BVGassociates

UK content analysis of Robin Rigg Offshore Wind Farm operations and maintenance

A report commissioned by E.ON Climate & Renewables

July 2012

BVG Associates

BVG Associates is a technical consultancy with expertise in wind and marine energy technologies. The team probably has the best independent knowledge of the supply chain and market for wind turbines in the UK. BVG Associates has over 120 career years experience in the wind industry, many of these being “hands on” with wind turbine manufacturers, leading RD&D, purchasing and production departments. BVG Associates has consistently delivered to customers in many areas of the wind energy sector, including:

- Market leaders and new entrants in wind turbine supply and UK and EU wind farm development;
- Market leaders and new entrants in wind farm component design and supply;
- New and established players within the wind industry of all sizes, in the UK and on most continents, and
- The Department of Energy and Climate Change (DECC), RenewableUK, The Crown Estate, the Energy Technologies Institute, the Carbon Trust, Scottish Enterprise and other similar enabling bodies.

Author

Dr Alun Roberts has worked in the offshore wind industry for more than three years and has developed a comprehensive knowledge of the UK’s offshore wind supply chain. Recent work he has led includes the report *Towards Round 3: Progress in Building an Offshore Wind Supply Chain* for The Crown Estate and he has authored material to help suppliers understand the opportunities for them in offshore wind.

The views expressed in this report are those of BVG Associates.

Front cover image courtesy of E.ON Climate & Renewables

Contents

List of figures

List of tables

1. Introduction

This analysis of the operational expenditure (OPEX) at the Robin Rigg Offshore Wind Farm (Robin Rigg) was commissioned by E.ON Climate & Renewables (EC&R) to explore its impact on the local and national economy and to show the potential benefits to the UK from its forthcoming offshore wind developments.

Robin Rigg is located in the Solway Firth, off the west coast of Scotland and close to the north coast of Cumbria, where its operational base (Workington) and grid connection (Seaton) are located. The wind farm consists of 60 Vestas V90-3.0MW turbines, and the 180MW site began full generation in April 2010. The project is the third offshore wind farm built by EC&R, and its first commercial wind farm in Scottish waters.

In 2010, EC&R commissioned BVG Associates to undertake a study of the UK content in the construction of Robin Rigg, which concluded that 32 per cent of its value went to UK companies.[1] This conclusion has been reported widely and has been cited by the UK Government as evidence of the benefits of offshore wind to the economy.

Although the UK content for operations and maintenance (O&M) activities for the wind farm is likely to be significantly higher than 32 per cent for construction, little detailed analysis has been placed in the public domain. EC&R has commissioned BVG Associates to establish the UK content of the O&M activities for the Robin Rigg offshore wind farm during the first year of its operation to address this deficit of information, extending our earlier analysis.

2. Methodology

O&M is defined as the activity during the lifetime operation of the wind farm, including fixed costs and overheads such as insurance and legal fees, and Crown Estate rent. Once operating, projects have an ongoing demand for goods and services. The design life of wind farm components is typically 20 years. The economics of projects depend heavily on minimising logistics costs, with quick and reliable access to the site a necessity. Wind farms typically have a single designated O&M base, which requires sufficient facilities to deploy and maintain vessels for personnel access and small component retrieval. They also need local workshops, fabrication and accommodation facilities. Additional port facilities elsewhere may be needed in the event of large component replacement.

This analysis included all the costs incurred by Robin Rigg during the first year of operations, including internal costs within the E.ON group.

The period considered for analysis is the 12 months from 1 May 2010 (the first full month of operation) to 30 April 2011. EC&R provided details of the transactions made during this period, including the relevant company name, address, and the nature and value of the work. The results presented here are exclusively based on this data. Any relevant work undertaken within EC&R but not charged to the wind farm has not been included.

On 2 March 2011, the transmission assets (the onshore and offshore substation and export cables) were transferred from EC&R to the offshore transmission owner (OFTO), TC Robin Rigg OFTO, which is owned by Transmission Capital Partners. EC&R has continued to maintain the transmission assets and these costs are included. Transactions with the OFTO have not been included.

2.1. Analysis by location

BVG Associates has allocated the value of transactions depending on whether it was captured by companies who were local to the wind farm or in the same region, or to the UK as a whole. Although the wind farm is located in Scottish Territorial Waters off the coast of Dumfries and Galloway, the operational base and connection point is in Cumbria in north west (NW) England, which is defined as the counties of Cheshire, Cumbria, Greater Manchester, Lancashire and Merseyside. Figure 2.1 shows the geographical breakdown used in the study.

