The Economic Value of Offshore Wind
Benefits to the UK of Supporting the Industry

Miriam Noonan and Gavin Smart
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Summary

The UK offshore wind industry is going through a period of rapid cost reduction, brought about by innovative technological solutions and underpinned by a growing and maturing industry, together with continued Government support. The UK Government is expecting not just clean energy capacity but also projects that deliver economic benefit to the UK. By looking at the relationships between revenue support and the economic benefits of an active UK supply chain, there is a clear net benefit to the UK from investing in the offshore wind industry, both to serve UK projects as well as bolstering the potential to export skills, products and services to the global market.

Continued cost reduction will ultimately result in lower levels of public financial support being required and this, coupled with increasing amounts of UK content in offshore wind projects, results in even greater returns on investment for the UK Government. It is therefore important that the industry continues to highlight the increased UK gross value added (GVA) of projects as well as cost reduction successes. This forms the basis of a compelling sector deal in line with the UK's current direction for industrial strategy, with industry and Government working together to maximise UK growth and job opportunities and continue the cost reduction journey.

Headlines

- UK offshore wind projects currently being installed and operated have an estimated 32% UK content. By continuing to increase UK content in areas of strength such as blade and tower manufacture, cable supply and operations and maintenance (O&M), and developing strengths in other areas, including installation and foundation manufacture, it is projected that up to 65% UK content could be possible by 2030, given the deployment of 19GW+ installed capacity. Successfully developing capability in these areas will open up further export opportunities for the UK in a European market worth an estimated £9.2bn per year by 2030.

- The gross value added (GVA) to the UK per GW installed, given 32% UK content, is currently £1.8bn and is estimated to increase to £2.9bn by 2030 – if 65% UK content can be achieved.

- Supporting UK offshore wind is cost-benefit neutral with a strike price of £105 and 30% UK content. But industry is already doing better than this, and each additional 10% of UK content is worth a net £500m – £600m (depending on strike price), and each £10 strike price reduction is worth £240m – £350m (depending on the level of UK content).

- If the next UK auction round achieved a strike price of £90 and 50% UK content, this would represent an estimated £1.7bn per GW in net benefit for the winning bid.

Cost reduction and industrial strategy

The offshore wind industry is undergoing a period of rapid growth and change. Larger turbines, more efficient generators, improving O&M strategies and increases in market volume are all helping to drive down costs in consecutive licensing rounds across Europe.

Recent auction rounds achieved record low prices in the Netherlands (€54.5/MWh at Borselle III & IV) and Denmark (€63.9/MWh at Vesterhav). The 2016 Cost Reduction Monitoring Framework[1] states that UK projects are reaching Final Investment Decision (FID) in 2015-16 with an average Levelised Cost of Energy (LCoE) of £97/MWh, compared to £142/MWh in 2010-11 (Figure 1). The forthcoming UK CfD auction round has set a cap of £105/MWh (2012 real figure), but many industry participants and observers expect winning bids significantly below this.

Current UK offshore wind installed capacity stands at 5.1GW, and is forecast to grow to around 10GW by 2020 (Figure 2).[2] Capacity is expected to continue to increase by 1GW per year until 2030 – an estimate based on UK Government statements pledging support for up to 10GW of new offshore wind projects in the 2020s, provided that progress in cost reduction continues.[3]

