



Opportunities for the Aerospace, Defence and Marine industry in offshore renewables

Zoe Barnes 6/10/11

About BVG Associates

- BVG Associates is a technical consultancy with expertise in wind and marine energy technologies.
- The team has very strong independent knowledge of the supply chain and market for wind turbines in the UK.
- BVG Associates has over 120 man years experience in the wind industry, many of these being “hands on” with wind turbine manufacturers, leading RD&D, purchasing and production departments.

Zoe Barnes

- Over nine years experience in wind turbine technology, manufacture and development
- Lead our activities in Scotland, where I am based
- Specialises in technology development, commercialisation and technology transfer
- Led Vestas team managing collaborative research, building a strong global network of relationships in the renewables industry and in parallel sectors such as aerospace

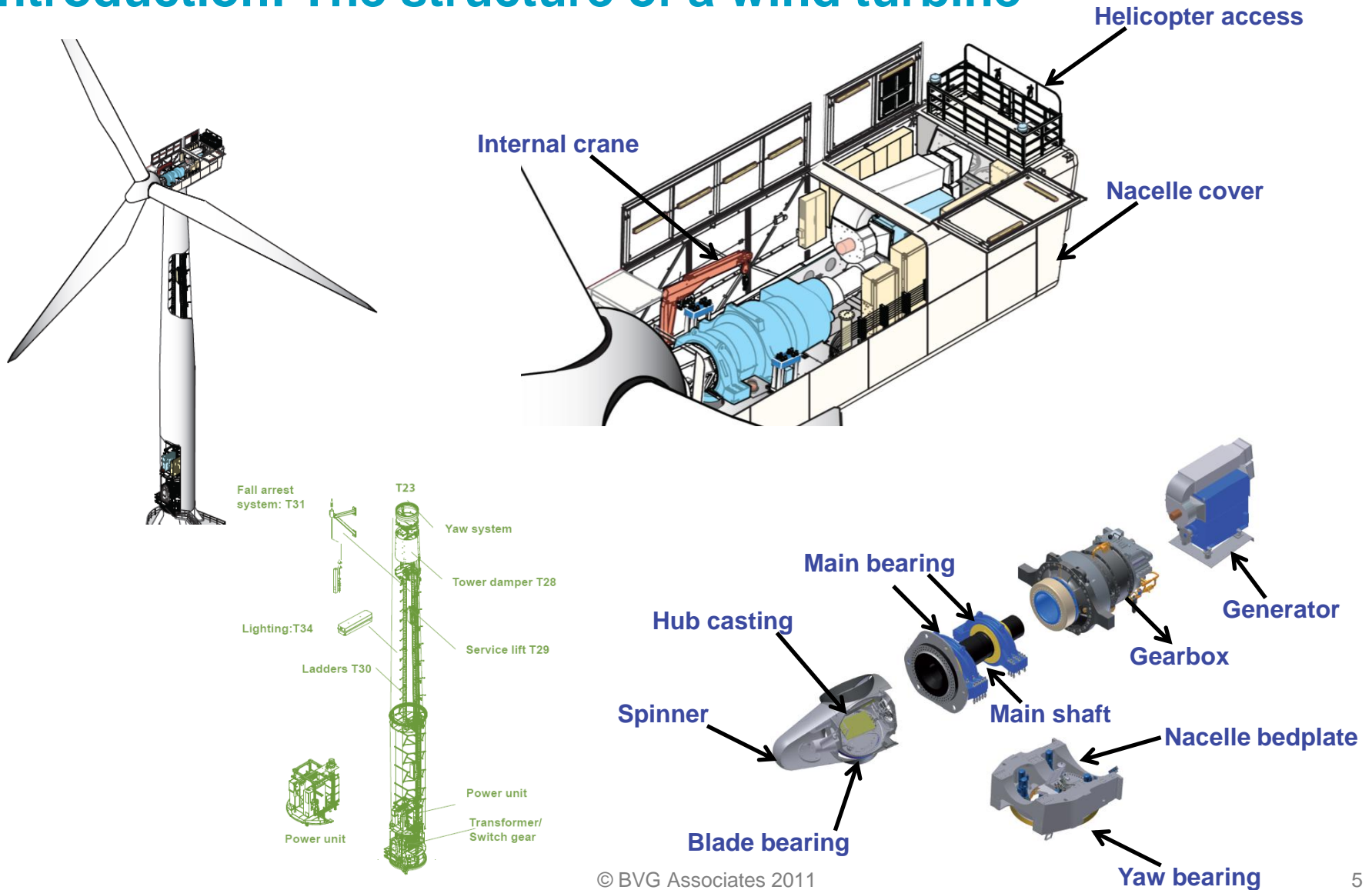


Aim: To give an overview of the UK offshore renewables market and cross-over opportunities for the AD&M markets.

