UK Offshore Wind: latest vision of market and technology development

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BVG Associates
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Agenda

Contents

- EU offshore market
- The UK offshore market
- Cost of energy driver
- Technology changes

Selected clients

BVG Associates

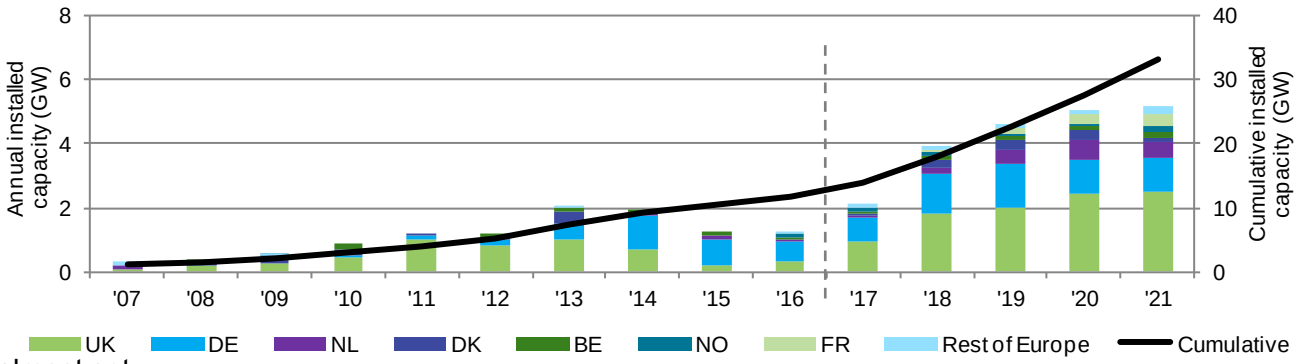
- Market and supply chain
  - Analysis and forecasting
  - Strategic advice
  - Business and supply chain development
- Economics
  - Socioeconomics and local benefits
  - Technology and project economic modelling
  - Policy and local content assessment
- Technology
  - Engineering services
  - Due diligence
  - Strategy and R&D support

EU Market

EU offshore wind market for supply to 2020

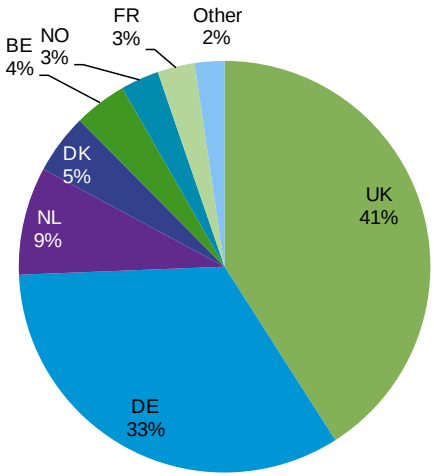
EU market history

- UK most consistent, growing market since '03 (CAGR 33%).
- UK 3-year slow-down '14-'16 impacts whole market.
- Germany only starts at scale '14.
- Installed capacity to '16 now almost set.

