Where did '*The Saudi Arabia of Renewables*' story go wrong?

Realistic offshore wind opportunities for Scottish companies

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Agenda

Scotland and Offshore Wind

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Selected clients

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Business advisory

- 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

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1. Scotland – *'The Saudi Arabia of Renewables'*

A case of exuberant optimism ?

- The unfortunate tagline was coined by Alex Salmond in 2011.

  metaphor: (i) net exporter *'the Sassenachs wont take oor Scottish tenners but they'll take oor green energy….'*

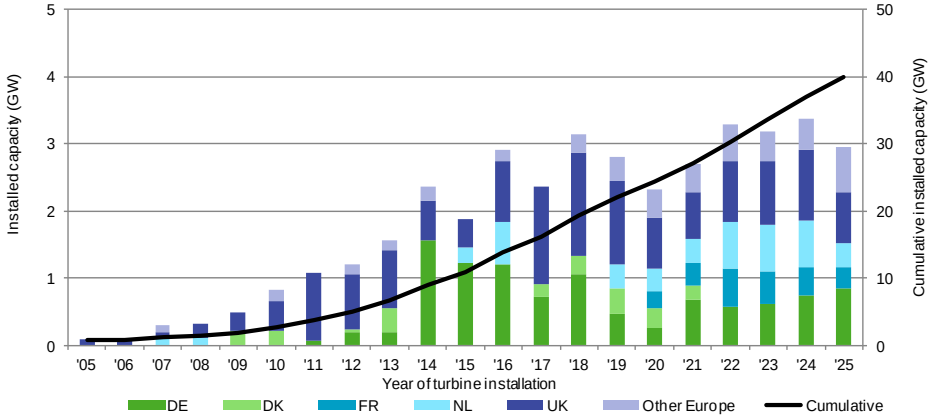
  (ii) small country with huge untapped resource potential

- Renewables industry was extolling the 'green oil' boom awaiting us
  - Scottish Renewables (2010): 30,000 Scottish FTE in offshore wind by 2015 / 49,000 FTE by 2020
  - Reality is around 2,000 – 3,000 (2015) ~ *we Scots have history of recovering from over exuberant optimism*
- Scotland performing well on renewables compared to the rest of the UK
  - 87% of household electricity from renewable energy by 2020 (target 100%)
  - Renewables employees 21,000 people, generates £1bn capital investment, has displaced carbon emissions equivalent to the entire transport sector
  - 70% of Scots are in favour of more renewable energy following the 2016 election
  - 2014 - Renewables #1 (38% Scottish electricity demand) nuclear (33%), fossil (28%)
  - Scottish wind turbines supplied 131% of Scottish household electricity (Nov 15)
- *Onshore wind is virtually cheapest form of new capacity generation*
  - *Scotland will look after itself, Conservatives happy for Scotland not England to push on*

2. European Offshore Wind 2005 to 2025

Offshore wind – *Scotland has the best clobber but we are on the outside of the party looking in*

- UK continues to be most consistent, growing market since 2003.
- UK nearing the end of a 3-year slow-down between 2014 and 2016, transition to new ‘strike price’ mechanism. Dip towards 2020 down to new Government and ‘1 lost CfD year’
- UK and Germany make up 2/3 of the cumulative forecast EU market by the end of 2025
- Deployment in France expected to begin at volume from 2020, Netherlands ramp-up expected after 2021
- Denmark and other Europe markets intermittent
- European installed capacity to rise from just under 11GW in 2015 to 40GW in 2025 (total wind farm investment over £100bn)
- With 7700 turbines installed by 2025, each operating for 25 years+, the O&M market is likely to increase tenfold



- All offshore wind markets are subsidised to a roughly similar extent and support is likely to be required until around 2025
- Moving to larger zones (~1GW). In some cases, expected to be phased around 500MW projects.

What next for the UK and Scotland ?

