific technology
- Largest prototype 10MW+, 180m+ diameter
- Global industrial players dominate
- Fewer players left seeking to enter
- 30-50% of players assembling in UK

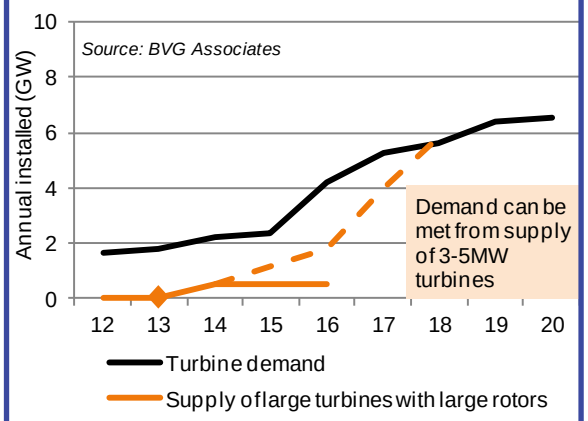
Turbine suppliers



Challenges

- Investment £100-£300m for development of new turbine PLUS new coastal facilities
- ~6 years gestation from concept to bankable sale
- Reliability still not good enough – substantial warranty / LTSA risk
- (When) will Chinese players come to European market?

Summary

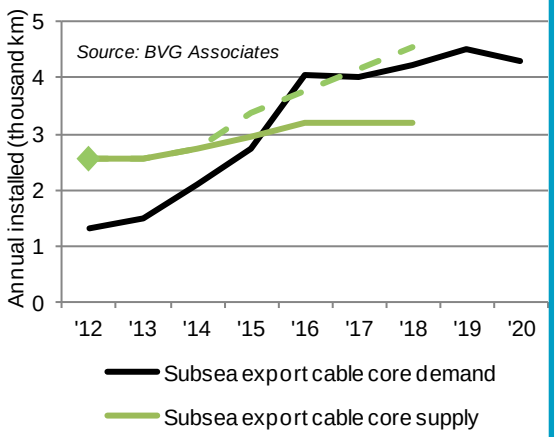


Supply

Other key potential bottlenecks

Confidence in market and technology critical to investment

Cables

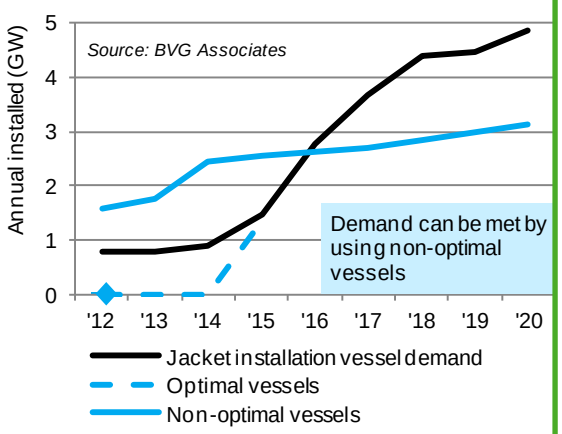


- Main market for HV cables is offshore wind
- Big 4 dominate the market
- UK's JDR Cable Systems could play – including with innovative solutions
- Expect 'just in time' investment
- Manufacturing location not critical
- Reliability issues expensive – mainly related to installation

Foundations

- Monopiles - sufficient supply as not optimum solution for larger turbines in deeper waters / quick to ramp up production
- Jackets - sufficient time to expand supply, but slow progress towards using mass-production methods
- Investment (~£100m) is location and sector-specific
- Concrete – used successfully in Baltic; likely to contribute eventually but high setup cost and installation logistics concerns

Vessels



- Turbine installation - good ongoing investment in vessels – various jack-up solutions
- Cable installation – significant quality issues but sufficient vessels available at short enough notice
- Challenge is efficient non-jack up solutions for jacket installation – needs new build or conversion of container ships

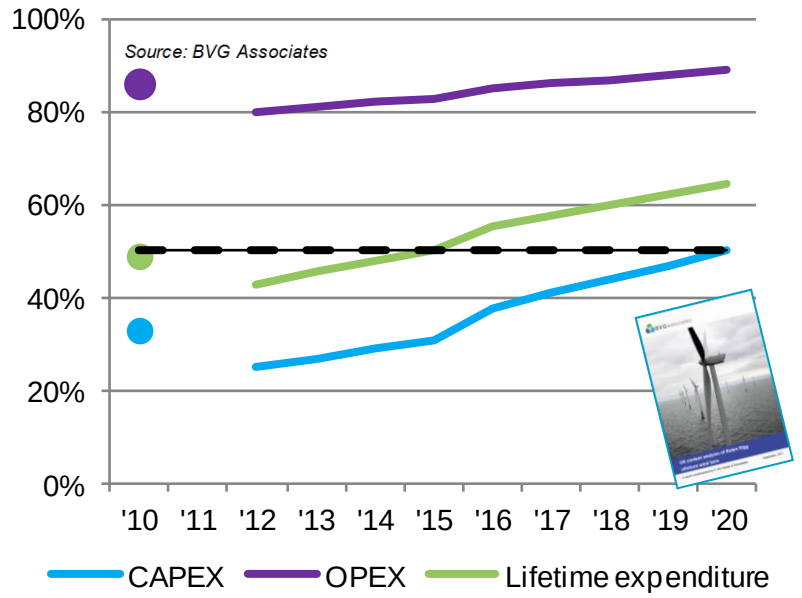
UK Benefit

Significant national opportunity

UK content

- Government / industry group Offshore Wind Developers Forum vision 50% UK content
- Work underway to define how to measure and document
- Westminster has softer approach than some in encouraging local content
- Need more strategic approach:
  - What industry wants...
  - That UK can make competitively...
  - That may be hard to transport...
- It is a competitive market
- Other measurable benefits:
  - Manufacturing and service jobs
  - Security of energy supply
  - CO_2 avoidance (takes 7-10 months for an offshore wind farm to produce as much energy as it took to make it)
  - Export potential

UK content forecast



Summary

- Supply chain unlikely to be significant bottleneck
- Confident, innovating supply chain will reduce cost of energy
- Reduced cost of energy will increase market size, across Europe
- UK has the best offshore wind resource in Europe
- To capture UK benefit, we have to invest strategically in supply chain – with that, we can secure a long-term, sustainable, sustainable industry

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