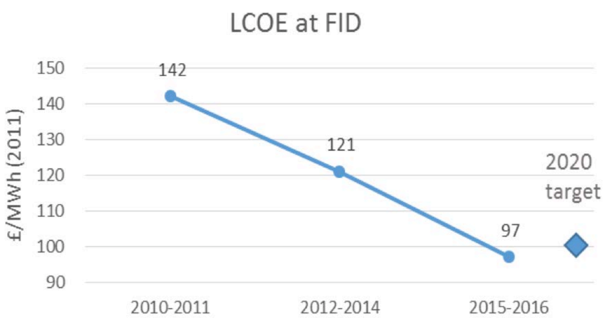

Figure 1: LCoE at FID

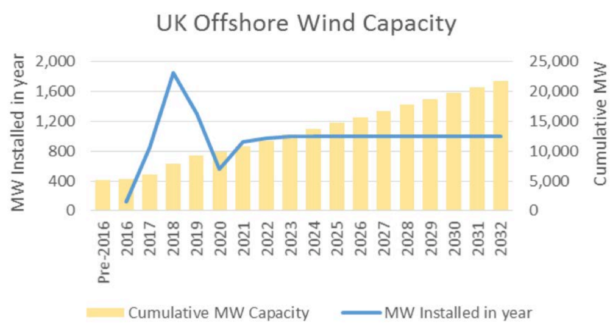

Figure 2: UK offshore wind capacity (MW)

Along with the rest of Europe, the UK offshore wind industry is committed to further cost reduction, which is critical to securing future auction rounds. Technology innovations and competition throughout the supply chain, as well as falling costs of finance, are the driving forces behind reducing costs, but costs are not yet low enough compared to the wholesale electricity price for projects to be economically viable without Contract for Difference (CfD) support.

In its current Green Paper on Industrial Strategy[4], the Government has invited UK industries to propose sector deals, which will establish a framework for how businesses plan to work together, and with Government, in order to propel their respective industries to the forefront of global markets. As with any deal, industry must present a compelling case for what value – in terms of clean, secure energy, jobs and wider economic growth – will be created in return for sustained Government support.

1 Cost Reduction Monitoring Framework 2016 Summary Report

2 This figure takes into account: Renewables Obligation Certificate (ROC)-accredited projects, FIDER projects (those supported by the UK Government's Financial Investment Decision Enabling for Renewables programme), and CfD (Contract for Difference)-approved projects.

3 Amber Rudd's speech on a new direction for UK energy policy - via UK Government

4 Building our Industrial Strategy - Green Paper - via UK Government

In order to achieve this, we need to quantify the expected costs and benefits of continued support. For the purposes of this paper, the cost is quantified as the cost of providing CfD revenues to operating offshore wind farms (i.e. the difference between strike price and wholesale price).The quantifiable benefit is taken as the economic value created by and within the UK supply chain. Such an approach allows the return on Government CfD investment to be viewed both in terms of deployment of offshore wind, but also in the GVA benefit derived though UK supply chain activity.

The value of the UK offshore wind supply chain

It is important to establish an estimate for the value of UK content in UK offshore wind projects as this underpins the economic value created. In this paper, "UK content" is defined as goods, manufacturing or services contributed by any company (including UK subsidiaries of overseas parents) headquartered in the UK. No assumptions have been made for sub-contractors who may or may not be located within the UK.

We have estimated the current and future potential UK content of UK offshore wind projects as: 32% in 2017, 50% by 2020, and 65% by 2030.

The current level of UK content (32%) is based on an analysis of contract values and company domicile held in the 4C Offshore stakeholder database.

The 2030 UK content value of 65% assumes that the country achieves the full potential outlined in a report commissioned by the then-Department for Business, Innovation and Skills in 2014: "UK offshore wind supply chain: capabilities and opportunities,"[5] assuming that 19GW installed capacity is reached.

Our forecast for the future shape of the UK supply chain takes into account known investments and/or slow-medium progression towards the 2030 estimate. Significant investments in UK offshore wind manufacturing facilities include MHI Vestas' blade manufacturing plant on the Isle of Wight and the new Siemens offshore wind blade plant in Hull. This pushes UK supply chain content to 50% by 2020, which is in line with the supply chain plan guidance[6] issued by the Department of Business, Energy and Industrial Strategy (BEIS), and ultimately 65% by 2030.

The associated market value (in £bn) is derived from projections of capital expenditure (capex) spend each year on project installation and O&M spend relating to full cumulative capacity. This paper assumes both capital and O&M costs will fall to 70% of their current value by 2030 as the industry matures. All Use of System charges, and other regulatory charges, have been excluded in this exercise.