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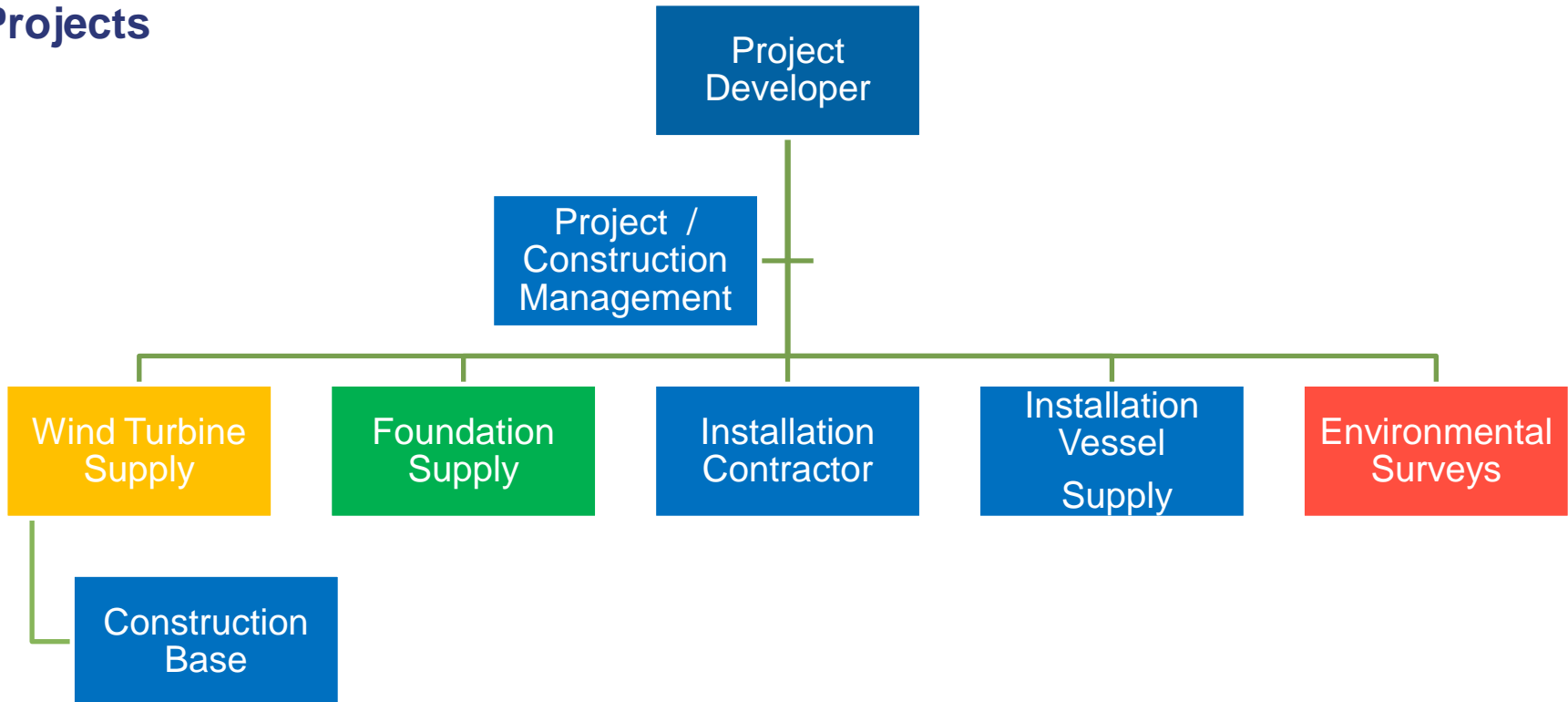
- **Introduction to offshore wind/renewables**
- **Scale of opportunities: The UK market**
- **Location of opportunities: Potentially suitable ports**
- **Scottish government support**
- **Opportunities for AD&M**
- **Barriers to entry**
- **Tips for approaching wind turbine manufactures and developers**