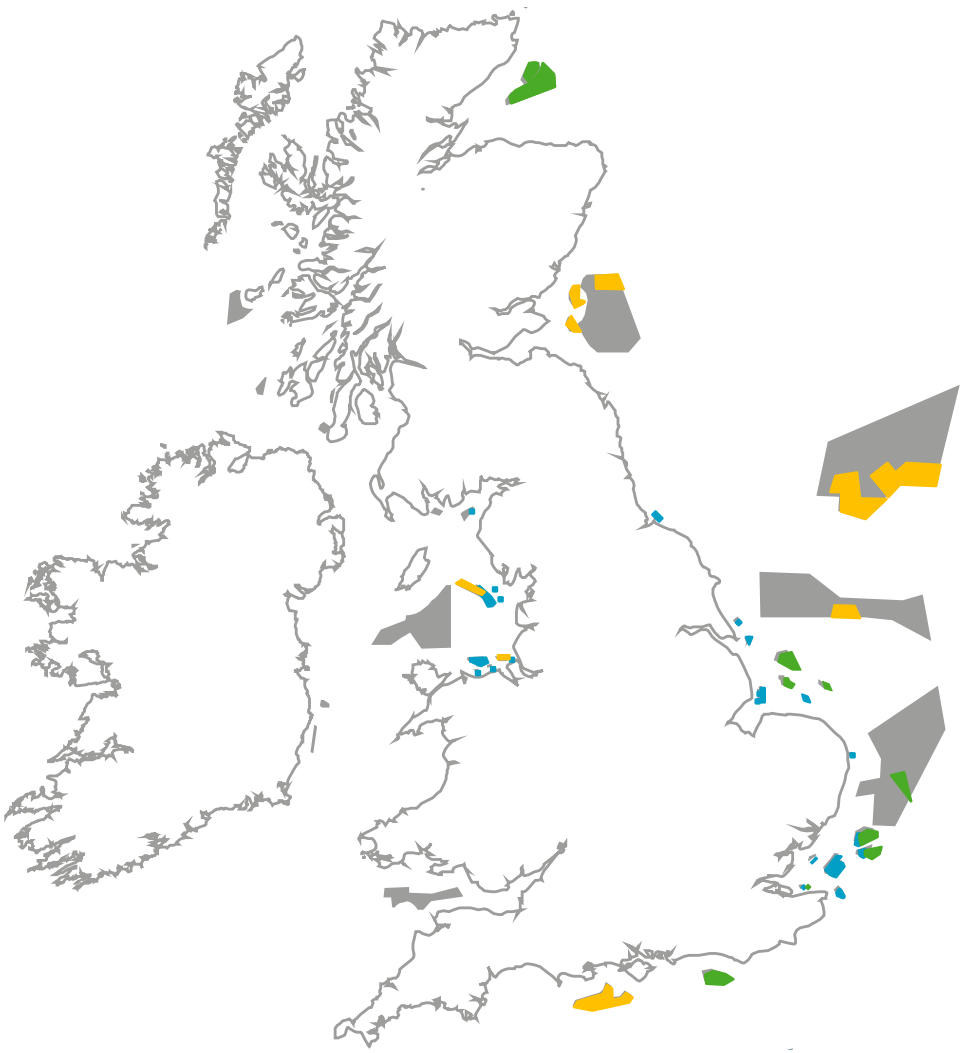


Market forecast

- CAGR in period 21%.
- Leading market is UK. UK and Germany, make up ¾ of the forecast EU market.
- All offshore wind markets are subsidised to a roughly similar extent and support is likely to be required until at least 2030.
- Typical time from first development activity to first operation of UK projects is about 10 years. FID typically 3 years before first operation.
- Average turbine size moving from 4MW to >6MW by 2020.



The UK market

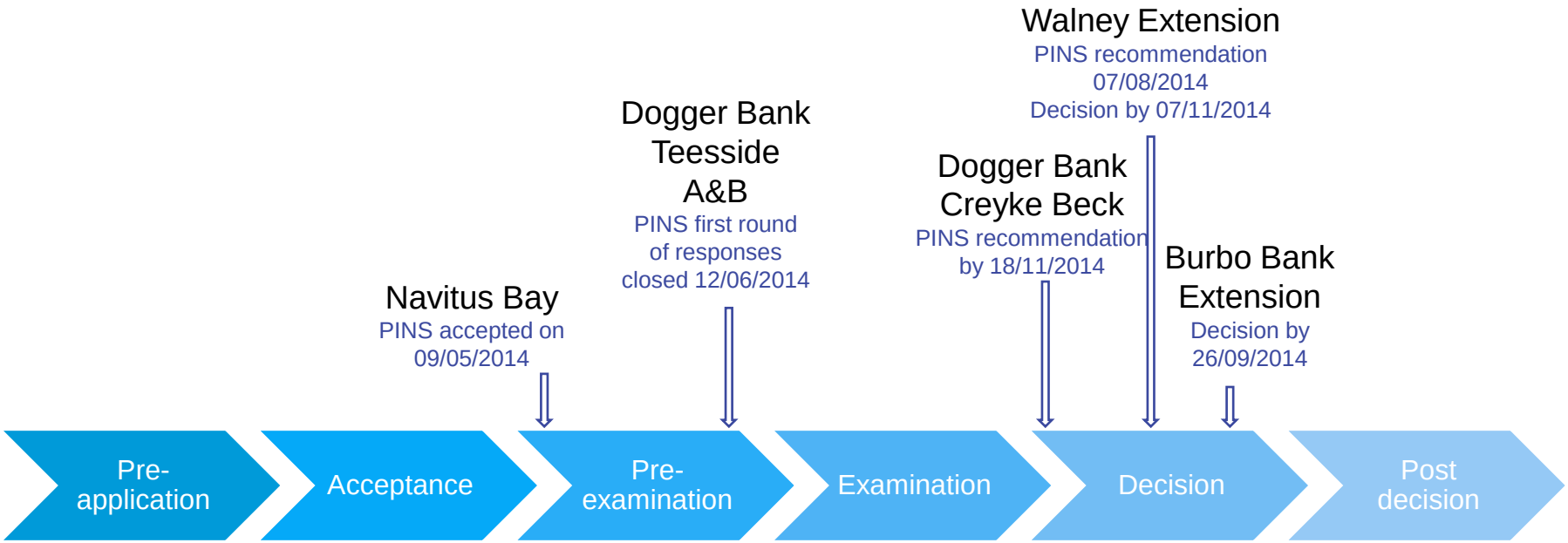


Completed or under construction: Includes projects in which the main contracts have been placed. 5.1GW