Our view on the evolution of UK content at component level is shown in Figure 3 below.

5 UK Offshore Wind Supply Chain: Capabilities and Opportunities
6 Supply Chain Plan Final Guidance - via Department for Business, Energy & Industrial Strategy

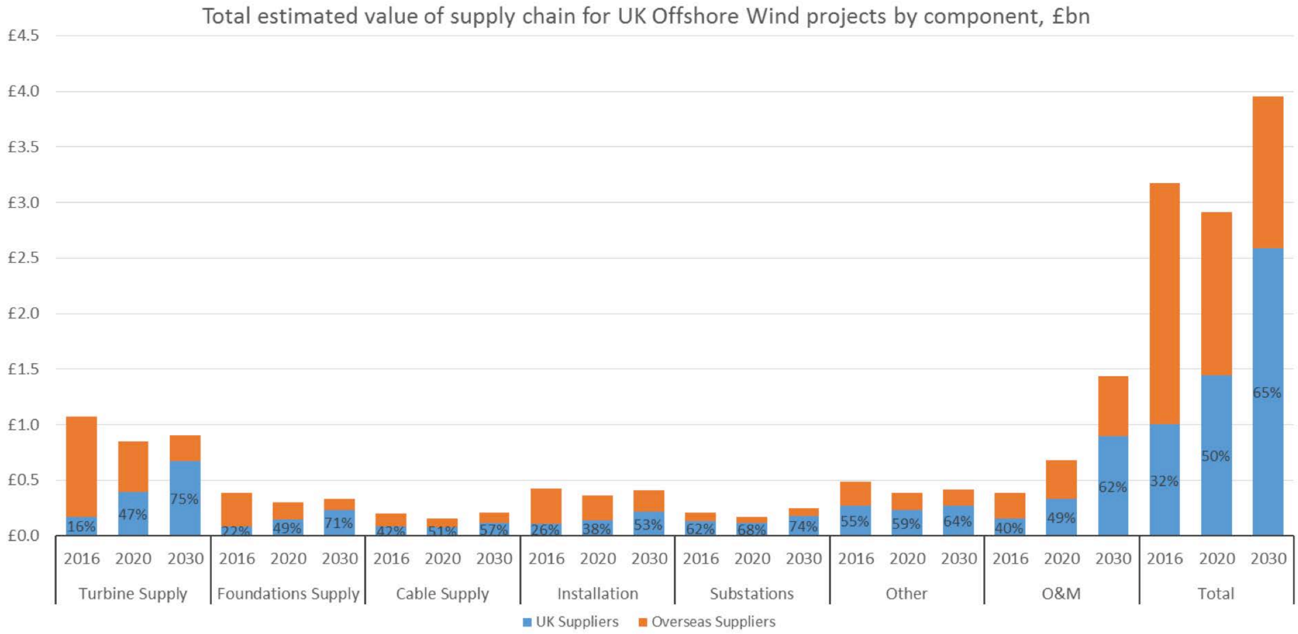

Figure 3: Total estimated value of supply chain for UK offshore wind projects, by component (£bn)

There is a large variation in the level of UK content between component groups. Sectors that have quickly become established are often closely linked to existing skills in transmission, oil and gas or the onshore wind industry. The recent downturn in oil and gas has motivated some service companies to broaden their services to incorporate the growing offshore wind industry.

Notable supply chain trends and expected developments are as follows:

Turbine supply

The turbine manufacturing category includes “balance of plant” facilities: towers, blades and external fixtures such as ladders, decking and support frames that are often sourced within the UK.

Currently, both tower and nacelle components are largely manufactured and assembled abroad, but tower manufacturing is expected to grow in the UK, with recent investment in new facilities, and there are obvious benefits from manufacturing closer to the point of assembly, such as lower logistical costs and reduced transit times. As a large cost element, future investment in a nacelle assembly site would increase UK supply chain value significantly by 2030. This may be more likely if a non-European turbine manufacturer wishes to establish a foothold in the UK and/or European markets.

