Drivers for innovation

13/02/2018

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CATAPULT
Offshore Renewable Energy

Agenda

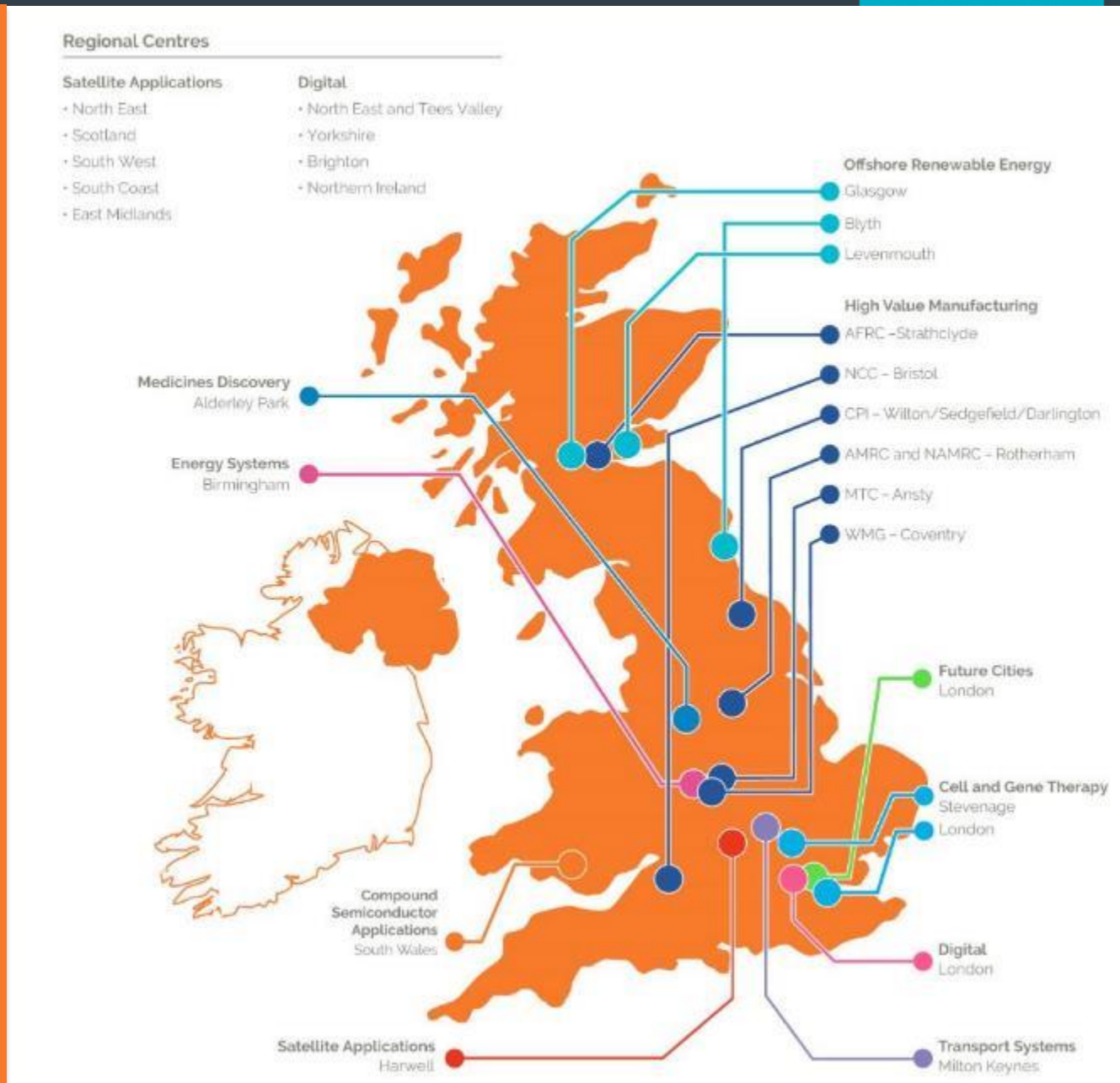
- Brief introduction to ORE Catapult
- Offshore Wind Market Overview
- Key Market Drivers for NDT
- OWIX (Offshore Wind Innovation Exchange)

The Catapult Network

10

Innovate UK

- Designed to transform the UK's capability for innovation
- Core grant leveraged with industry and other public funding