Consented: Projects that have received planning consent. 5.6GW

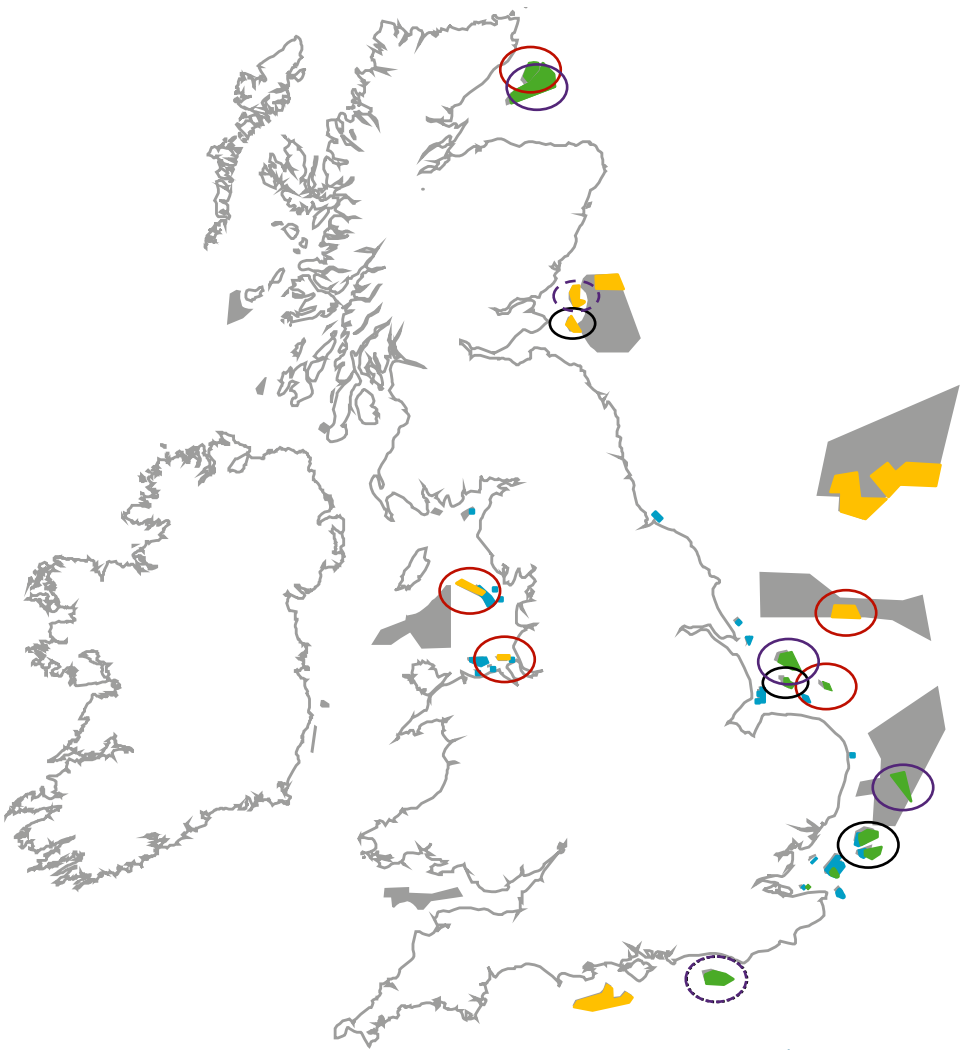
Consent applied for: Application has been submitted. 10.3GW

Projects in the planning process



Recently consented	
Beatrice	March 2014
Moray Firth Phase 1&2	March 2014
East Anglia One	June 2014
Rampion	July 2014

The UK market



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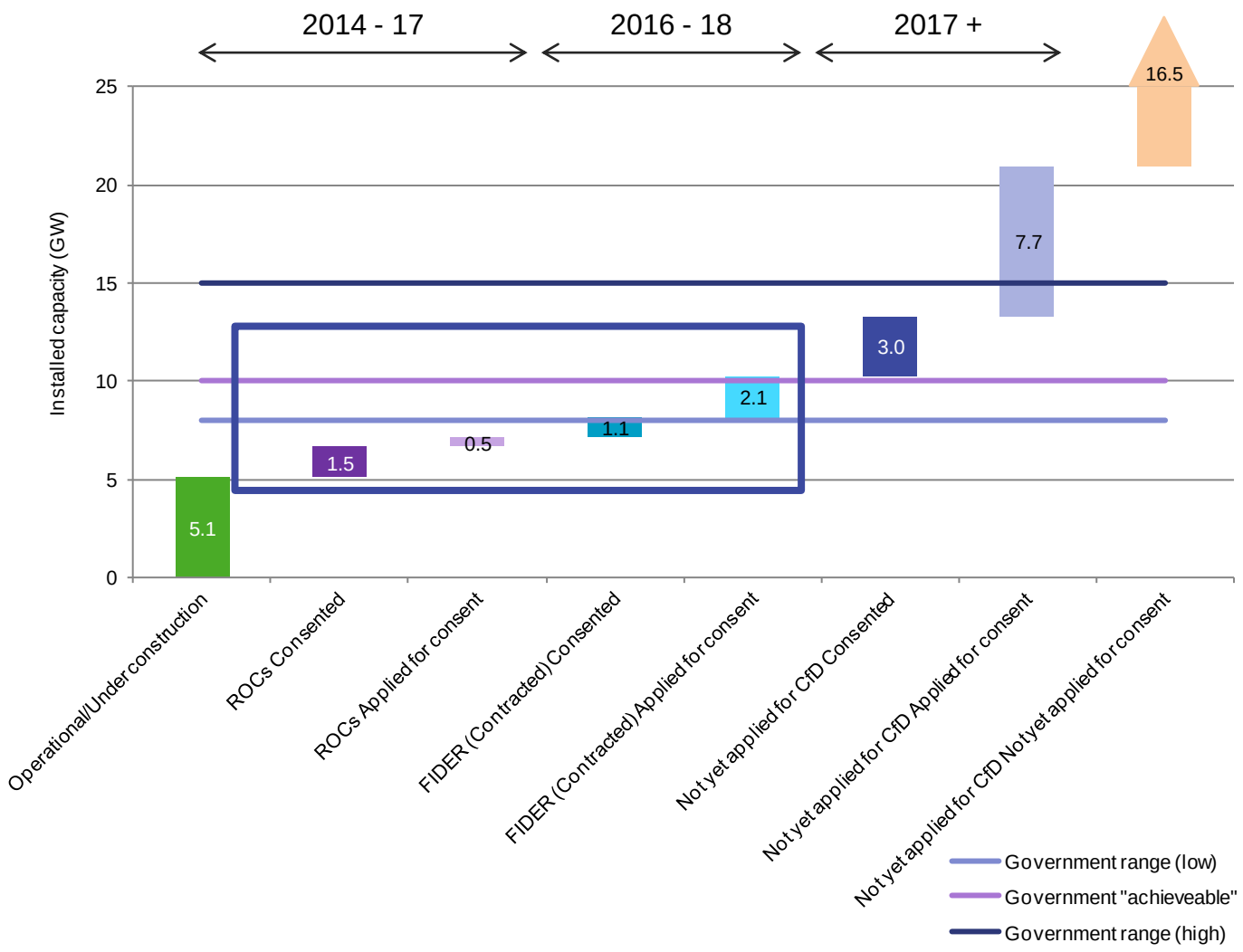
Targeting ROCs: Companies have published timelines. 1.3GW - 2GW