Blade manufacturing in the UK is already established, with the MHI Vestas manufacturing facilities on the Isle of Wight and a large Siemens facility constructed in Hull.

Foundation supply

The mix of foundation types deployed in future will depend on the site types selected. Beatrice and East Anglia 1, both currently under construction, represent approximately 1.3GW of jacket-mounted turbines. Looking forward, much of the East Anglia zone, areas of future Hornsea projects and many Scottish sites are likely to use jacket foundations. This study assumes that jackets will form a larger share of the foundations market than previously, as deeper water sites are commissioned towards 2030 (no alternative foundation types are considered to have a significant market share). Jacket foundations are generally more expensive than monopiles, however the similarity of jacket foundations to existing oil platform design has resulted in efficiencies in this area and a larger potential UK supply chain content and so account for the majority of the increase in UK spend towards 2030.

Cable supply

Cable supply has an established domestic market for a variety of transmission requirements, both onshore and offshore. With two thirds of the UK export and array cable markets already being supplied by UK companies, this is already a success story. Recent highlights include JDR Cables being awarded contracts for 242km of array cables at Hornsea 1, 20km of export and 66kV array cables at Aberdeen Bay and, most recently, being announced as preferred cable partner for US Wind Inc. As a small cost centre, there is limited potential for overall supply chain gains, but cable manufacture represents a valuable export opportunity.

Installation

The installation process uses local ports, and although many of the vessel companies are recognised as being non-UK, a significant proportion of these vessels will employ a UK crew and thus UK spend may be undervalued.

Foundation installation costs are higher for jackets than monopiles, so the expected shift towards a higher share of the market for jackets will drive an increase in UK supply chain spend for foundations.

Substations

Both onshore and offshore substations are predominantly manufactured in the UK. Many electrical standards are unique to the UK, which has established this industry well and it is expected to maintain a high level of UK content in the future. This also represents a key area of export strength as the core capabilities in electrical design are directly transferrable.

Other capex

Other capital costs include project development, surveys and insurance, all of which are heavily dependent on the domicile of the developer.

Operations and maintenance

Many of the most substantial O&M costs are reactive in nature and require fast, often bespoke solutions. This study assumes that major repairs require jack-up and heavy-lift vessels and so have a similar level of UK content to installation, while routine O&M and minor repairs have roughly 85% UK content, based on UK-based crew transfer vessel companies in our contract analysis. The industry-specific skills and knowledge being developed make UK workers an attractive export commodity.

Investing in the UK supply chain

Numerous valuable opportunities for the UK supply chain exist under the right conditions. For UK companies to invest long term, they must be assured of a predictable, steady project pipeline to return a future revenue stream. Much of the manufacturing and assembly requires large facilities and high up-front investment: a hurdle that can discourage new entrants from competing against the small set of established global manufacturers. So, in providing a long-term certainty of the policy framework, the Government has enabled important new investments in the industry such as those named earlier and also facilitated a supply chain of smaller businesses servicing the sector.

Achieving a 2030 vision of 65% UK supply chain content will require a number of breakthroughs in the market. This could include development and innovation in the following areas:

- Expanding manufacturing facilities to construct larger towers with novel designs.
- Increasing the UK content around installation – for example, building a UK fleet of specialised vessels for the next generation of larger turbines.
- Bolstering UK content in O&M via this specialised vessel fleet and commercialising the numerous weather forecasting and logistical tools currently under development.
- Further growing UK cable manufacturing and taking current research on higher capacity export cables into the commercial market.