Introduction: The structure of a wind turbine

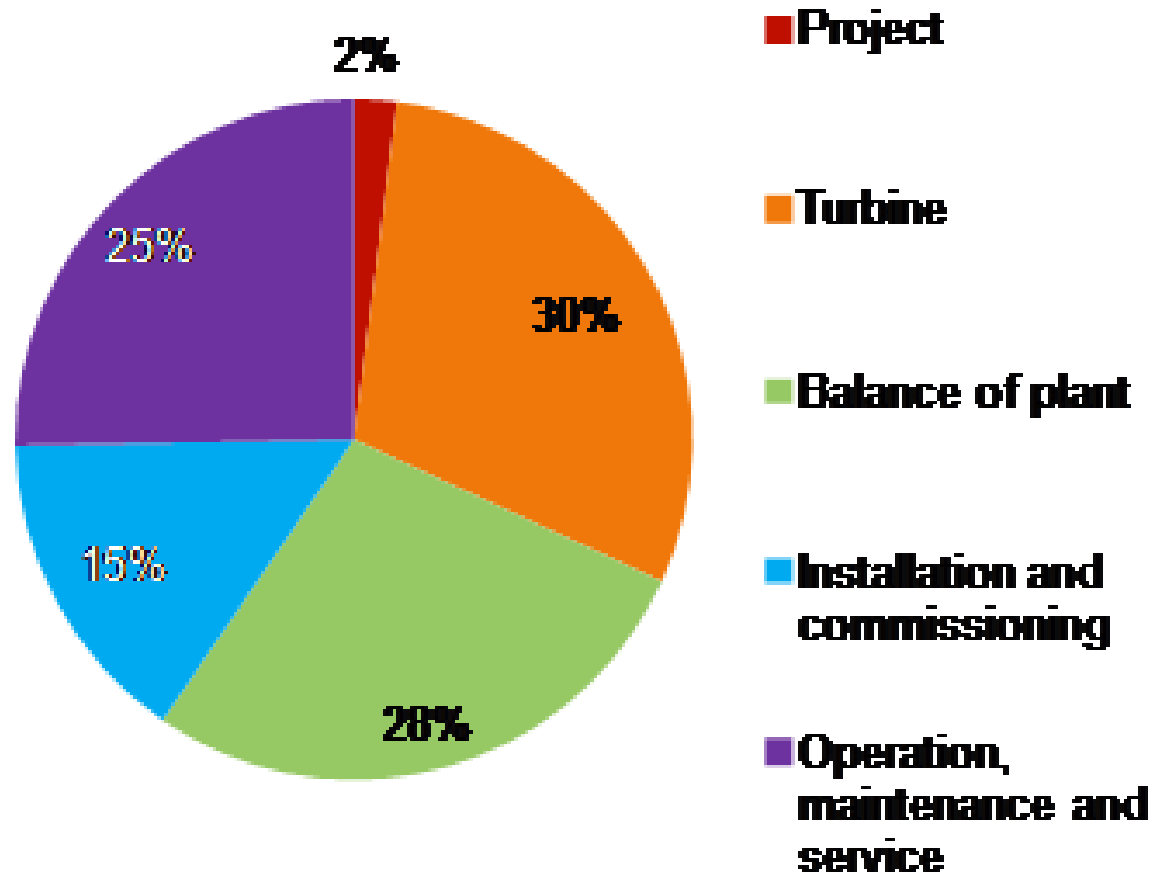


Introduction: Market Structure