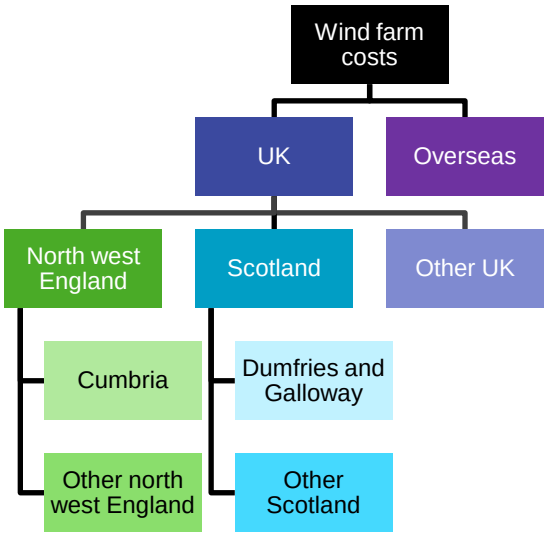

Figure 2.1 Geographical breakdown of supplier costs.

We apportioned contract values to the different geographical areas according to the primary address of the contractor. This can, however, give a misleading impression of the value captured by UK companies, as UK contractors will have sourced components or services from overseas and overseas contractors will have sourced components from the UK. It is also the case that UK contractors in, say, NW England have suppliers in Scotland. The aim was to allocate value as accurately as

possible to the location where the value is generated and where appropriate we split the value based on discussion with EC&R or industry intelligence.

2.2. Analysis by activity

Each contract value was assigned to a different area of O&M activity, as defined in Table 2.1. This generated data on the type of work won by local companies and provided insights into the factors that affect local content.

Table 2.1 Scope of O&M activities.

Activity	Scope
Turbine maintenance	Maintenance of the wind turbines
Balance of plant maintenance	Maintenance of substations, cables and foundations
Marine operations	Vessel charter and maintenance, fuel and berthing
Environmental services	Environmental monitoring and analysis
Fixed costs and overheads	Insurance and legal, administration, rent, onshore base maintenance and transmission use of system charges

2.3. GVA and jobs

Gross value added (GVA) is defined as the contribution to the economy (value of goods or services) of each individual producer, industry or sector. This study used a set of multipliers that were dependent on sector, job type and location. These were applied to the local content figures to derive a headline GVA figure broken down into the geographical categories described above and indirect and induced full-time equivalent (FTE) employment. These have been defined as follows:

- **Direct value** is generated through the activities of those companies with personnel dedicated to the O&M of the wind farm. This includes activity by EC&R and their onsite subcontractors Vestas, Solway Maritime and Windcat Workboats.
- **Indirect value** is generated down the supply chain. Most of this value derives from transactions involving EC&R, including those within the company. Some of this value will leak out beyond the geographical catchment area. For the purposes of this study, this leakage is assumed to be negligible or partially compensated for by opposite leakage with the net leakage not considered significant.
- **Induced value** is generated by those working directly or indirectly for the project who, by spending their salaries, recirculate their earnings into the economy.

The induced value multipliers are dependent on the size of the economy within a given geographical catchment area. As a result, the smaller the economy, the more likely it is that salary is spent outside the area. The multipliers employed in this study are show in Appendix A.

The number of FTE jobs is derived by estimating the proportion of transaction values that is labour content and the average salary levels. We have assumed that the cost of employing someone is about twice their salary. Relative salaries are shown in Appendix A.

3. Results

Between 1 May 2010 and 30 April 2011, EC&R conducted approximately 1,300 transactions with over 150 different companies. The total OPEX for Robin Rigg from 1 May 2010 to 30 April 2011 was £9.4 million, which equates to £52,000 per MW or £16 per MWh.

3.1. Analysis by location

Figure 3.1 shows that the UK content of the O&M expenditure at Robin Rigg for the year analysed was 86 per cent. A total of 34 per cent was local to the project in Cumbria. Regionally, NW England and Scotland together captured 45 per cent of expenditure.