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3. UK near term projects, Scottish strife

Beatrice is the only Scottish project with a 'trouble free' deployment plan

- After almost 1 year delay, CfD2 to 4 schedule announced:
  - £730 million this Parliament (4 years) £730m for up to 4GW of offshore wind and other less established renewables
  - First auction Q3 2016 of £290 million
  - Strike price trajectory defined ~ £105/MWh (in 2011-12 prices), falling to £85/MWh for projects commissioning by 2026 *– 'subsidy free'?*
- 2.3GW Scottish projects with legal challenges (NNG, Inch Cape, Seagreen)
  - *Not enough to go around - Scottish projects disadvantaged by higher CAPEX costs and transmission charges !*
- Strong developer commitment to UK
  - Overseas - Dong & Vattenfall heavily invested in UK, Shell entering NL ?
  - Domestic - SPR (EA1) & SSE u-turn ?
  - *Scottish developers – all or bust*
- Market probably has space for 3 strong WTMs
  - Siemens in Hull, MHI/Vestas IOW, GE ?
  - *Lack of Scottish WTM severely limits CAPEX potential **




Project	Lead developer	Contract type	Project status	* Expected capacity (MW)
Beatrice	SSE	EPC (WTM Siemens)	FID expected H1 2016	588
East Anglia 1	ScottishPower Renewables	EPC (WTM Siemens)	Post-FID	714
Hornsea 1	DONG Energy	Multi-contracting	Post-FID	1,200
Neart na Gaoithe	Mainstream	EPC (WTM Siemens)	Consent approved	448
Moray Firth 1	EDPR	EPC	Consent approved	500
Dogger Bank Creyke Beck	Statoil	Multi-contracting	Consent approved	1300
Triton Knoll	RWE Innogy	Multi-contracting	Consent approved	400
East Anglia 3	ScottishPower Renewables	EPC	Applied for consent	600
Hornsea 2	DONG Energy	Multi-contracting	Applied for consent	1,200
Inch Cape	Repsol	EPC	Consent approved	700
Dogger Bank Teesside	RWE Innogy	Multi-contracting	Consent approved	1200
			Total (MW)	**8,850**

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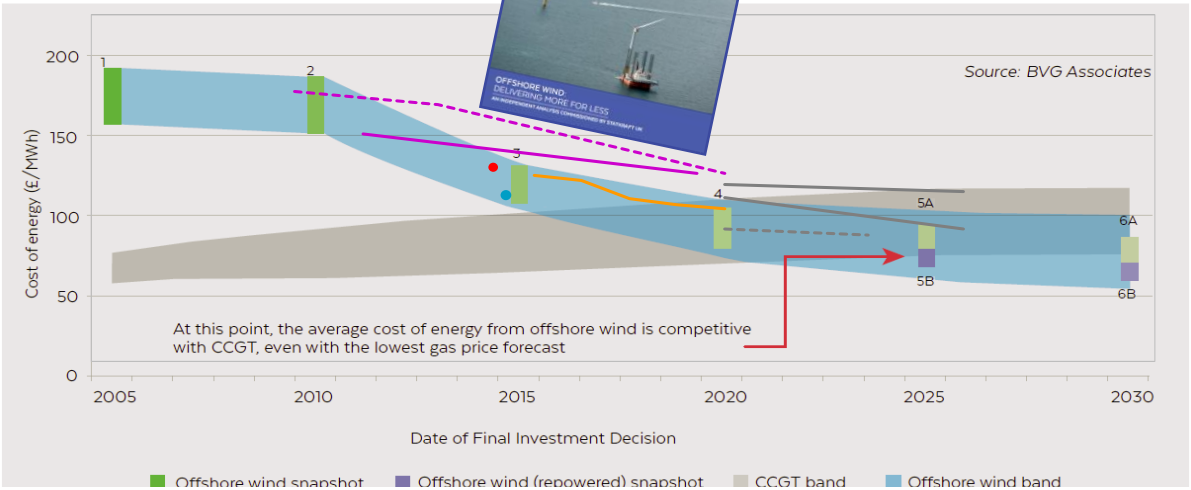
* Capacities are a BVGA scenario only / other projects not listed are possible

4. Journey to ‘subsidy free’

Going slow is not an option…



Race for LCOE brings its own problems for UK suppliers…

- The UK offshore wind industry is on target to meet a £100/MWh goal by 2020 (ORE Catapult / OWPB)
  - All but 1 of 13 cost reduction indicators ahead or on target with 2015 goals
- Mixed messages from Westminster
  - Lower than expected UK content - in face of strong continental competition, how can the UK supply chain compete at £105/MWh, never mind £85/MWh. ?