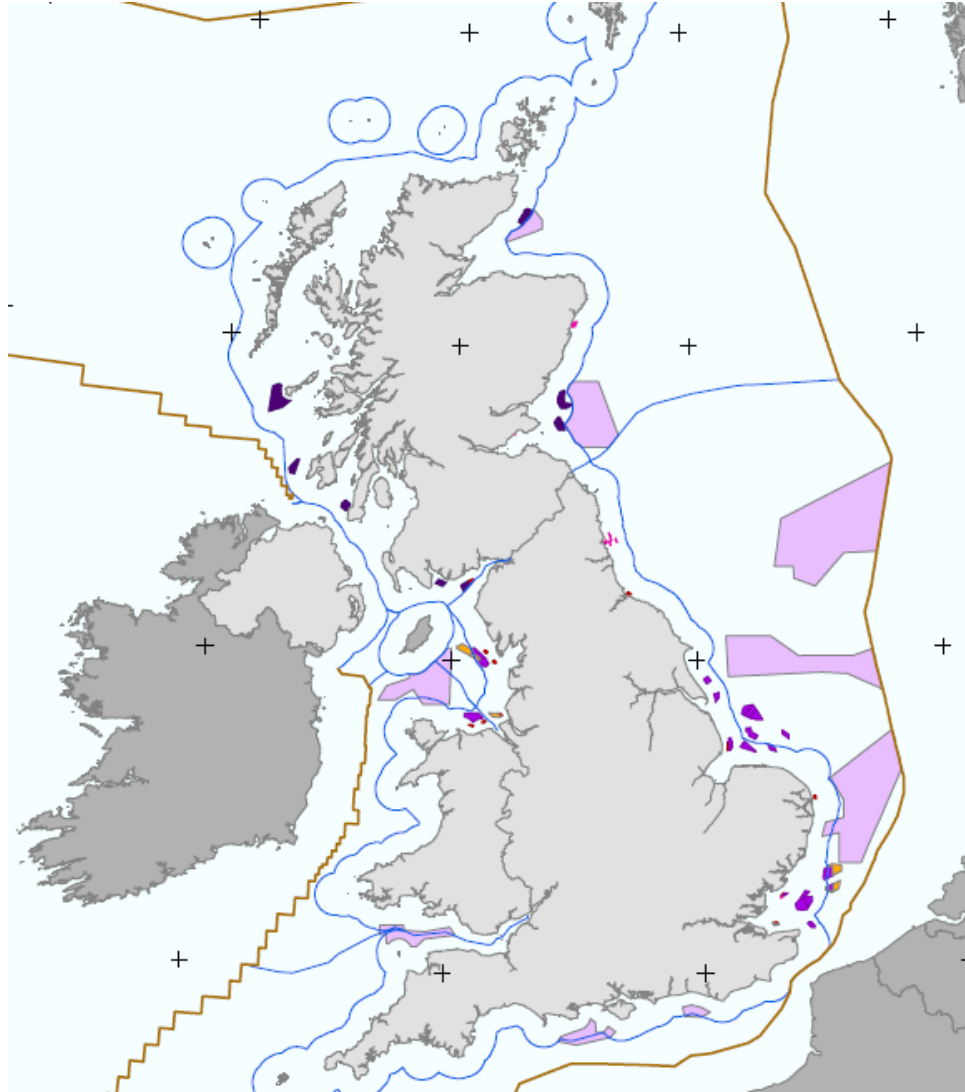
Projects



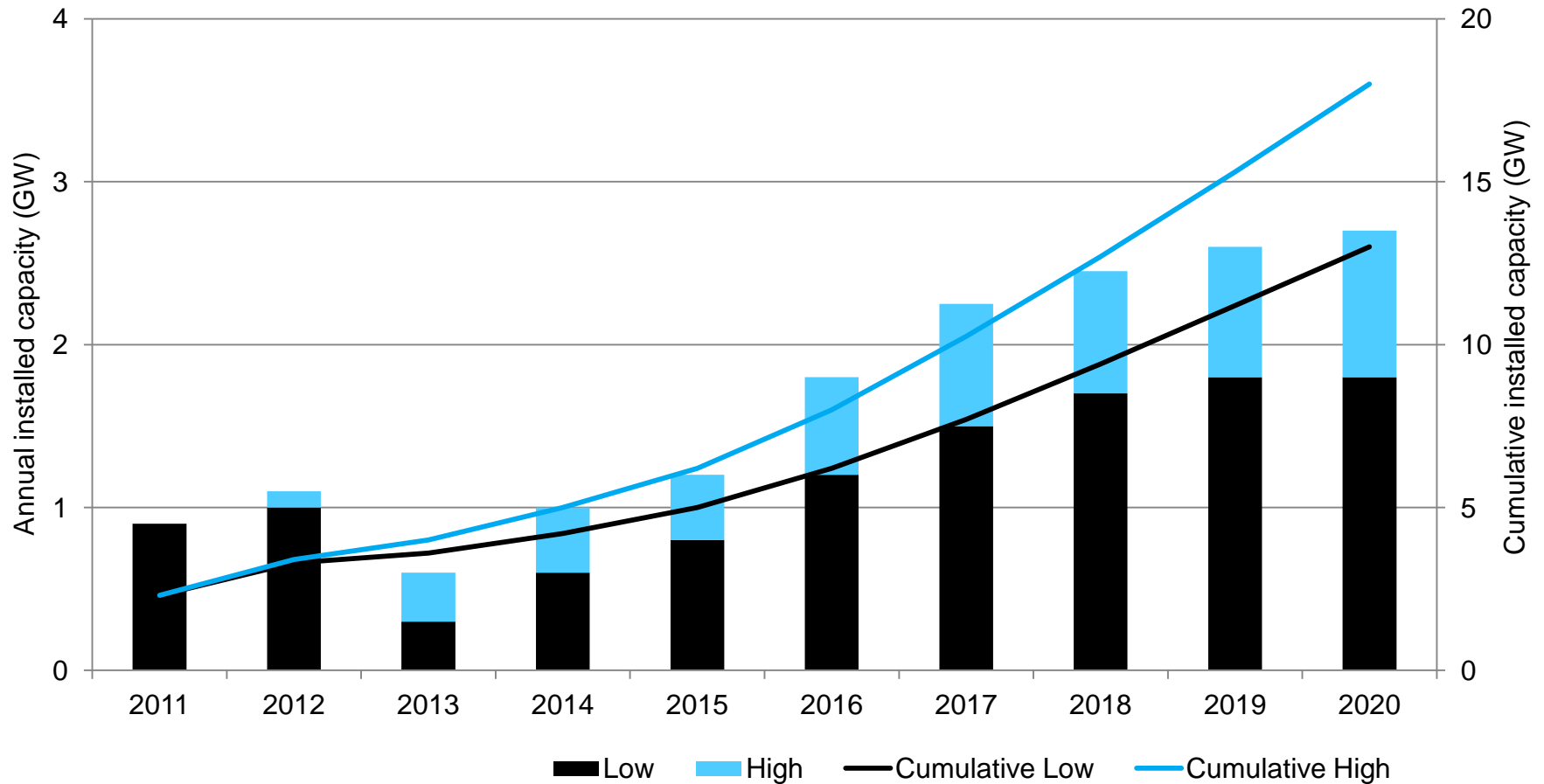
Introduction: The offshore wind farm lifetime costs