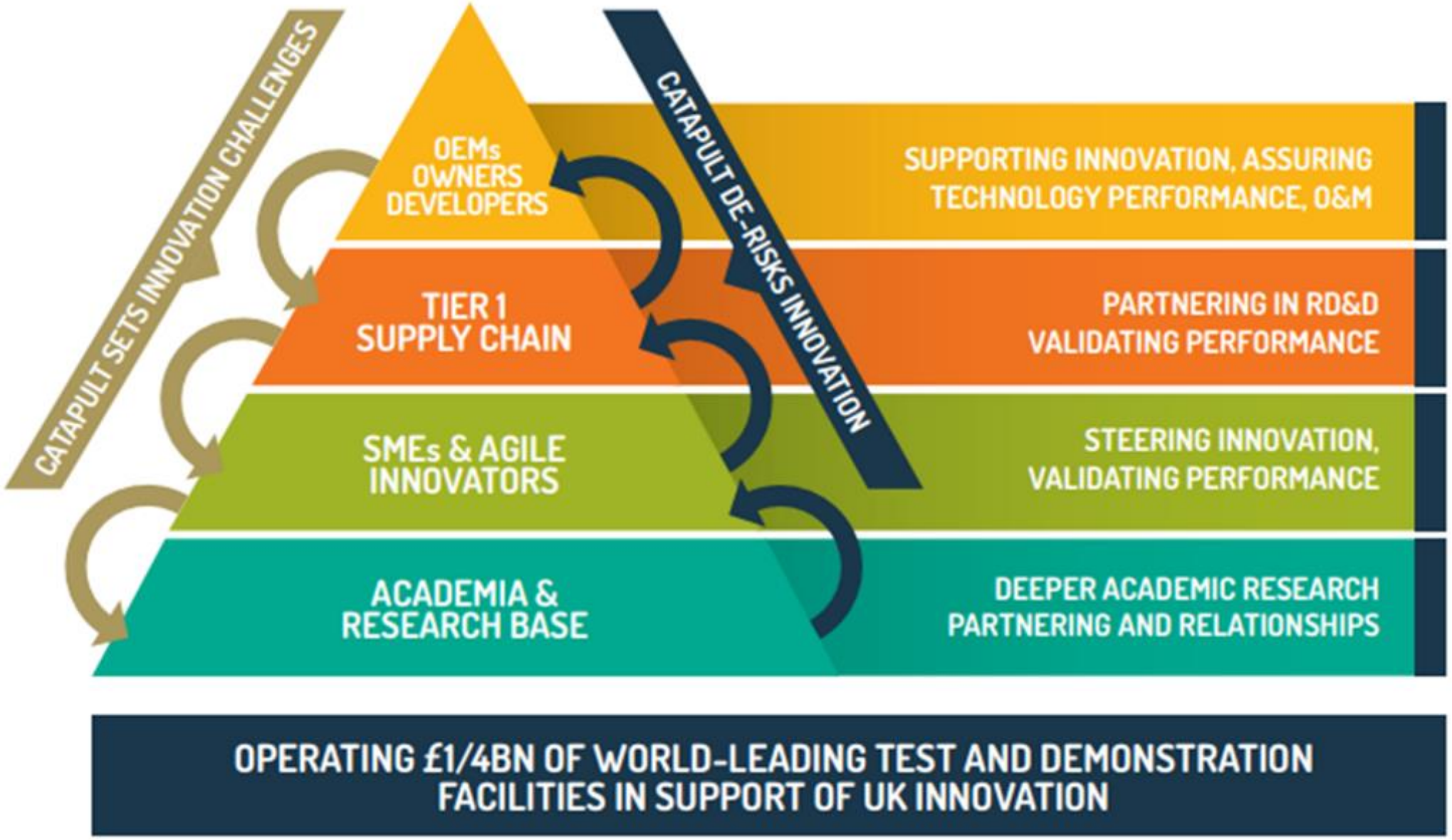
ORE Catapult

Our Mission:

Accelerate the creation and growth of UK companies in the ORE sector

- Reduce the cost of offshore renewable energy
- Deliver UK economic benefit

The Role of ORE Catapult



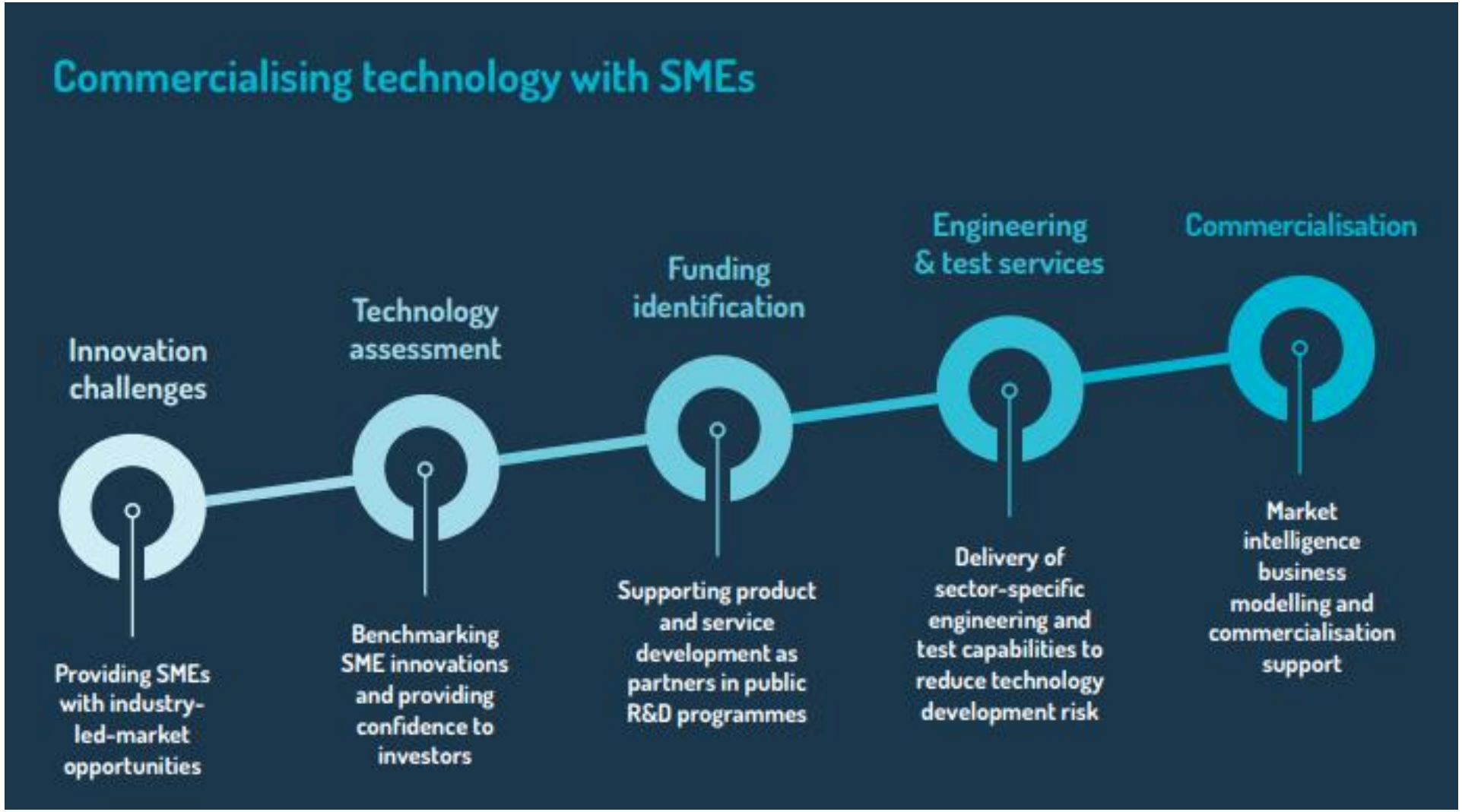
Our Impact


£¼bn
Value of Test Facilities
46
121
Companies Supported with Product Development
164
410
SMEs Supported
241
628
Industry Collaborations
Our Impact in 2017 / 18
100
196
R&D Projects
195
301
Academic Collaborations
58%
Yearly Uplift in Competitive R&D
33
54
International Projects
2017 / 18 figures
Figures since 2013