A more stretching target of 75% UK content could be achieved if, in addition to these, nacelle assembly facilities could be established in the UK as envisaged in the BIS 2014 report, which is cited above.[7]

Continued support via pipeline visibility and focus on innovation through initiatives such as the Offshore Wind Innovation Hub[8] and innovation challenges[9] for high growth potential companies is key to unlocking the UK supply chain's future potential and making UK business even more competitive. Supply chain companies of all sizes will be considering the UK market and the European market when making investment decisions around research and development.

7 UK Offshore Wind Supply Chain: Capabilities and Opportunities
8 Offshore Wind Innovation Hub (OWIH) - via ORE Catapult
9 Guidance on funding for innovation in renewable energy - via UK Government
Innovation Challenges - via ORE Catapult

Export opportunities – European pipeline

Investment in the UK supply chain also increases export opportunities for the industry.

At present, Europe leads the way in terms of installed offshore wind capacity. The European market (excluding the UK) has an installed capacity of 6GW, with a further 8-9GW expected to come on-line by the end of 2020. This growth is assumed to continue at a rate of 2.5GW a year to 2030. The successes in Europe have been recognised and development is accelerating in China, Japan, South Korea, Taiwan and the USA.

As shown in Figure 4, the UK supply chain's current share of the European offshore wind market is estimated at 5%.[10] The 2020 and 2030 UK supply chain shares of non-UK market are purely illustrative, assuming growth from the current estimate of 5% to 10% and 20% respectively.

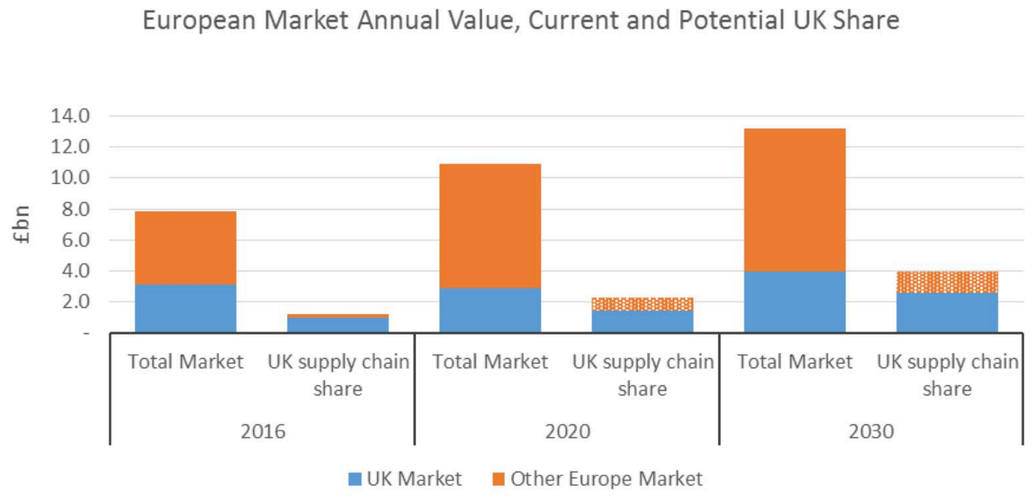

Figure 4: European market annual value, current and potential UK share

There is a great deal of uncertainty around future trade relations with the EU and how this may impact on the UK's exporting potential. Many economists anticipate volatile conditions in the short term while agreements are drawn up and, until these are in place, it is impossible to quantify the longer term impact. Being outside of the EU, the UK will be in a position to negotiate separately with non-EU countries and this may increase the export opportunities to other countries in Asia and to the USA, as mentioned above.

Initial GVA estimates based on UK pipeline

Using the estimates of installed capacity and UK content detailed above, as well as high-level capex and opex assumptions, the value of UK content per GW installed capacity has been estimated. This is then converted to GVA per GW installed by applying a multiplier of 1.7 (the multiplier for offshore

10 From an analysis of Renewable UK Offshore Wind Updates on allocated contracts awarded to UK and non-UK suppliers.

wind used in recent BIS studies)[11].