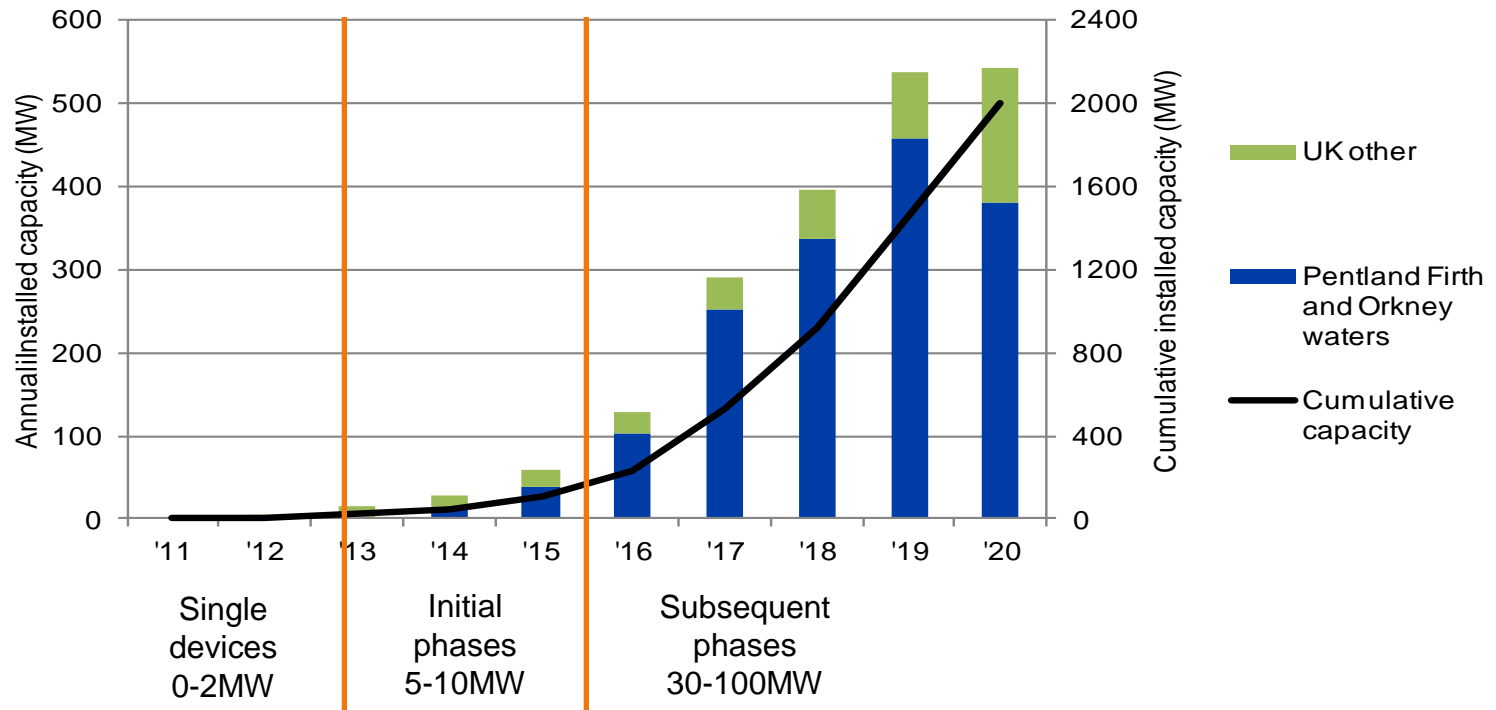
Scale of opportunities: The UK market



Scale of opportunities: Predications for UK offshore wind to 2020

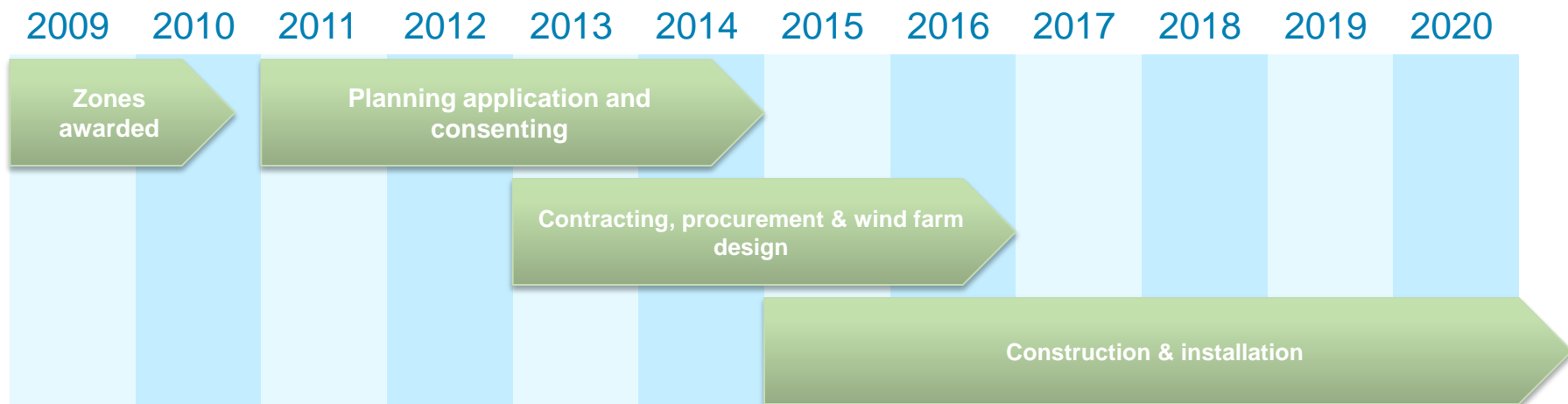


Wave and tidal forecast



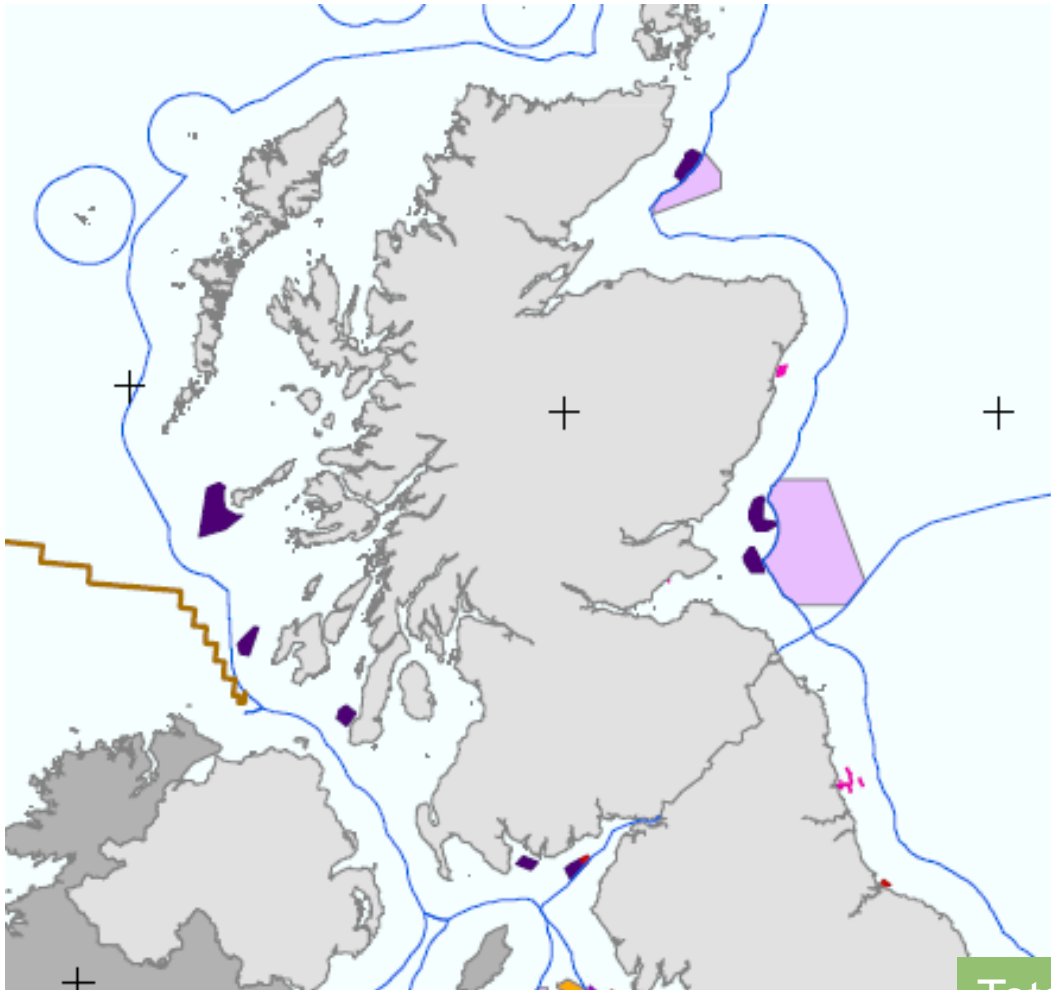
- Forecast assumes full build of Pentland Firth and Orkney waters by 2020
- To 2016 other significant projects include other Scottish leases in Western Isles and Shetland Isles
- Beyond 2016 it is assumed that new commercial leases begin construction in Scotland, Wales and Ireland