Commercialising technology with SMEs

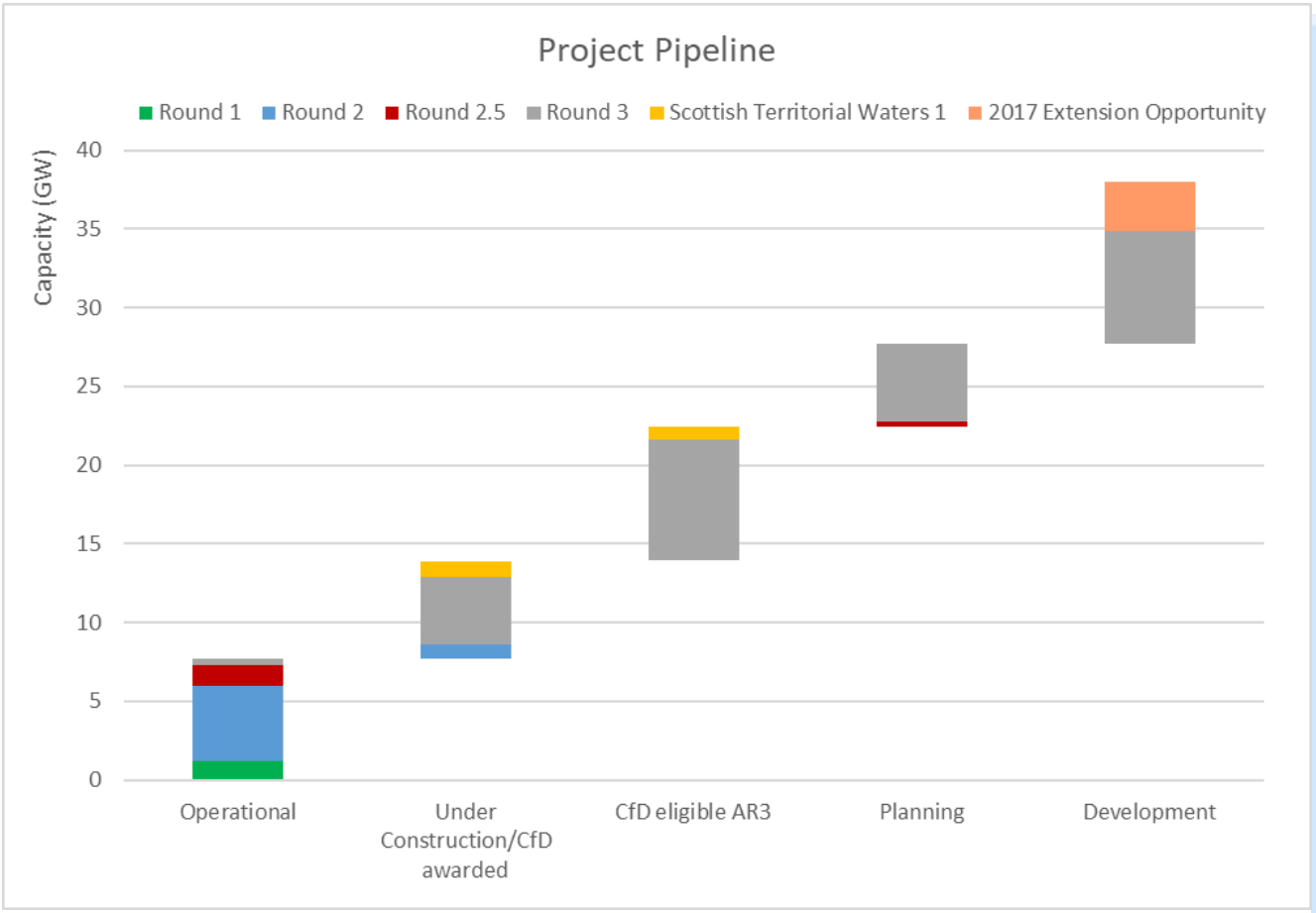
164 SMEs supported in 2017/18

410 SMEs supported since 2013



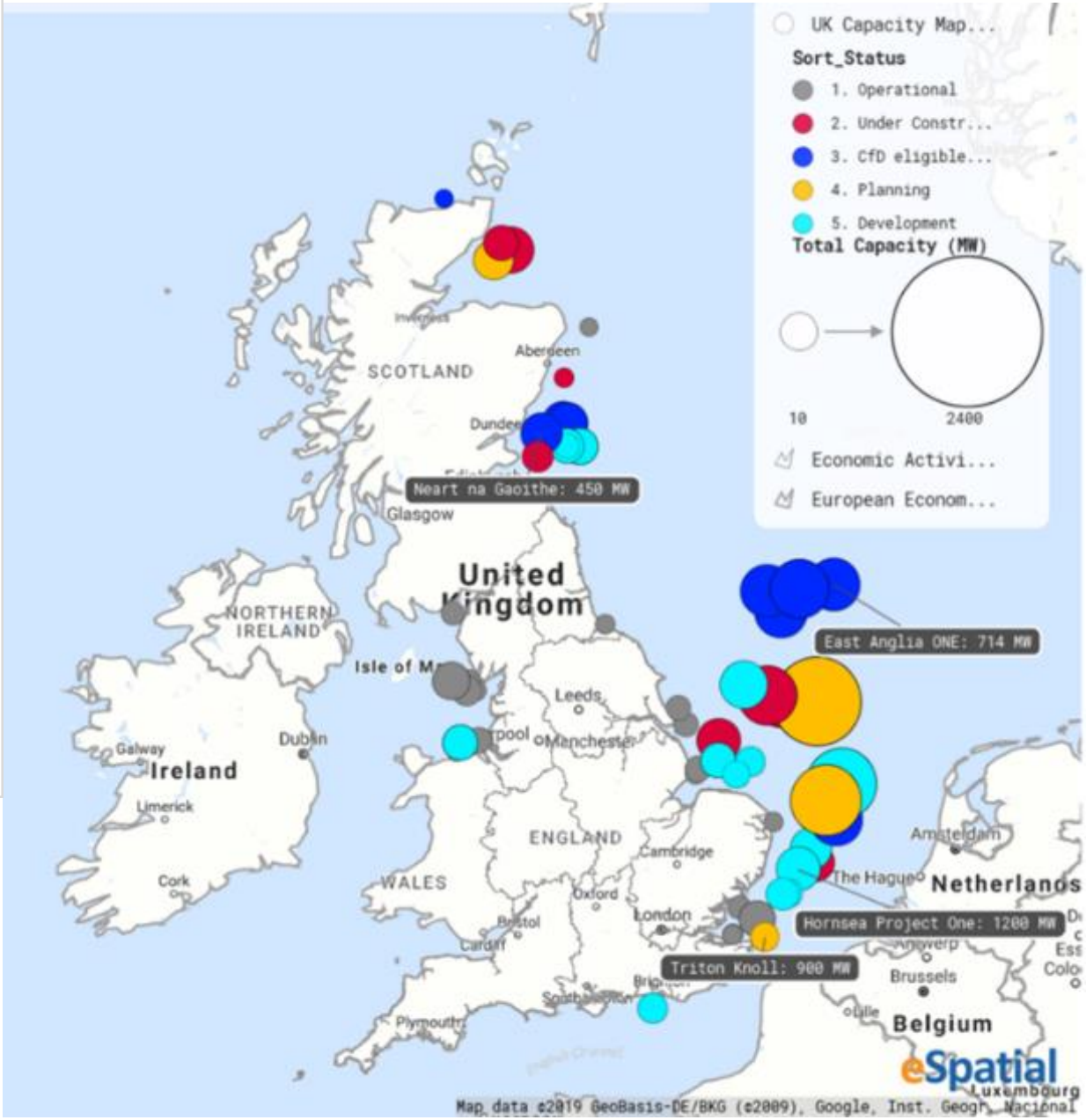
Offshore wind market overview

UK Offshore wind projects

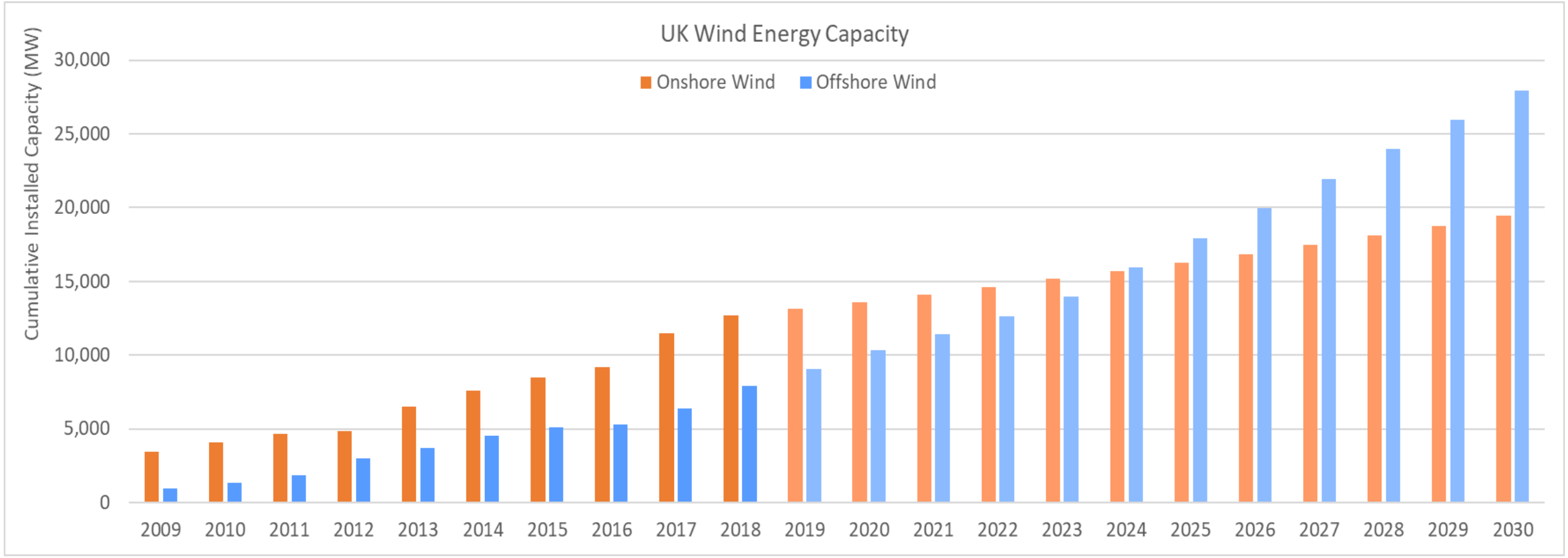


UK Project Rounds:

Round 1:	1.2 GW
Round 2:	5.6 GW
Round 2.5:	1.7 GW
Round 3:	24.4 GW
Scottish Territorial Waters 1:	1.8 GW

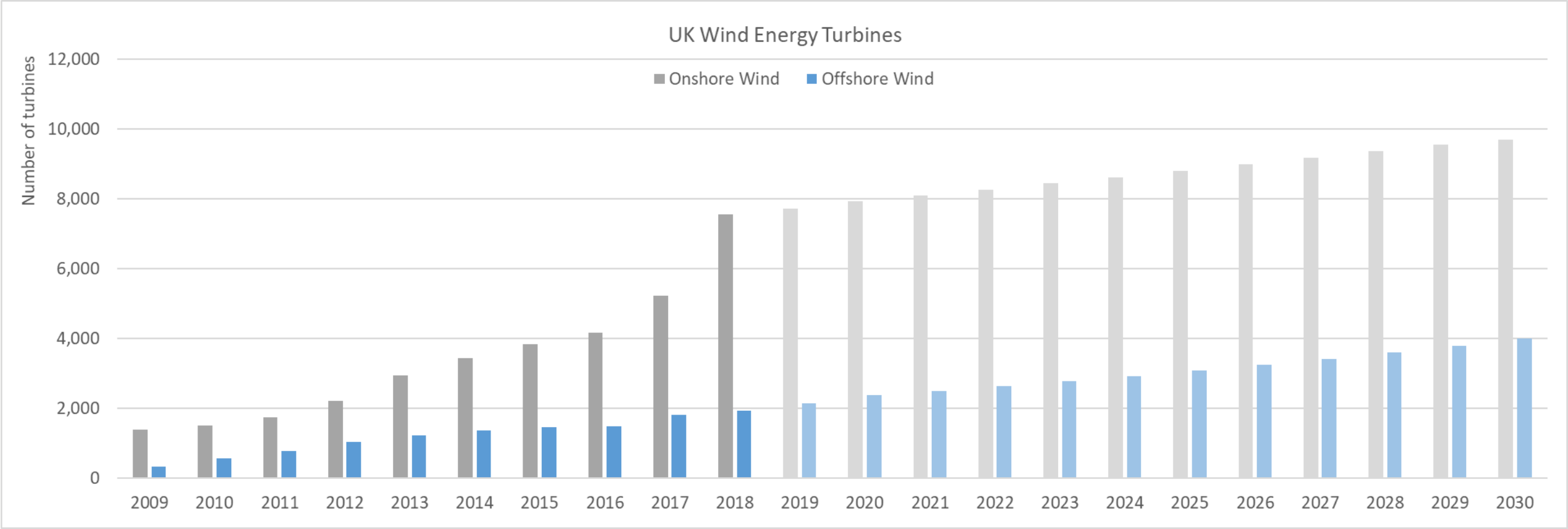


UK wind energy capacity



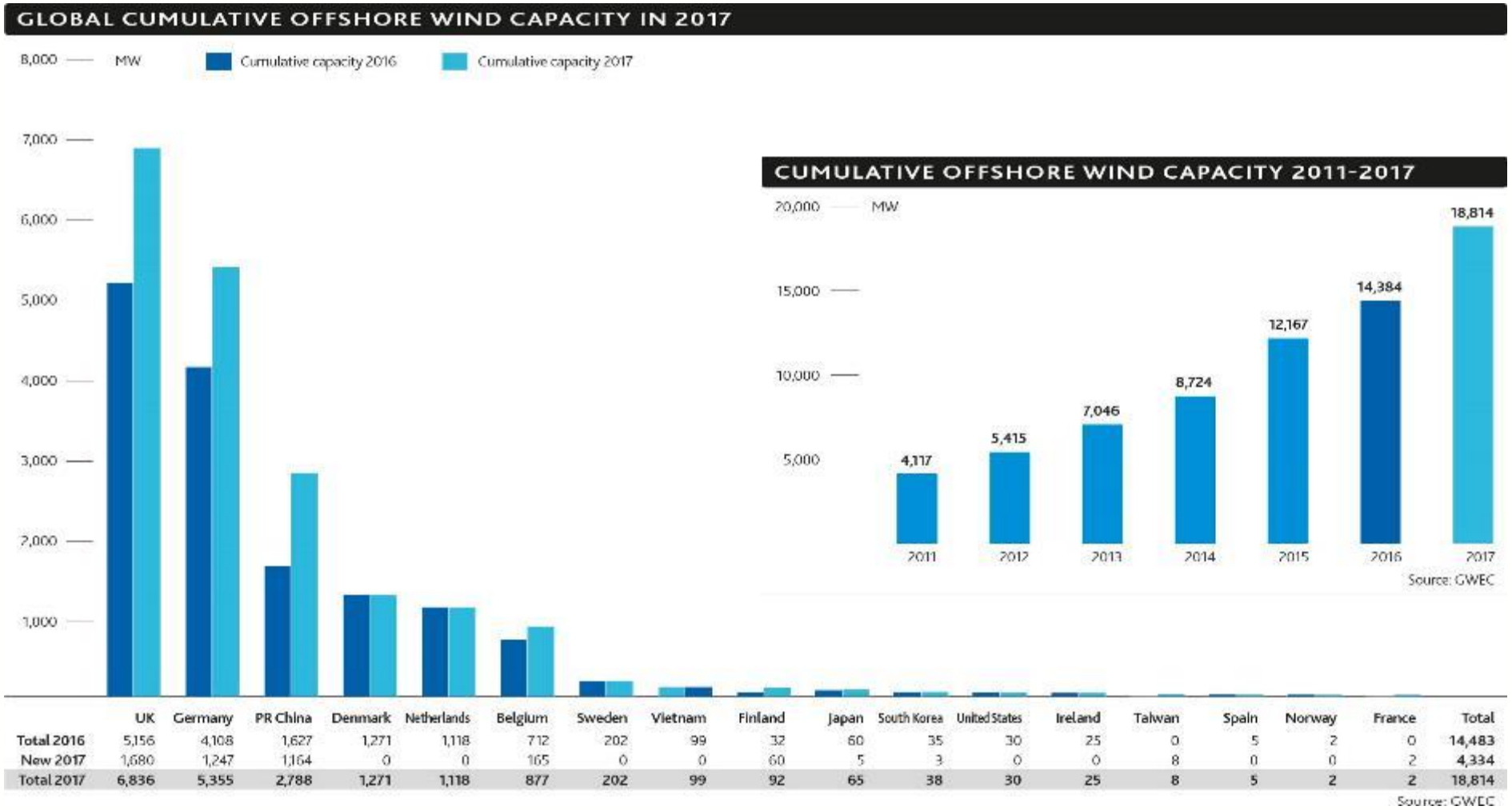
Sector deal vision: 30 GW offshore wind by 2030