    “If UK suppliers can’t work effectively and put a competitive offer into bidding they need to take a hard look at themselves…. we are committed to more UK content but not at any price.”
  - On the other hand, the message to developers:

    “In order for the UK to benefit properly from our decision to support new offshore wind, we will require UK content and the UK supply chain to be a key beneficiary of it.“
- All good and well but:
  - Mid-term pipeline required for investors
  - *Do UK suppliers have a level playing field ?*

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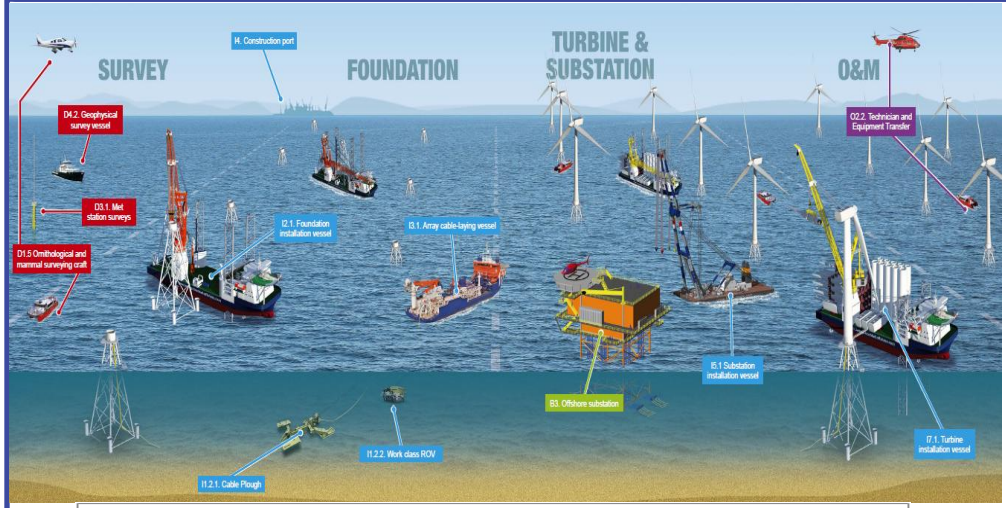
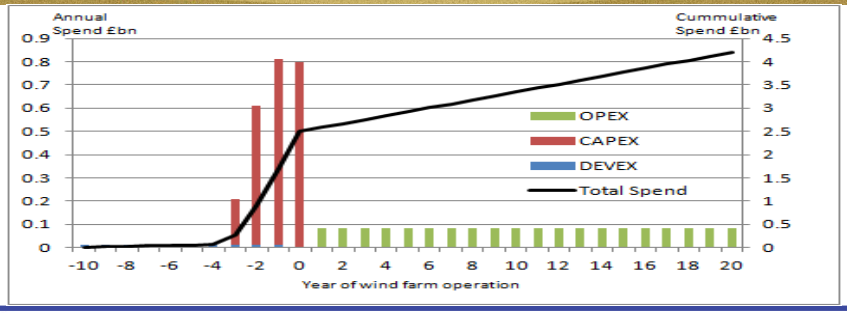
5. Where the money goes…. understanding Scottish opportunities

Scottish CAPEX opportunities limited…. 40% of lifetime spend on OPEX, local supply preferred



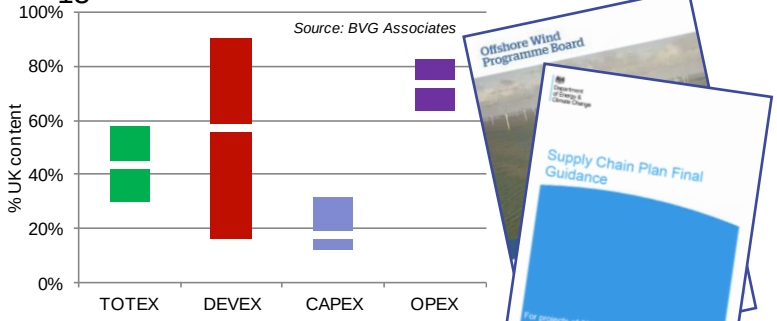


6. Local benefit – key to continued support

Engage with Scottish suppliers that have succeeded in offshore wind….