Scale of opportunities: Estimated timeline for UK projects (Round 3 Phase 1 and STW Phase 1)



- Most projects will be phased
- Some projects may be stalled by developers

Scale of opportunities: Scottish Market



Name	
Islay	690 MW
Argyll Array	1800 MW
Beatrice	920 MW
Inch Cape	1000 MW
Neart na Gaoith	420 MW
Firth of Forth	3500 MW
Moray Firth	1400MW
Solway Firth	300 MW
Wigtown Bay	280 MW
Kintyre	378
Forth Array	450 MW

Total still in process – 9.7 GW

Source: Crown Estate

Scale of Opportunities: Scenarios for economic benefit in Scotland by 2020

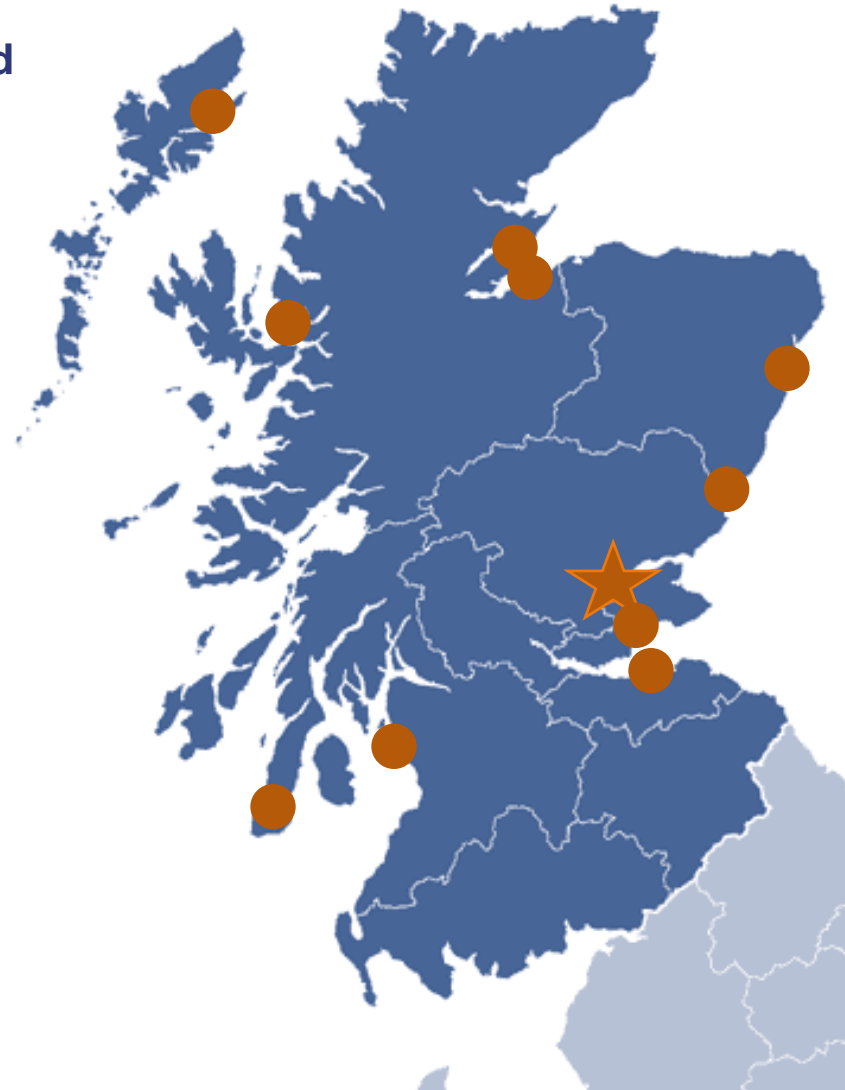
Scenarios		Economic value	Jobs created
A	Energy, economic benefit & export	£7.1bn	28000
B	Energy & economic benefit	£4.5bn	19000
C	Low delivery energy & economic benefit	£1.6bn	6000
D	Low delivery of energy only	0	0

Source: Scotland's Offshore Wind Route Map: Developing Scotland's Offshore Wind Industry to 2020

Location of opportunities: Potentially suitable ports

Offshore wind is likely to cluster around port sites as will act manufacturing, installation and O&M hubs

Site
Leith
Dundee
Nigg
Energy Park Fife at Methil
Aberdeen
Hunterston
Arnish
Campbeltown/ Machrihanish
Ardersier
Peterhead
Kishorn



Some mechanisms available to support diversification into offshore wind in Scotland

Support Mechanism	Target development area
Offshore Wind Expert Support Programme	Provides 2 days support to companies to explore opportunities in offshore wind
The National Renewables Infrastructure fund	Funding for port and infrastructure development
International Renewable Energy Zone	Location where companies can access research and skills needed to commercialise new technologies
Scottish Energy Laboratory	Network of accessible prototype and test facilities
Scottish Supply Chain Database	Lists companies with relevant competencies and products
Low Carbon Skills Fund	Provides sector specific training for companies
POWERS	Support for development of prototyping for offshore wind
Regional Selective Assistance	Grants for safe guarding or generating jobs in Scotland