UK wind turbines



- Wind turbine installation growth rate is estimated at 5% offshore
- Increase in size of turbine rating (> 10 MW) = reduced installation rate as fewer turbines needed for same energy production

Global cumulative offshore wind capacity



	UK	Germany	PR China	Denmark	Netherlands	Belgium	Sweden	Vietnam	Finland	Japan	South Korea	United States	Ireland	Taiwan	Spain	Norway	France	Total
Total 2016	5,156	4,108	1,627	1,271	1,118	712	202	99	32	60	35	30	25	0	5	2	0	14,483
New 2017	1,680	1,247	1,164	0	0	165	0	0	60	5	3	0	0	8	0	0	2	4,334
Total 2017	6,836	5,355	2,788	1,271	1,118	877	202	99	92	65	38	30	25	8	5	2	2	18,814

Source: GWEC

Consistent growth of offshore wind globally over the last five years with the market more than tripling in size

Offshore Wind is Growing…

United Kingdom

- 2020 Operational Turbines
- 8.53 GW

Rest of Europe

- 2470 Operational Turbines

Globally

- 5046 Operational Turbines

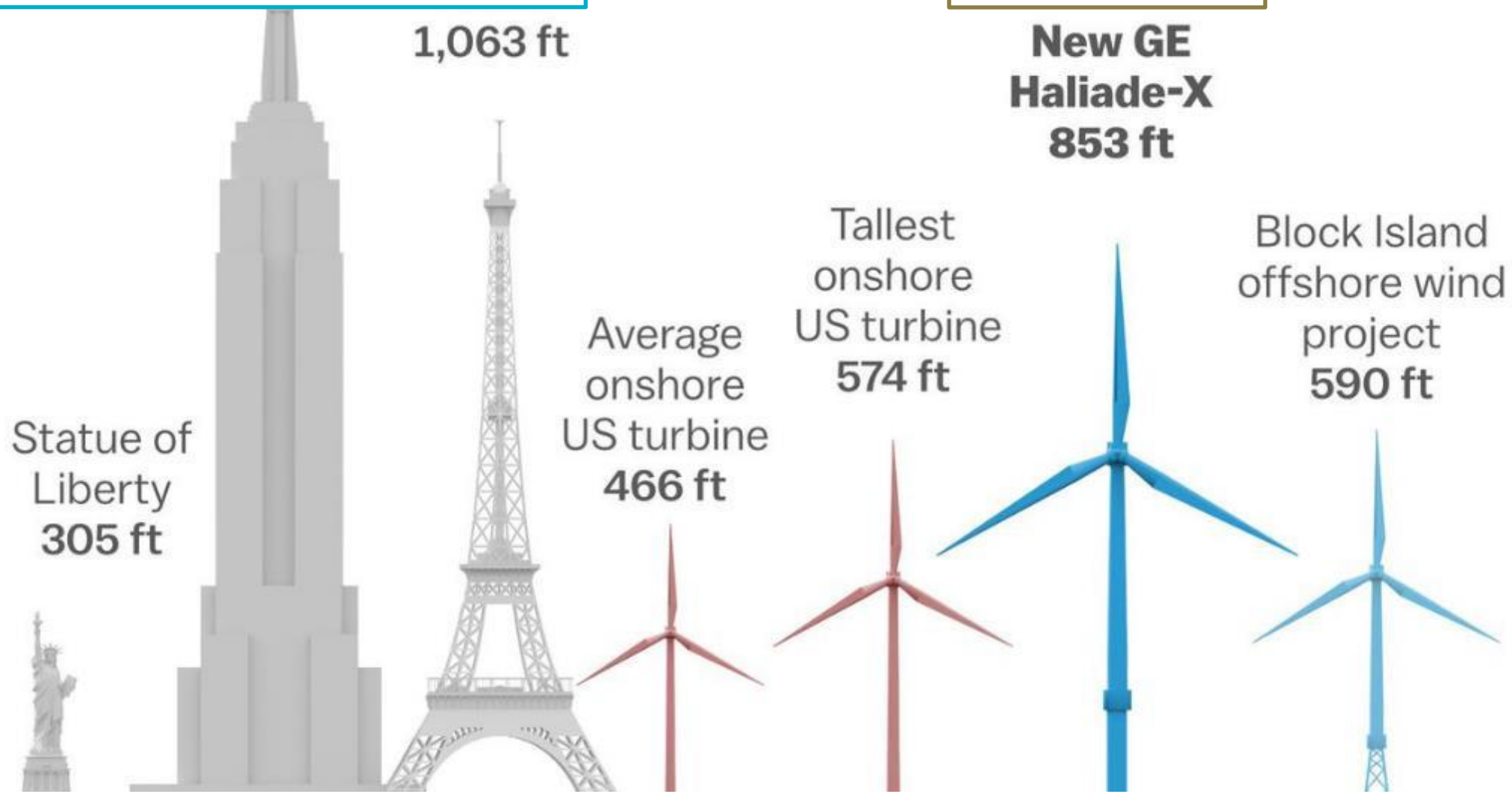
http://electricinsights.co.uk/#/dashboard?_k=q8az3x