FIDER contracted: Announced in April 2014. 3.2GW

Targeting CfD?: Projects that meet the criteria (or are expected to soon): 2.8GW – 4.4GW

Challenge: Government only expected to support 500-600MW this year

The UK market



ROCs - consented
Galloper
Race Bank
Rampion

ROCs – Applied for consent
Neart na Gaoithe

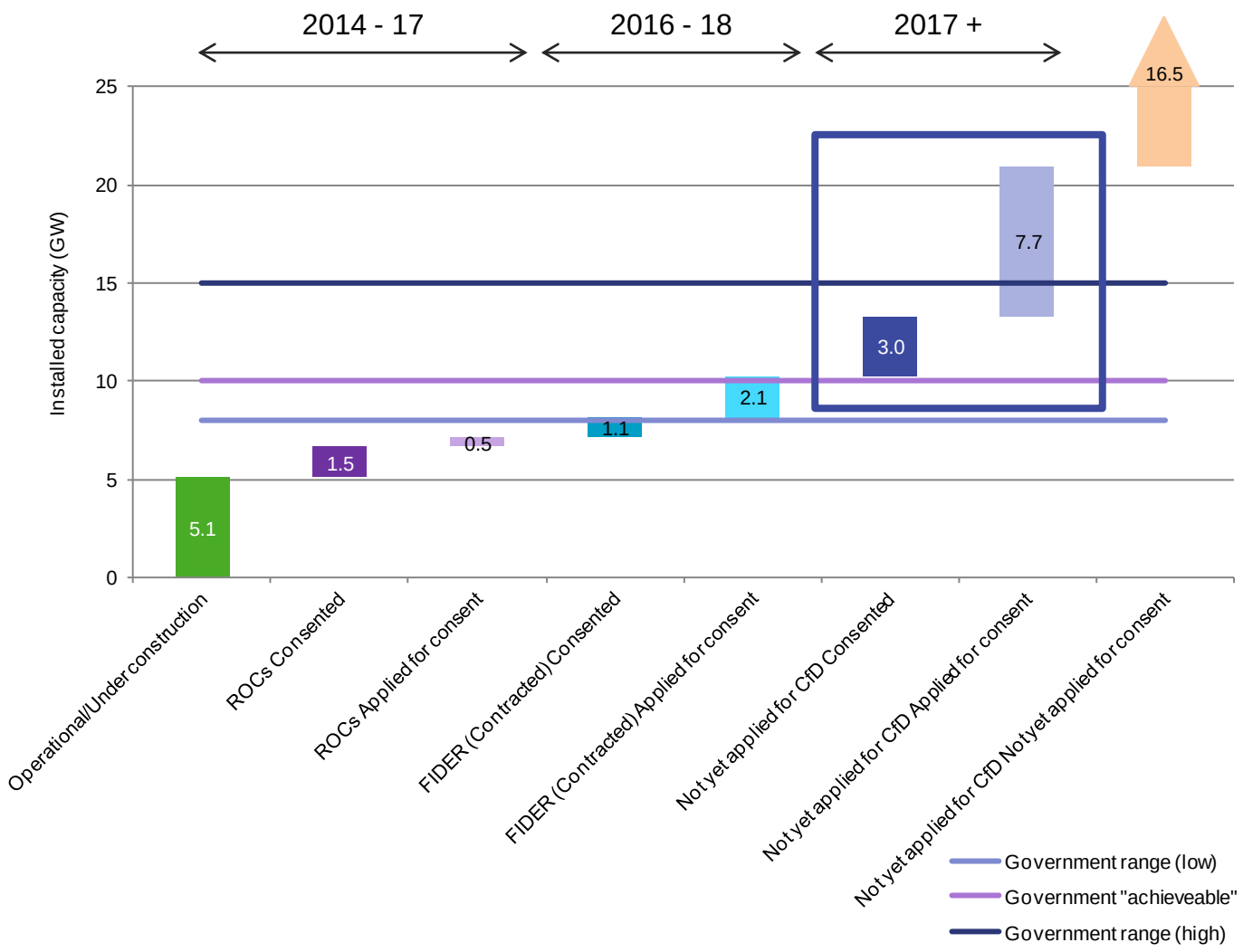
FIDER (Provisionally affordable) - Consented
Beatrice
Dudgeon

FIDER (contracted) - Applied for consent
Burbo Bank Extension
Hornsea Heron/Njord
Walney Extension

Project progress is dependent on both planning consent and public funding approval .