Opportunities for AD&M in offshore wind

Opportunities for AD&M: Introduction

- **The wind industry is looking to other sectors to provide technology and supply chain solutions**
- **Opportunities in consenting, tech transfer, supply, manufacturing and O&M**



Source: The Boeing Company

Opportunity: Wind farm development and consenting support

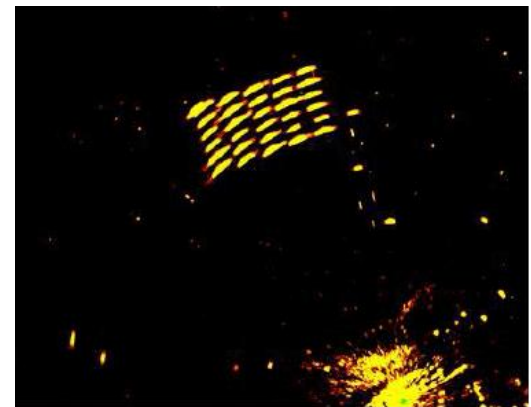
- **Provision of services and products for logistics and transport**
 - Site access products
 - Service or products for the transport of large objects
 - Logistic management tools and services
- **Provision of site assessment services**
 - Radar impact
 - Terrain
 - Resource

Example: BAE Systems: Radar impact assessment

BAE Systems has for a number of years offered a service to wind farm developers whereby they predict the effect of a proposed wind farm on civil marine and military radar.

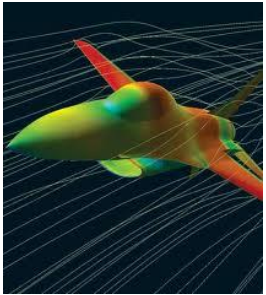


Source: The Boeing Company



Source: Department of Transport

Opportunity: Technology transfer and supply: Shared challenges



Aerodynamics



Composites



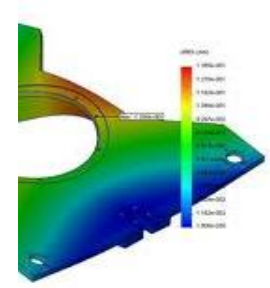
Smart Grids



Energy Storage



Reliability



Design Tools



Lightning



Stealth



Manufacturing



Controls



Condition Monitoring



Testing

Opportunity: Technology transfer and supply - Methods

- **Transfer of knowledge from aerospace to offshore wind:**
 - Externally funded collaborative projects
 - Technical consultancy
 - IP licensing
 - Component supply
 - Provision on testing facilities and services
 - Provision of design tools
- **Collaborative technology development:**
 - Membership of laboratories (ORETIC)
 - Secondments
 - Co-funded internal R&D projects
 - Co-funding of academic research

Opportunity: Technology transfer and supply - Examples

QinetiQ/Vestas TSB Stealth Turbine Program

- Project applied aerospace stealth materials to wind turbine blades and towers
- Costs of project split between QinetiQ/TSB/Vestas
- Collaborative development
- Patents shared
- Stealth material patents licensed to Vestas from QinetiQ

Boeing/Vestas Strategic Partnership

- Signed MOU
- Range of collaboration:
 - Secondments/workshops
 - Co-support of academics
 - Business development opportunities
 - Sharing test data
 - Co-development of tools
- Areas include:
 - Manufacturing
 - Aerodynamics
 - Systems integration

Opportunity: Supply of turbine components and subsystems

There is opportunity for supply of a significant number of components and subsystems including:

- **Composites:**
 - Materials
 - Subcomponents
 - Components
- **Power electronics**
 - Electrical and mechanical control systems
 - Grid integration systems
- **Asset monitoring and protection systems**
 - Condition monitoring
 - Radar impact reduction systems
 - Lightning
 - Smart coatings

Examples:

Moog Insensys

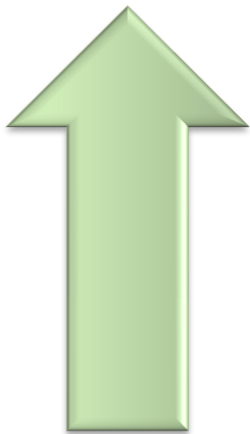
Supply condition monitoring systems to the offshore wind industry and have product development projects with some wind turbine manufactures.

EADS

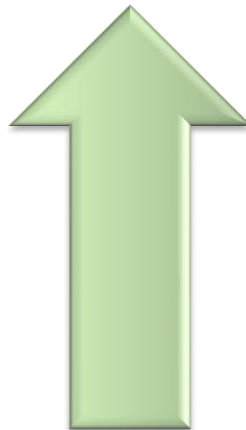
Developing blade manufacturing factory using internal composite expertise.

Opportunity: Manufacturing support

Challenges in common



**Speed and
volume of
production**



**Size of
component
including
composites**



**Quality and
reliability**

Opportunity: Manufacturing support

- Supply of tooling
- Provision of service for optimisation of manufacturing (e.g. LEAN, factory layout)
- Supply of quality assurance processes
- Supply chain development and optimisation
- Co-support of development skills base



Source: M. Torres

Example: **M. Torres**

Composite tooling supply company. Primary market is aerospace but have diversified to become one of the leading suppliers to the wind blade market.