Market drivers

Drivers for NDT market: Increasing asset value

12MW in 2025 = £3.3m/yr. (£53/MWh price)
2MW in 2004 = £0.7m/yr. (£140/MWh price)

12MW = £9k /day
2MW = £2k /day



Less is more: Wind farms growing with fewer turbines

175 turbines 630MW

London Array

87 Turbines 659MW

Walney Extension

Competitive CfD Auction process drives cost reduction

The cost of failure

12MW = £9k/day

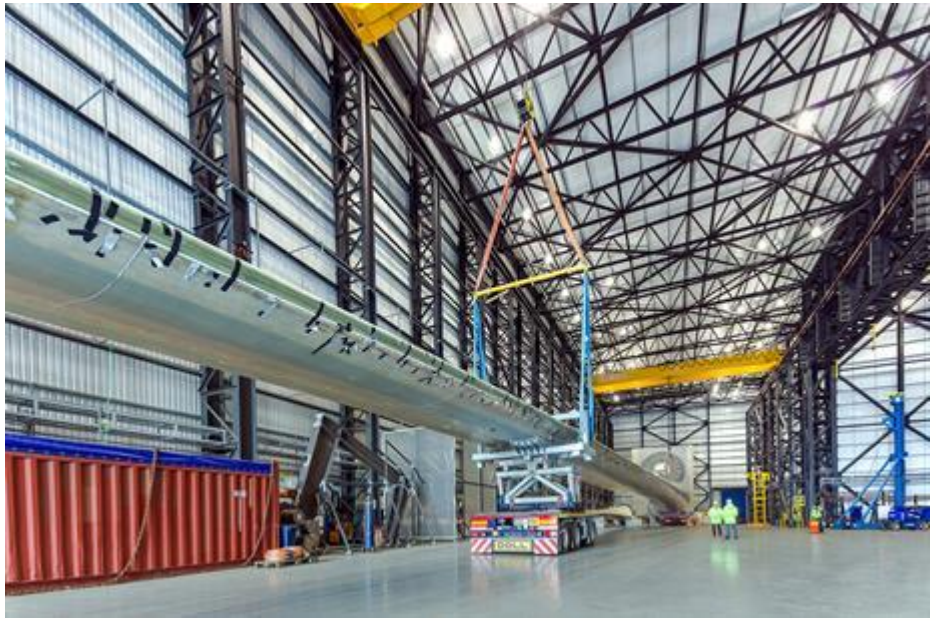
Large Jackup vessel = £1-200k/day

Weather delay = ?

Replacement blade= 350-400k

Mobilisation = ?

Reducing operational cost through predictive maintenance



- Reliability testing
- Condition monitoring (NDT)
- Analytics
- Predictive maintenance
- Scheduled pre planned maintenance

Life extension & Repowering

- 25 Year Design Life
- Consenting as lengthy and risky process
- £80m to get project ready for CfD bid
- Increase output of existing fleet?
- Moving beyond 25?

Case Study: iFROG

Develop a robotic NDT inspection platform to support maintenance of offshore wind turbine foundations

ORE Catapult role:

- Industry requirements
- Testing and validation
- Commercialisation strategy

Innovate UK

InnoTecUK™ Innovative Technology & Science Ltd

CATAPULT Offshore Renewable Energy

Brunel University London

BIC

TWI

Case Study: Bladebug

Multi use robotic platform for wind turbine blade inspection

- Increase operational window
- Reduce rope access requirement
- Enhanced data to support maintenance strategy

Innovate UK

CATAPULT Offshore Renewable Energy

OWIX: Offshore Wind Innovation Exchange

Picking winners in a complex landscape

Innovate UK family

OWiX is delivered by the KTN and ORE Catapult

OWiX competition introduction

Requirements that OWiX fulfills

Offshore wind technical issues

OEMs and utility companies have:

- Confidential engineering challenges to solve with no time to explore markets
- Low exposure to companies outside the offshore wind supply chain

A platform for solving industry challenges

Technical solutions from other sectors

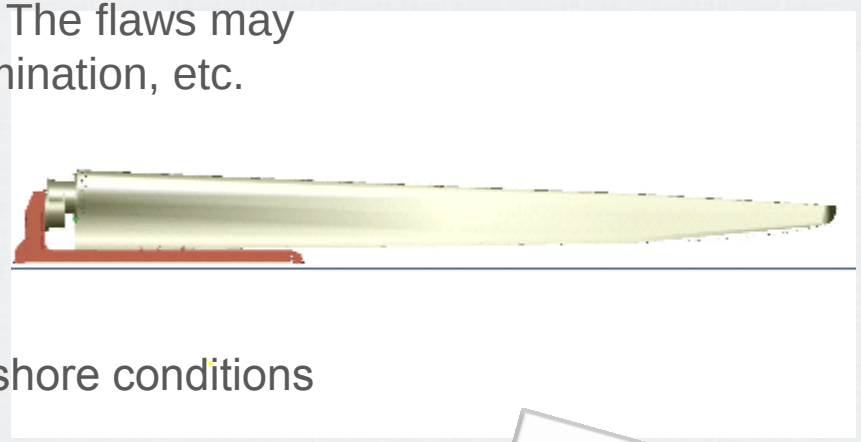
Solution providers find it difficult to:

- Find the right person within a target customer's organisation
- Prove the value proposition of products
- Understand customer's time constraints

Example challenge

Challenge: “Subsurface structural inspection of large composite wind turbine blades”

- Solution should be capable of detecting a minimum physical flaw/defect of 10mm at a resolution of +/- 5mm, ideally to the depth of 5cm. The flaws may include a surface/subsurface crack, voids, de- bonding, delamination, etc.
  - The priority is to identify sub-surface defects
  - Validation of solution: within 1 year
  - Field trials: within 1-2 years
  - Commercial implementation: within 3 years



• Solutions must be able to be operated safely and reliably in offshore conditions with:
  - Wind speeds of 8m/s, with gusts of up to 25m/s
  - An ambient temperature 0-40 C
  - Heights of 100-200m from sea level
  - Distances up to 25km from shore, ideally up to 40km
- New solutions must offer faster inspection rate at a lower overall cost. Current industry practice is capable of inspecting three blades per day at an estimated cost of £6,000.
- An ideal solution should aim to achieve a 50% overall improvement on cost and time of inspection.

NDT Challenges so far

Wind

- Inspection of the blades in the factory to ensure quality manufacture including no wrinkles or sharp edged voids.
  - Drones
  - Robots
    - X Ray back scatter
    - Ultrasound
    - Microwave
    - Light systems

OWiX results in numbers

How the competition performed

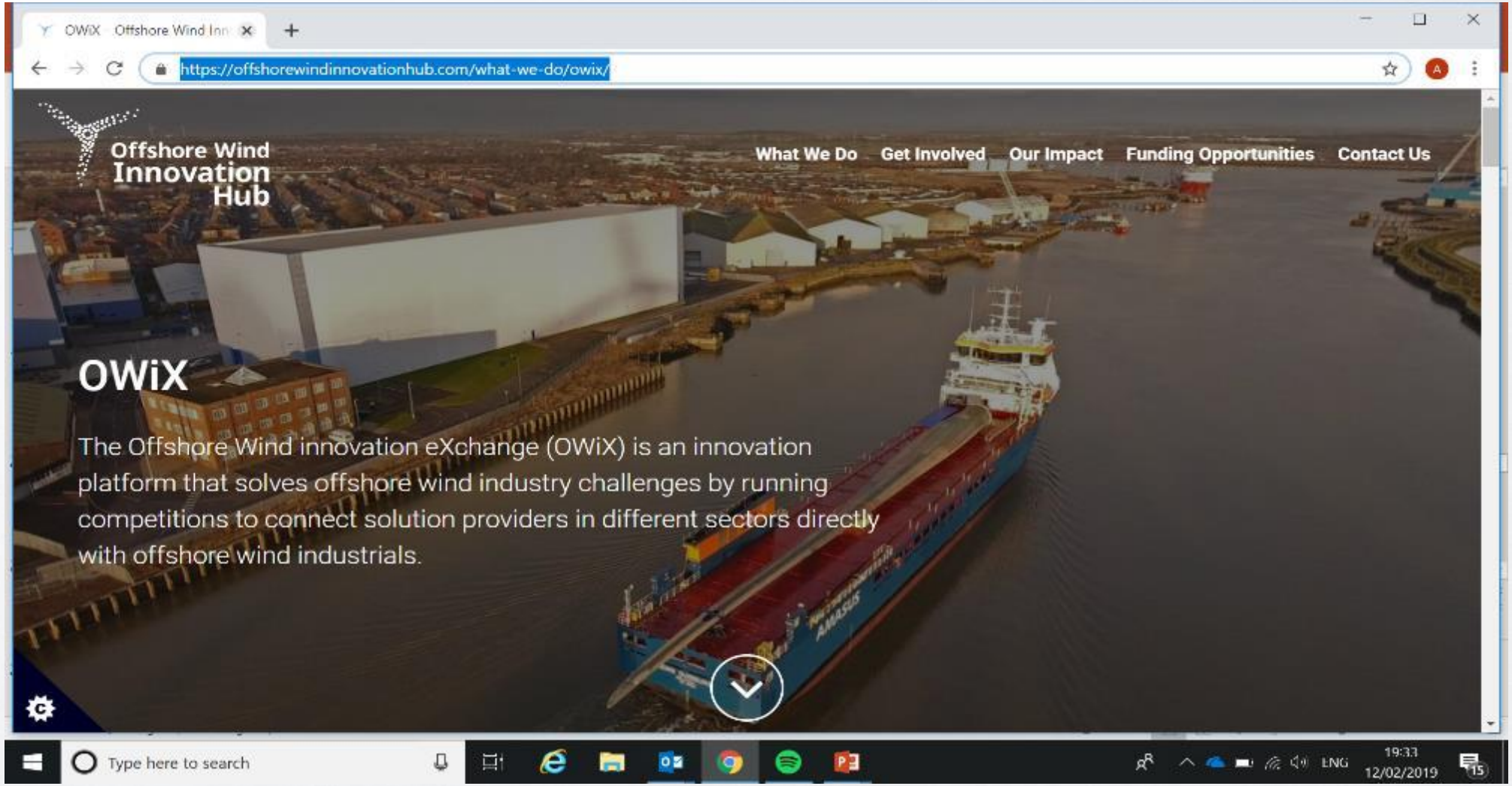
69
applications across seven challenges in two competitions

20
Previously unseen UK companies were given the opportunity to pitch their idea

6
live demonstration projects with an OEM and a utility company

4
Commercial contracts are in place between a turbine OEM and OWiX winners

Finding the challenges



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