Achieving a final investment decision will still be dependent on the developer but these other factors give an indicative “running order”

The UK market



Not yet applied for CfD - Consented

Blyth (demo)
East Anglia 1
EOWDC (demo)
Moray Firth
Triton Knoll

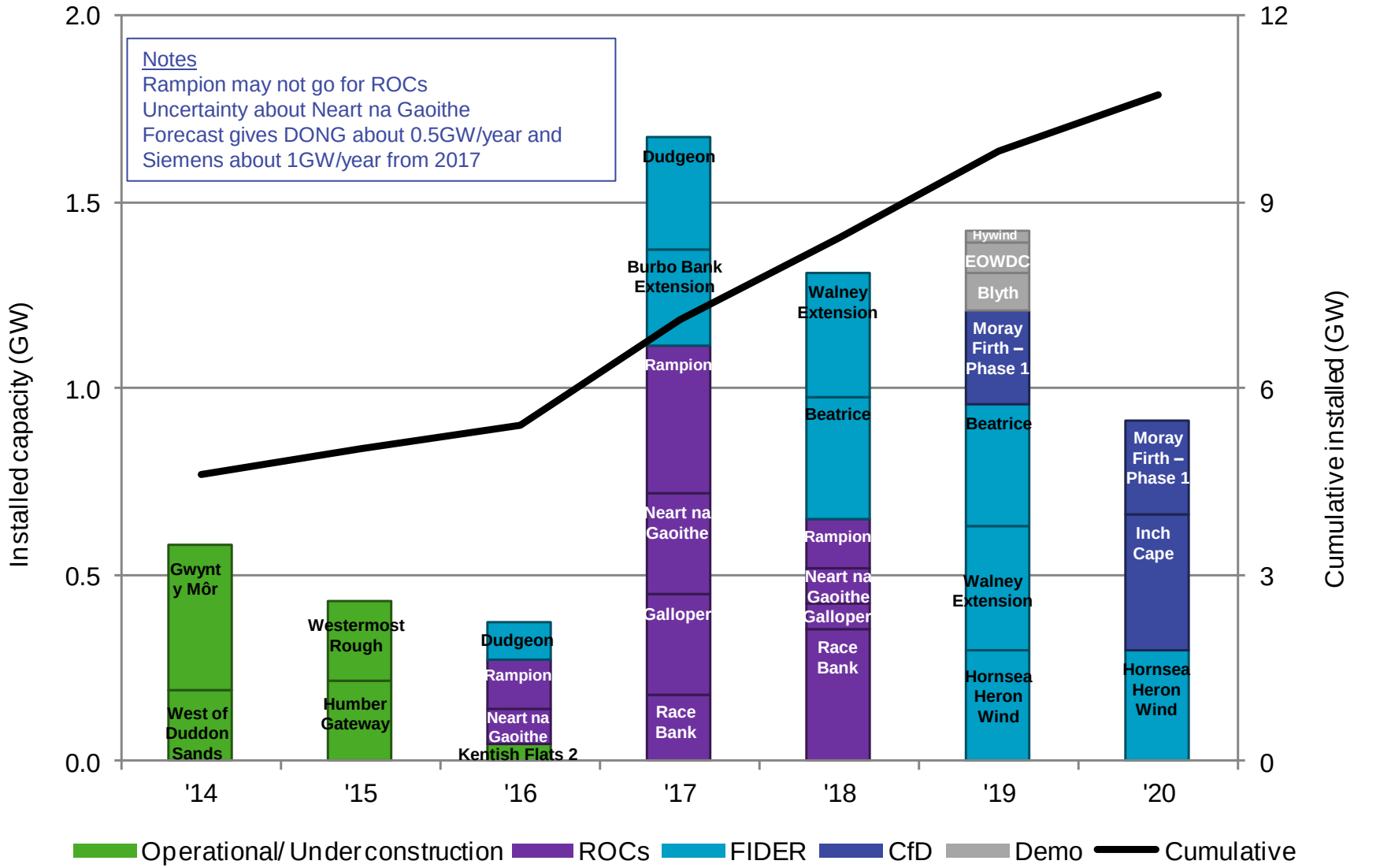
Not yet applied for CfD - Applied for consent

Dogger Bank Creyke Beck
Dogger Bank Teesside
Inch Cape
Navitus Bay
Seagreen Alpha/Bravo

It is likely Government will only accept an increase in offshore wind activity beyond its 10GW target if it sees strong arguments to do so.