Disjointed progress

- 10 UK wind farms larger than 100MW, completed 2009-13



	UK content		
	Lower	Upper	Weighted average
TOTEX	30%	57%	43%
DEVEX	16%	90%	57%
CAPEX	12%	32%	18%
OPEX	64%	82%	73%

Supply chain plans

- Supply chain plan "gateway" into the CfD auction process ~ Three criteria: competition, innovation and skills
- Backed up by strong DECC, BIS and UKTI pressure, supply chain plans must be delivered, no UK content beauty contests
  - ➢ All reasonable steps must be taken to help UK suppliers supply UK wind farms at the very least….
- Positives for Scotland:
  - ➢ Institutional investors engaged in Scottish projects
  - ➢ Floating wind – 3.5 ROCs driving Dounraey and EOWC (Statoil, Floating Power Plant, Hexicon)
  - ➢ WTM - 2B Energy (Methil)
  - ➢ Supply chain ~ Towers: Wind Towers Scotland (CS Wind - £14m investment) / Substations: Babcock (Rampion and Hornsea) / Foundations: Global Energy Group (Hywind 2 suction anchors), Bi-Fab (Beatrice ?) / Installation: Seaway Heavy Lift (various wins) / ROVOP (various wins) / Others: Foundocean (grouting), Briggs Marine (cable O&M), Searoc (offshore logistics), Ports: Aberdeen, Dundee and Wick

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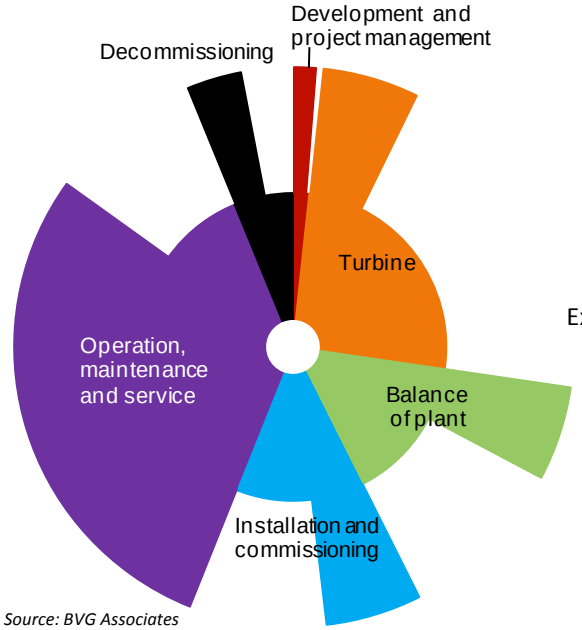
6. Local benefit – key to continued support

We have the largest market, but…

Confidence and market size are key to how far we get



Source: BVG Associates

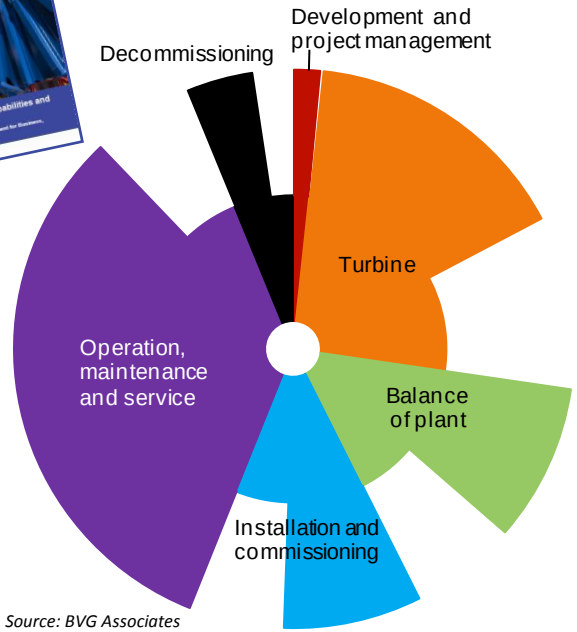
50% UK content – good target for current projects