Opportunity: O&M support and asset management

Development and provision of asset management products:

- SCADA systems
- Data management systems
- Condition monitoring systems

Provision of maintenance tools:

- Maintenance management software
- Maintenance engineer tools
- Access systems
- Maintenance vessels

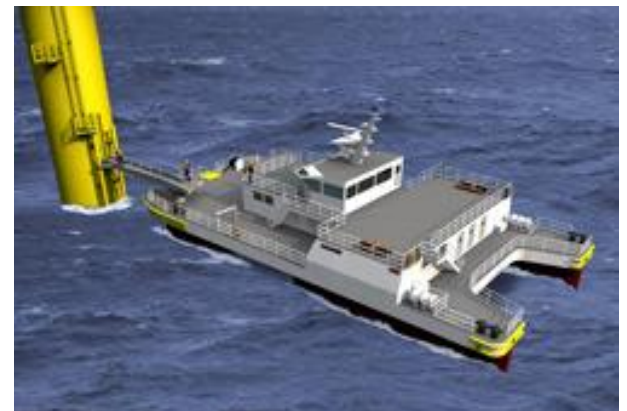
Provision of maintenance services

- Maintenance teams
- Port sites
- Spare parts logistic support
- Refurbishment

Example:

Lockheed Martin

Recently commended for their designs of vessel access systems for offshore wind during the Carbon Trust accelerator program.



Barriers to entry

- Wind industry expects an annual decrease in capital and O&M cost
- Wind turbine manufacturing philosophy is moving closer to that of the automotive sector
- Much lower margins
- Wind industry perception of aerospace & defence sectors
- Building up a track record
- Integrating new technologies into road maps



Tips for approaching wind turbine manufactures and developers

- **Reliability is one of your key selling points, play it up but balance it with an understanding of cost drivers**
- **Be able to explain how any proposal or product directly affects cost of energy generated over a wind farm lifetime**
- **Collaborate with potential customers to ensure you understand and can meet industry demands**
- **If looking to collaborate, bring in external funding**
- **Be able to demonstrate a global mindset**
- **Have a definite offering or proposal when you approach them**
- **Don't underestimate the cultural and cost driver differences between the two industries**

Thank you

Note:

Zoe Barnes (BVG Associates)

Paul Gardener (Garrad Hassan)

John Bambrough (Optimat) and

Heather Quigley (SE Offshore Renewables Expert Support Programme Manager)

will be around at lunch to answer questions.

zhb@bvgassociates.co.uk



Scottish Enterprise Offshore Renewables Expert Support

Zoe Barnes 6/10/11

Objective of support

- **Product is designed to help companies consider and build diversification strategies to enable them to win business in the Offshore Renewables sector**
- **Product will provide up to 2 days worth (100% funded) of one-to-one support**
- **This support will be delivered by specialist suppliers who have knowledge and experience of the Offshore Renewables sector**
- **Focus on identifying and exploring potential profitable revenue streams for the business in the future**

Experience so far

- 12 very variable companies

- Companies

Small metal
working shops,
local harbours



Large multinational
aerospace
companies

- Market readiness

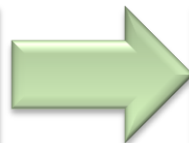
Minimal offshore
wind knowledge



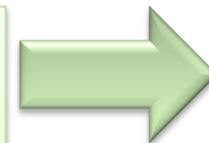
Existing offshore
wind revenue
stream

- Requirements from scheme

Basic introduction
to offshore wind
industry



Overviews of
specific areas of
the market



Product specific
market analysis

Example: Scottish Aerospace Company

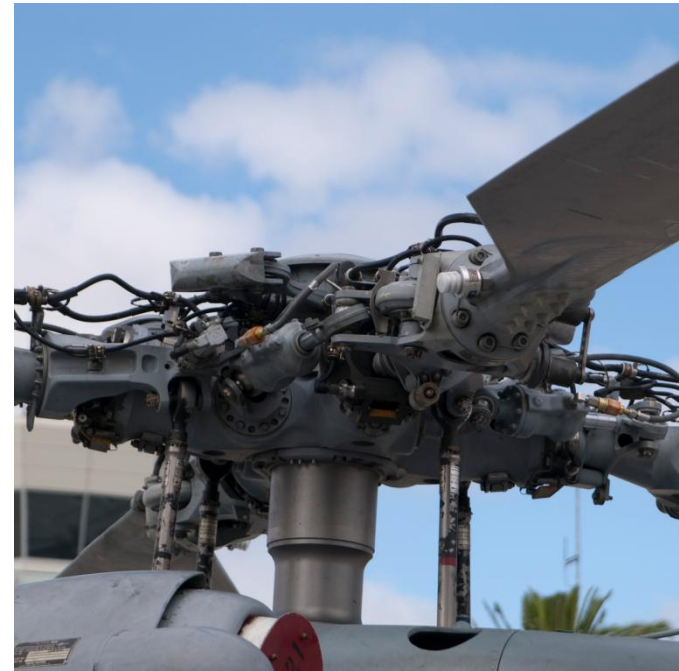
Who?: A provider of maintenance, repair and overhaul services

Initial Approach: Required an overview of the wind industry and the refurb market for offshore wind

Refined requirements: After an initial call, focused it down on gearboxes for the sake of the 2 days support

Work: Developed and delivered presentation for internal use on the size of the offshore wind market and the specific opportunities for refurbishment of gearboxes offshore

Following on: Review of the refurb market for hydraulic systems by BVG Associates partially supported by Scottish Enterprise



Source: Freeimageslive.co.uk

How to apply

- **Application Form on SE Website**
<http://www.scottish-enterprise.com/your-sector/energy/offshore-wind/opportunities-for-business.aspx>
- **Send completed application to offshorewind@scotent.co.uk**
- **For further information contact:**
 - **Heather Quigley, Project Manager**
 - **01698 742095**
 - **heather.quigley@scotent.co.uk**