These could because of:
- Greater cost reduction
- Increased UK activity

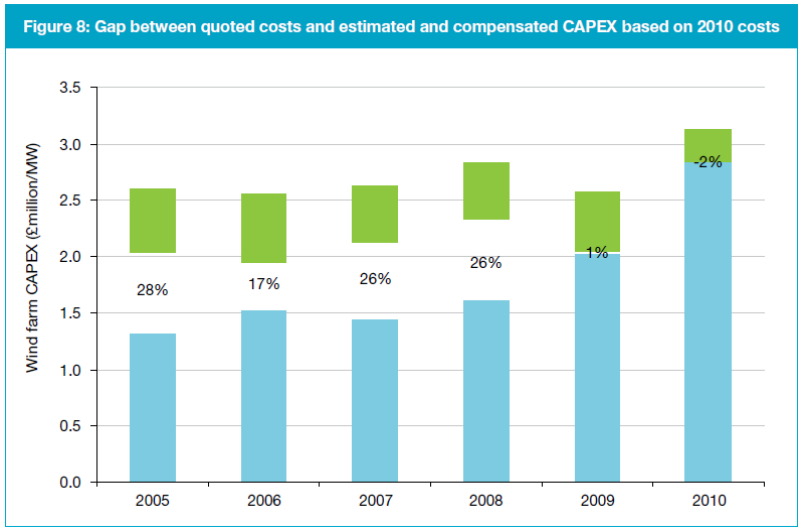
UK market forecast



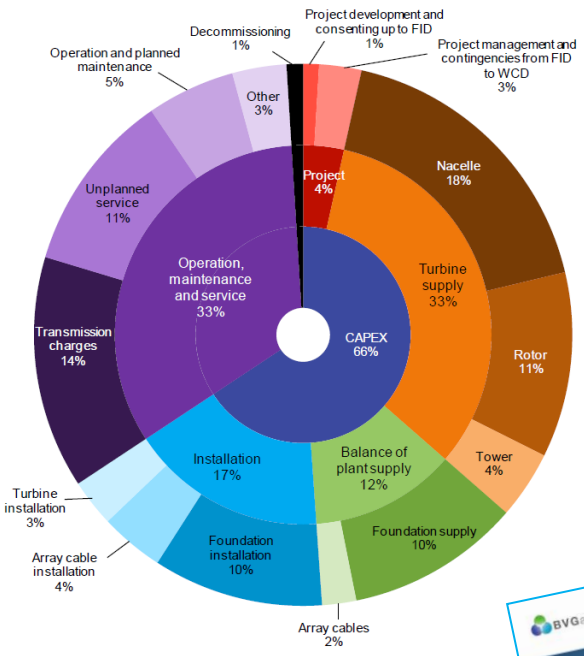
Cost of energy

Health warnings

CAPEX has been going up, not down



Cost of Energy is more than just CAPEX



~ €160/MWh Today

↓

£100/MWh (€125) In 2020

↓

€100/MWh late 2020's?

↓

$100/MWh (€80) in 2040's?

LCOE = Revenue (from whatever source) / MWh required in order to get sufficient return on investment

LCOE = $\frac{\text{Annualised CAPEX + OPEX}}{\text{AEP}}$

The Crown Estate study

Overview

Context

- 2011 UK Government Energy white paper:
  - Central scenario 13GW by 2020
  - Minded to support to 18GW if cost of energy reduced – target £100/MWh

- The Crown Estate cost reduction pathways study established to evidence what industry thinks could be done
  - Supply chain, finance and technology work streams

- Published summer 2012

Methodology in numbers: technology work stream

4 Dimensional cost model: Time, types of wind farm site, turbine sizes, industry scenarios

6 Industry day-long workshops (in UK, DK, DE)

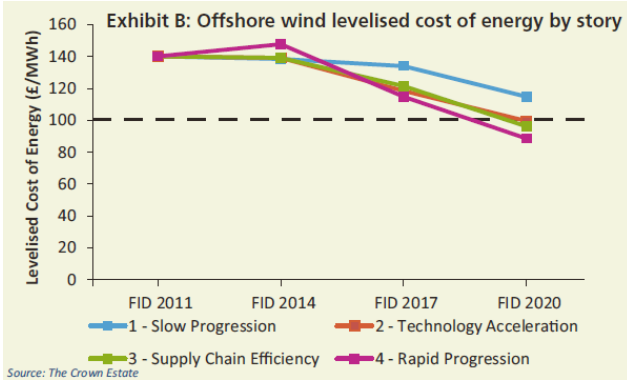
20 Deep industry interviews (4 hours +)

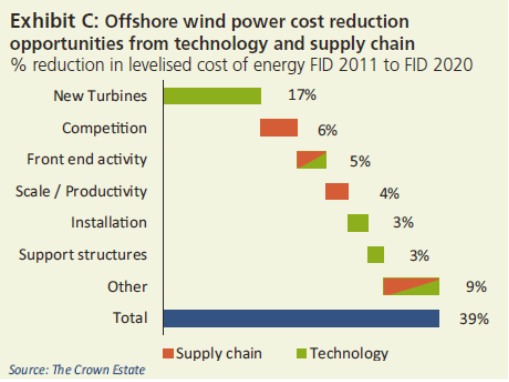
125 Industry individuals directly involved