Nacelle assembly and main component supply

Export cable and increased UK-based foundation supplier success

Increased UK-based supplier success

UK manufacture of replacement components and UK SOV operators



Source: BVG Associates

70% UK content – not in current environment

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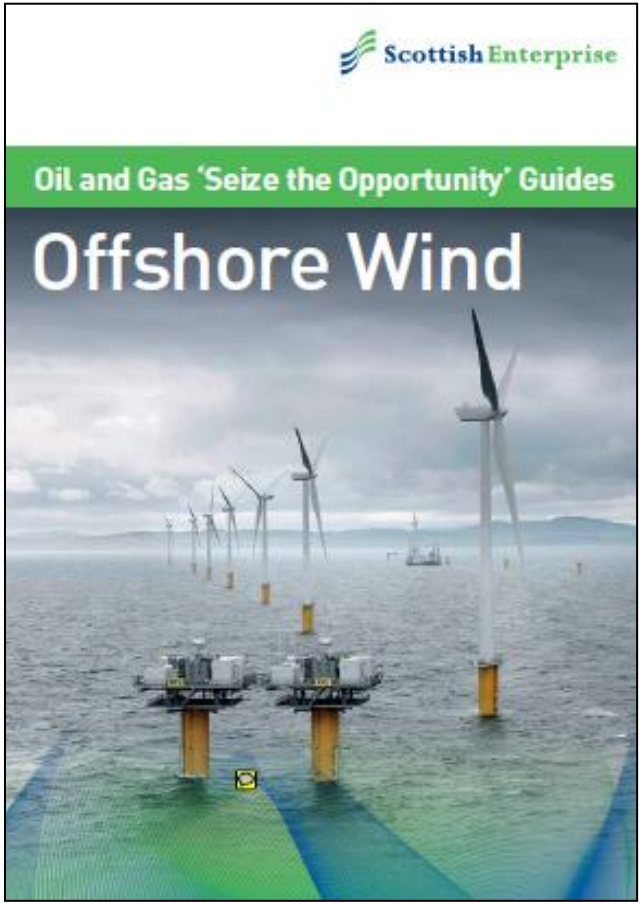
7. Realistic offshore wind opportunities – O&G deep-dive

How to diversify: Oil & Gas deep-dive

Hitting the ‘virtual’ shelves this week….

First analysis in a concerted effort by ‘Team Scotland’ to support our Scottish O&G supply chain find diversification opportunities in these challenging times for the industry….