Figure 5 shows UK GVA per GW installed increasing from an estimated £1.8bn in 2016 to an estimated £2.9bn by 2030. The increase in UK content from 32% to 65% more than offsets the reduced capex and opex spend per GW, meaning GVA numbers continue to grow.

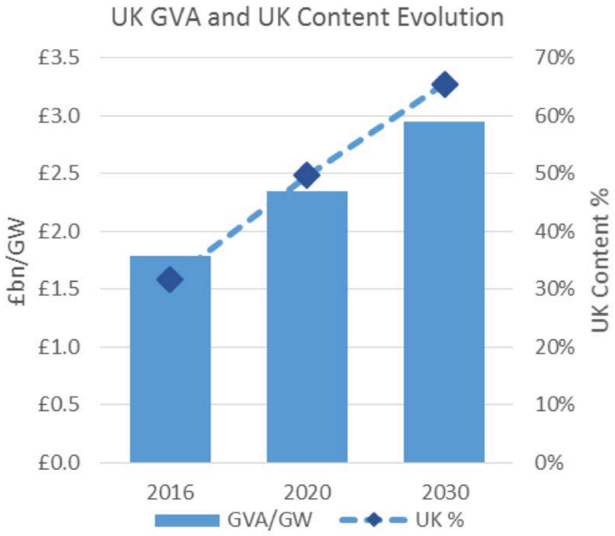

Figure 5: UK GVA and UK content evolution

UK GVA and CfD support

The UK Government has committed to providing £730m of CfD support to renewable electricity projects over this parliamentary term, with the vast majority expected to be allocated to offshore wind projects. The net financial benefit of this investment to the UK economy can be evaluated as the net present value (NPV)[12] of the lifetime GVA of projects minus the NPV of 15-year CfD support. This provides a like-for-like comparative view of the lifetime benefit to the UK of using public investment to support the offshore wind industry.

Figure 6 shows the net benefit of offshore wind per GW for a range of strike prices and UK content[13].

11 Government data on activity in the UK low-carbon economy between 2010 and 2013 by sector and region
12 Discounted at Treasury Green Book Real discount rate of 3.5%
13 This assumes that lower strike prices are achieved via a combination of lower capex and opex with reducing rates of return to reflect the lower perceived risk in a more mature market.