215 Pages – available for download from our website

Cost reduction pathways study: results

- Given right external conditions, industry can meet target:
  - Confidence in market size to beyond 2020
  - Smooth and timely transition under EMR
  - Planning consent timelines reliably met
  - Clear and predictable offshore grid regulatory framework
  - Facilitation of new technology introduction
- To deliver, industry also needs to work together:
  - Best practice, standardisation, risk management, accessing new finance

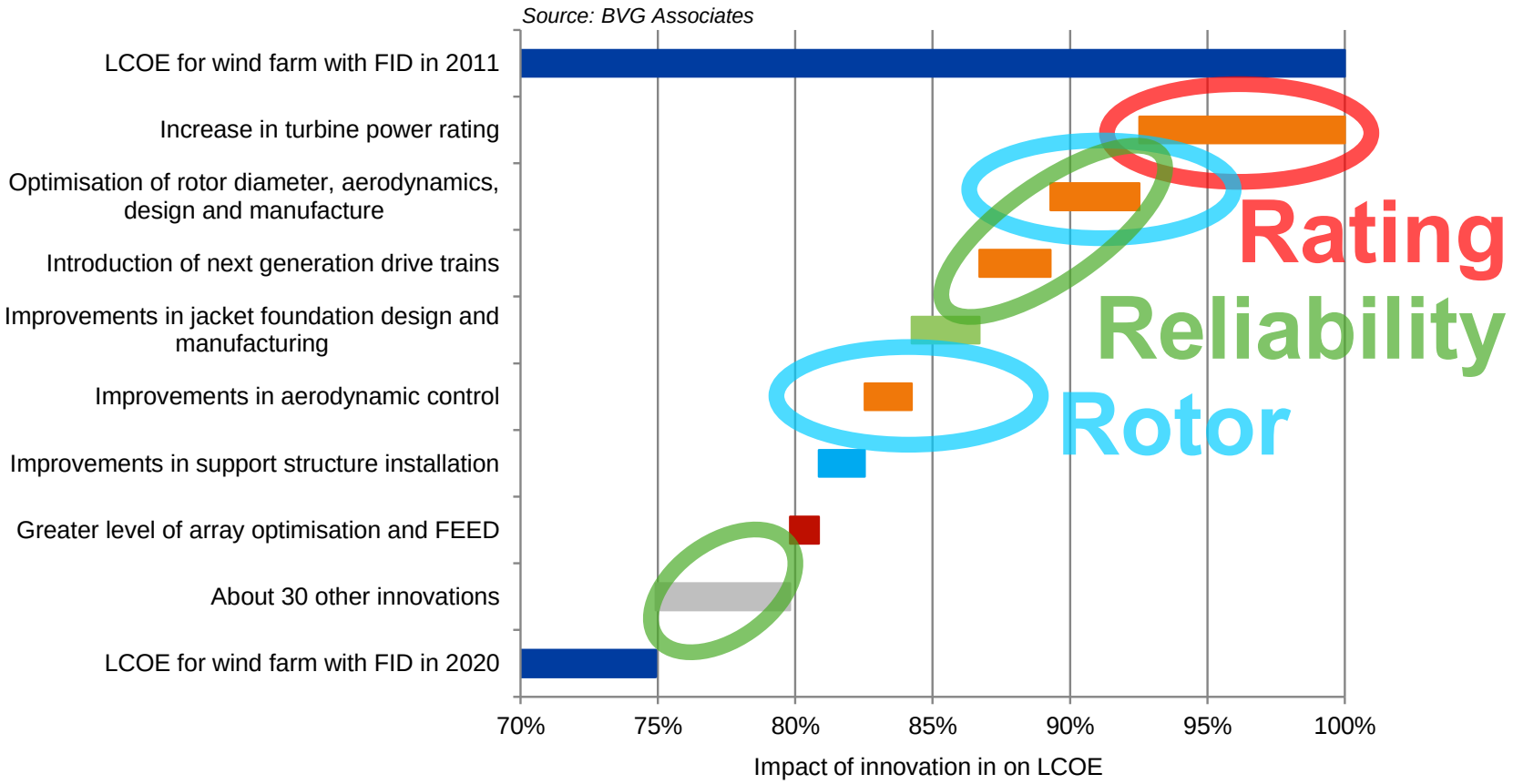




Technologies

Where are the greatest savings?