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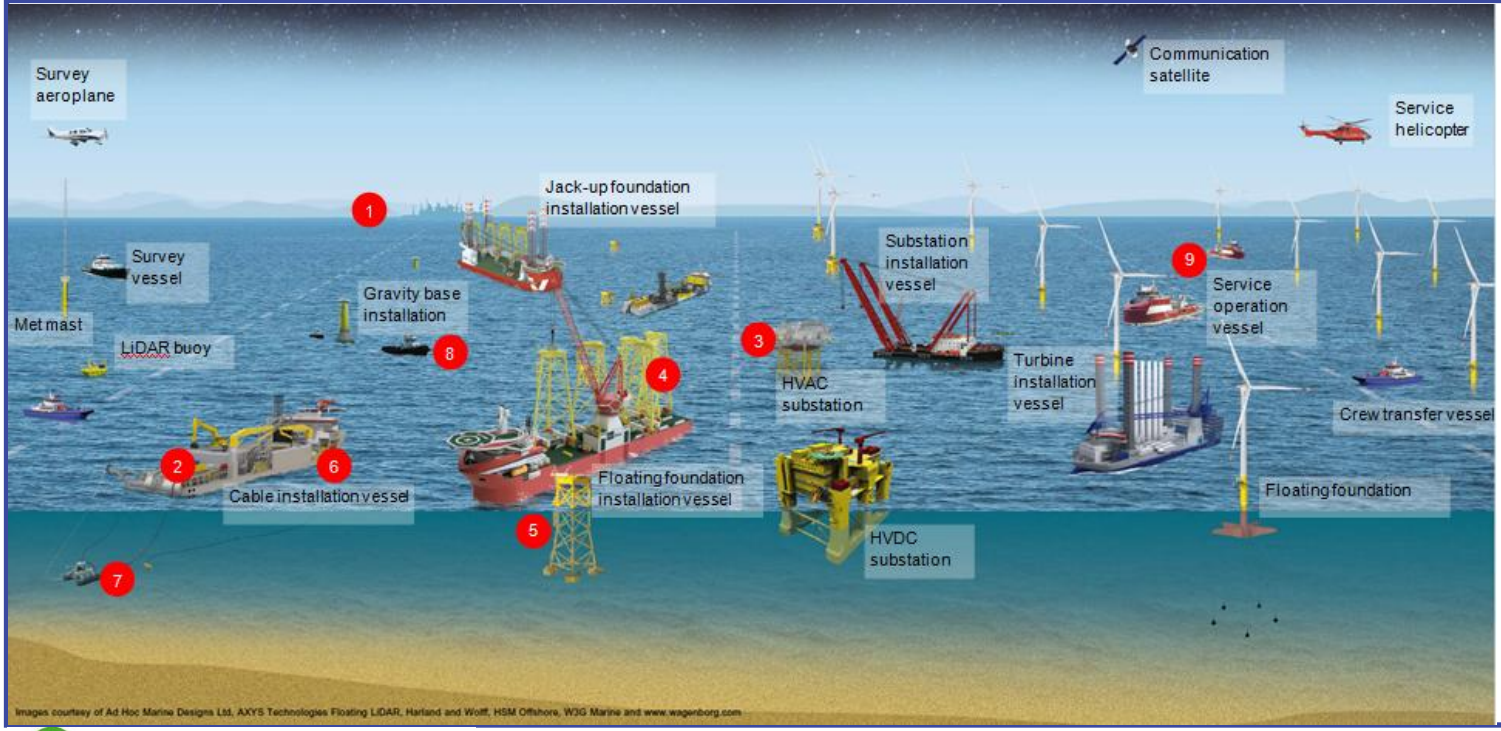
7.1 Offshore wind high potential diversification areas

Supply chain split into 35 sub-element areas of supply – 9 ‘hot spots’

Considers O&G track record in wind, supply synergies, appetite, cost-out potential, investment & size of the prize



1. Project management
2. Array cables
3. Substation structures
4. Turbine foundations
5. Secondary steelwork
6. Cable installation
7. Installation equipment
8. Installation support services
9. Operations, maintenance & inspection services

7.2 Offshore wind high potential diversification areas

£8 billion of high potential annual spend by 2025 up for grabs

A number of traditional UK oil & gas companies have successfully navigated the challenges to entry

1. Project management	Oil and gas companies are already offering skills in managing complex projects offshore. *"There is a realisation of the benefits that offshore oil and gas expertise can bring to the emerging offshore wind sector"*
2. Array cables	Their manufacture requires similar skills and equipment to O&G umbilical manufacture. *"The fact we are able to develop solutions which can be deployed in both sectors allows us to share best practice across industries"*
3. Substations structures	These are typically one-off designs on a similar scale to oil and gas platforms. *"One of SLP's main objectives has been to apply its long experience in designing and building offshore platforms for the oil and gas industry to the offshore wind sector"*
4. Turbine foundations	Fabrication skills from oil and gas can be harnessed to produce serially manufactured structures. *"The growing offshore wind sector can be served in conjunction with the oil and gas sector. We are demonstrating to wind developers that we can manufacture foundation structures in volume"*
5. Secondary steelwork	This is an accessible market for companies without the capacity for foundation manufacture and entry may not need new coastal facilities. *"We have enhanced our automated cutting and profiling services to develop a lean manufacturing plan for competitive volume fabrication for the offshore secondary steel market in particular."*
6. Cable installation	Most experienced contractors have not only oil and gas experience but learnt that the complexity of offshore wind contracts presents significant new challenges. *"If you are a company that can offer high calibre engineering support, you can more than succeed in offshore wind in UK and beyond"*
7. Installation equipment	The transition from oil and gas equipment supply has been made by a significant number of companies, for example in pile and cable handling equipment and trenching and burial tools. *"There is a definite appetite for robust, simple and cost-effective solutions in this new market"*
8. Installation support services	The experience of working offshore can bring real benefits to offshore wind not only in subsea services such as diving and ROV services but also in onshore activities such as marine consultancy. *"The supply chain has to work hard tendering against projects that are not fully financed…. get it right and offshore wind can be a long-term part of a company's strategic vision with excellent global prospects"*
9. Maintenance and inspection services	Oil and gas experience of offshore logistics can shape evolving strategies in wind. *"New market entrants must have a clear idea of what their core competence is and how to articulate their value proposition. Companies must show how they can help customers improve asset efficiency or reduce cost"*