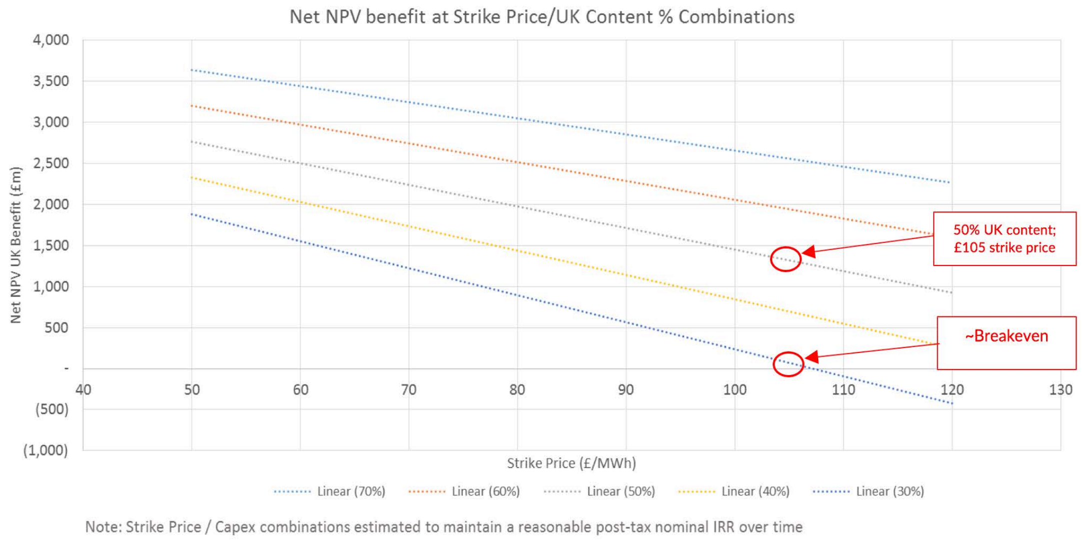

Figure 6: Net NPV benefit at Strike Price/UK content percentage combinations

At the administrative cap strike price of £105/MWh (2012 real figure), Figure 6 shows that supporting UK offshore wind is roughly cost-benefit neutral with 30% UK supply chain content (breakeven point circled in Figure 6). In line with the supply chain plan guidance (referenced above), the expectation is that bidders in this auction round will source a minimum of 50% of contract value through UK suppliers. This increase in UK content to 50% would increase the net benefit to the UK of offshore wind by around £1.2bn – even holding the strike price at £105.

In fact, each 10% increase in UK content has a net worth to the UK of £500m-600m (depending on strike price), and every £10 strike price reduction has a net worth to the UK of £240m-£350m (depending on UK content). This analysis provides a ready reckoner for assessing the net benefit of future CfD allocations where the strike price and UK content percentage are known.

As an example, a strike price of £90 with 50% UK content would have an estimated net benefit of £1.7bn per GW.

Figure 6 illustrates that, fundamentally, the return on providing CfD support increases as UK content increases and/or strike prices decrease. These are, and must continue to be, cornerstones of the offshore wind industry's sector deal proposal.

Conclusions

- Ongoing progress on cost reduction, combined with the forecast of a growing UK supply chain, paints a positive outlook on the economic benefit of the offshore wind industry to the UK.

- Continued public support for, and investment in, the UK offshore wind industry will create a virtuous circle of cost reduction and economic growth.

- Targeting support to innovations in key supply chain areas will increase UK competitiveness in the global market.

- As industry has the confidence in a visible CfD-enabled project pipeline, it will invest further in innovation-based cost reduction initiatives and create UK jobs; as costs fall, the level of public support required falls and as more jobs are created, the return on this investment increases.

- The net benefit to the UK of installing each 1GW of offshore wind at a strike price of £105 with 50% UK content is estimated at £1.3bn. With expectations for the next auction round achieving a clearing price well below £100 and UK content "pass marks" being minimum 50% UK content, the UK GVA per GW of the next auction will be well in excess of this.

- Benefits that are less quantifiable, such as having a secure, low-carbon energy supply, have not been considered within this analysis, but are important factors in considering the UK's energy supply as a whole.

Appendices

Recommended reading

[Cost Reduction Monitoring Framework 2016 by ORE Catapult]

[BEIS Green Paper on Industrial Strategy]

[UK Offshore Wind Supply chain: Capabilities and Opportunities]

Author profiles

Miriam Noonan is a Financial Analyst at ORE Catapult and holds a Master's degree in Civil and Environmental Engineering. She is responsible for delivery of the financial element of projects, maintaining economic models and analysis of market situations. Her background covers business planning and commercial analysis in a range of energy industries.

Gavin Smart is the Investment & Financial Analyst at ORE Catapult and is responsible for developing and maintaining ORE Catapult's financial and economic modelling, which feeds directly into the organisation's commercial strategy. Gavin spent three years as Senior Investment Analyst for a major European utility, developing models and analysis tools for UK and European offshore wind and marine projects. Prior to this, he worked as a Valuation & Business Modelling consultant in the Middle East for one of the 'big four' accounting and consultancy firms.

ORE Catapult

Inovo
121 George Street
Glasgow
G1 1RD

T +44 (0)333 004 1400

National Renewable Energy Centre
Offshore House
Albert Street
Blyth
Northumberland
NE24 1LZ

T +44 (0)1670 359 555

Fife Renewables Innovation Centre
(FRIC)
Ajax Way
Leven
KY8 3RS

T +44 (0)1670 357 649

Email: info@ore.catapult.org.uk
Web: http://ore.catapult.org.uk