Advancements in blade and turbine technologies

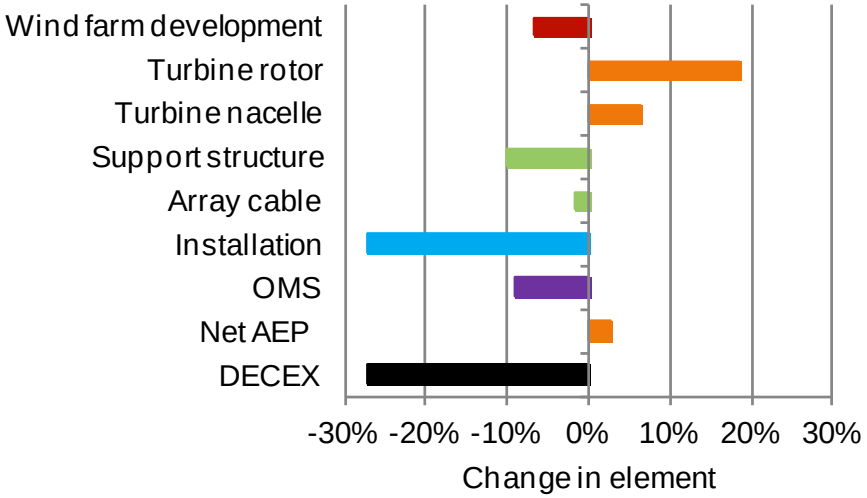


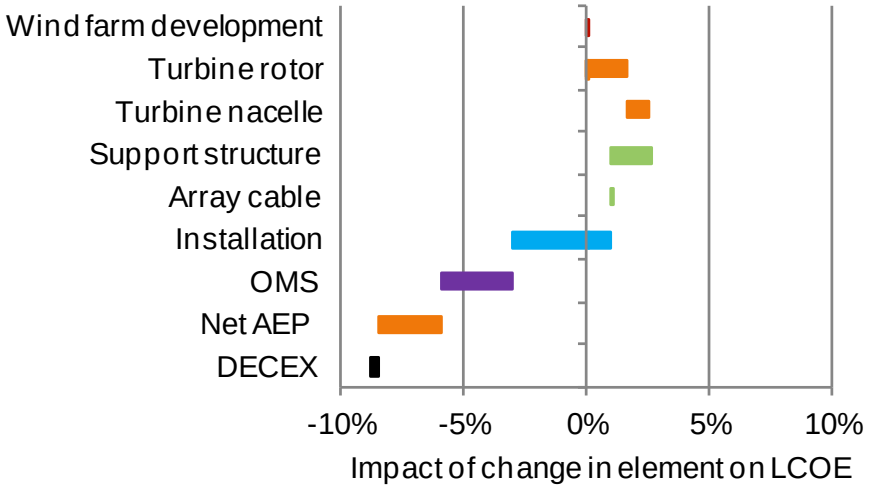
Turbine rating

Larger turbines cost much more, but...

From 4 to 6MW turbines

Source: BVG Associates





Technology Progress

Comparison with other studies

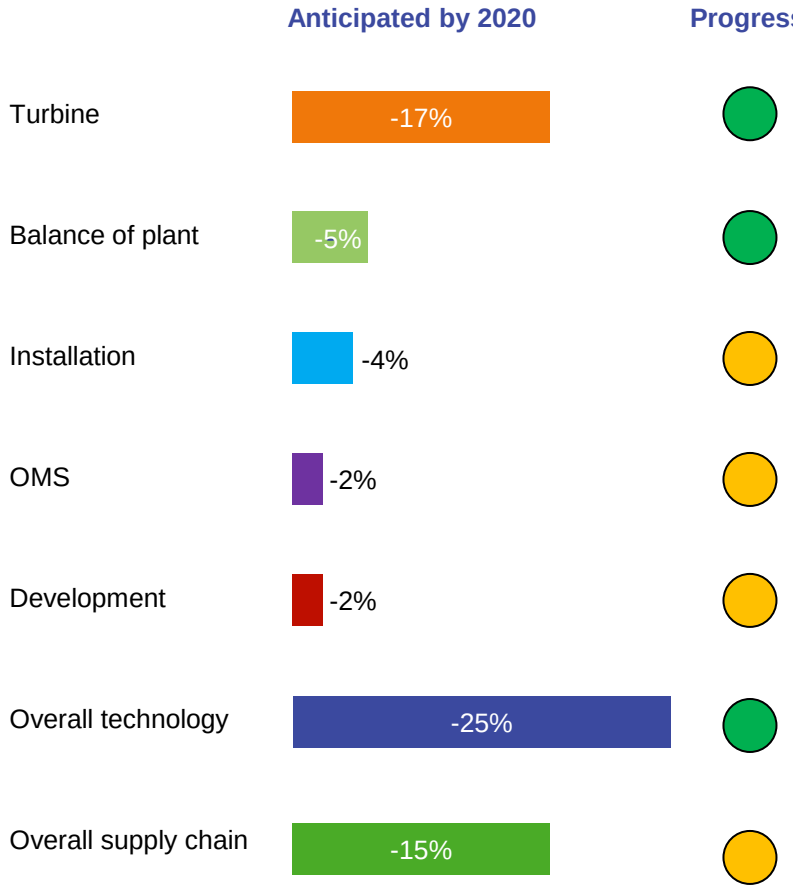
German Stiftung Offshore Windenergie (2013)

- Similar but simplified approach (budget only 10% of The Crown Estate study)
- Often identical assumptions – aids comparison
- Similar trends, except:
  - Higher energy losses due to aerodynamic wakes
  - Higher support structure savings but lower installation savings
  - Lower cost of capital
  - More sharing of offshore infrastructure

KIC InnoEnergy (2014)

- Identical but simplified approach (budget less than 5% of The Crown Estate study)
- Part of a series to be published on onshore wind and solar, using same methodology
- Identical assumptions
- Assessment brought up to date
- Forecast extends to FID in 2025

Progress check (technology & supply chain)



Conclusions

- UK market likely to reach c 11GW installed capacity by 2020
- Significant share for Siemens
- Introduction of 7MW and 8MW turbines expected in projects before 2020

- Turbine and rotor developments will carry us beyond 2020
- Jacket foundation developments still to make a big impact
- Improvements in cables, installation and OMS need to be carried on beyond 2020

Thank you

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