7.3 Facing the diversification challenge

" It's offshore marine Jim but not as we know it…."

Understand core competence, address the supply gaps in offshore wind seeking highest LCOE savings

Differences	Offshore wind market characteristics	Oil and gas market characteristics
Volume and nature of supply	High numerical demand for standardised goods and services	Low numerical demand for bespoke goods and services
Subsidies	Direct price support	Indirect tax credit support
Culture	Innovation at pace in an environment with technical unknowns	Incremental innovation within an established environment
Value	Achieved through intellectual property ownership	Achieved through efficient control of spend and product standardisation
Contracting	Less established processes and adversarial in nature to stimulate cost reduction	Standardised contract header terms with high collaboration across supply chain

Challenges

- Lack of track record
- Risk-averse investors
- Cost competitive ness
- Contracts (Lump sum / fixed price)
- Warranties & Asset uptime linked reward

Mitigations

- Target multiple projects (framework)
- Long-term OPEX focus: high local content
- Floating wind: high O&G structure synergy
- Disruptive innovation / cost competitive
- Understand differences with clear strategy

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8. My ‘Team Scotland’ call to arms


Denmark cancels planned offshore wind farms because of expense

16 MAY 2016

On May 13, the Danish government said it would scrap plans to build five offshore wind farms with a total combined capacity of 350-megawatts as their output would be too expensive for consumers.

AWEA Welcomes Danish-US Offshore Wind MOU

The American Wind Energy Association (AWEA) has hailed progress by American agencies in working with their Scandinavian counterparts to expedite the development of offshore wind in this country.

The leaders of the United States, Denmark, Finland, Iceland, Norway, and Sweden released a joint statement promising leadership in the fight against climate change which included cooperation to finance and deploy clean energy.

A bilateral Memorandum of Understanding (MOU) between the U.S. Bureau of Ocean Energy Management (BOEM) and the government of Denmark to work together to develop more offshore wind power was also released.

Installation of foundations at the 30MW Block Island wind farm off Rhode Island. Photo: Deepwater Wind

How do we harness the power of Scottish wind ?

- Saudi Arabia not feasible – we have 25% of the resource but virtually no control over harnessi
  - Scottish offshore wind will not realise its full potential without some element of energy autonomy or a
  - Scottish Government – with our reservoir of ‘green oil’ available to export and offshore wind not far fro
    back of the couch to help Scottish projects ? how will we sustain our first-mover advantage in floating w
- If we can’t harvest our own back yard, let’s look east….
  - China offshore wind set to explode – 1.3GW to 13GW in the next 10 years
  - Follow the Denmark example ? *SE / SDI very active in Asia*
- With a very small Scottish funded pipeline, we need to be pragmatic about Scottish opportunities
  - DECC monitoring 50% UK content down south, Scottish enablers need to apply *‘stick as well as carrot’*
    Hywind 2 – 3.5 ROCs in return for a largely Norwegian O&G supply chain (Nexans, MacGregor, Subsea7 (Norway)) ?
  - Developers and tier ones must make clear what their shopping list is– Scottish agencies can help prepare the Scottish supply chain
- My questions for the rest:

Westminster

THE UK NEEDS A MID-TERM COMMITMENT: overseas investors wont invest without one so how can we get the jobs ?

Miss Rudd – whilst 4GW is welcome, what happened to your pre-election ‘reset speech’ promising support for 10GW ?

Scottish supply chain

Can you up-skill ? – ‘one stop shop’ value proposition (Seacat – Not just CTVs, procurement support, marine coordination, port logistics, technical expertise)

RSPB

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Thank you

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