Source: BVG Associates

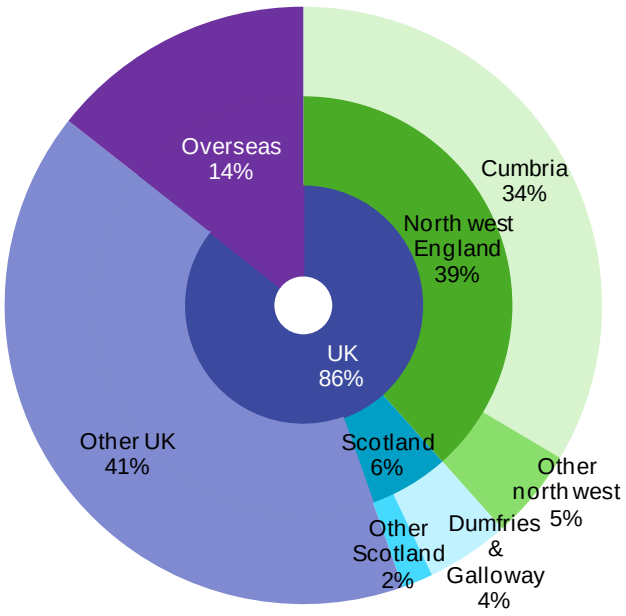

Figure 3.1 UK, regional and local content in Robin Rigg O&M expenditure.

Only 7 per cent of expenditure went to businesses in Scotland and NW England that were based outside Cumbria and Dumfries and Galloway. This indicates that the economic impacts were felt close to the location of the wind farm and, in particular, at the location of the operations base at Workington, Cumbria, NW England. It further suggests that there was little wider regional benefit.

The total UK content was fairly evenly split between the sum of the two counties immediately adjacent to the wind farm and the rest of the UK. A significant proportion of the other UK content was made up of internal transactions, with E.ON UK headquarters in Coventry and its engineering division in Nottingham.

Much of the overseas content came from the provision of Vestas support services in Denmark and E.ON transactions handled centrally through its German parent company. Such content included Vestas's spares sourcing, which has not been analysed in detail. Local knowledge indicated that some of this expenditure came back into the UK although no formal analysis was been undertaken. There was also a small support team in Vestas Offshore's business based in Warrington, which used local services from the UK as well as providing UK jobs.

3.2. Analysis by activity

Figure 3.2 shows that fixed costs and overheads accounted for the largest share of expenditure during the period considered in this analysis. This comprised significant sums, many of which related to regulatory requirements, along with internal transactions within E.ON, including salaries.

Source: BVG Associates

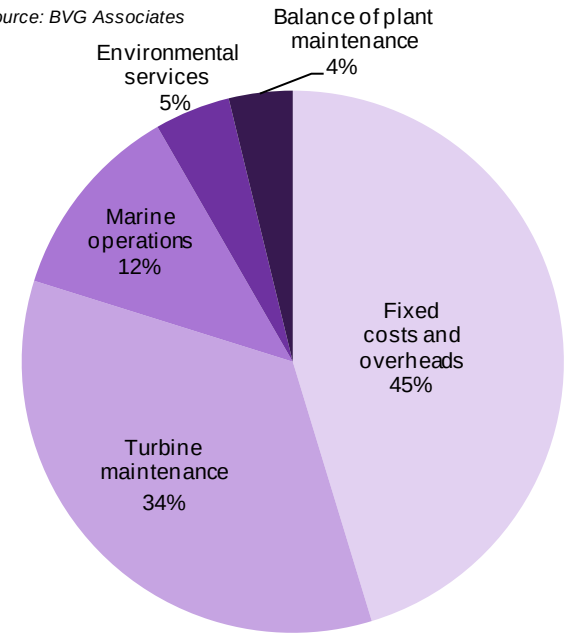

Figure 3.2 O&M expenditure breakdown by activity.

Turbine maintenance costs also comprised significant sums, with most of the expenditure made up of the monthly service and warranty charge by Vestas.

Fixed costs and overheads

Fixed costs and overheads made up the largest contribution to wind farm expenditure and the two most significant elements of this were insurance and legal services and transmission network use of system (TNUoS) charges (see Figure 3.3). TNUoS costs are set by the Office of the Gas and Electricity Markets (Ofgem) and National Grid, and include provision of the grid connection and associated transmission costs. Care should be taken when drawing comparisons between offshore wind farms as not all sites are subject to the OFTO regime and varying

TNUoS charges are paid for different sites depending on their type of grid connection.

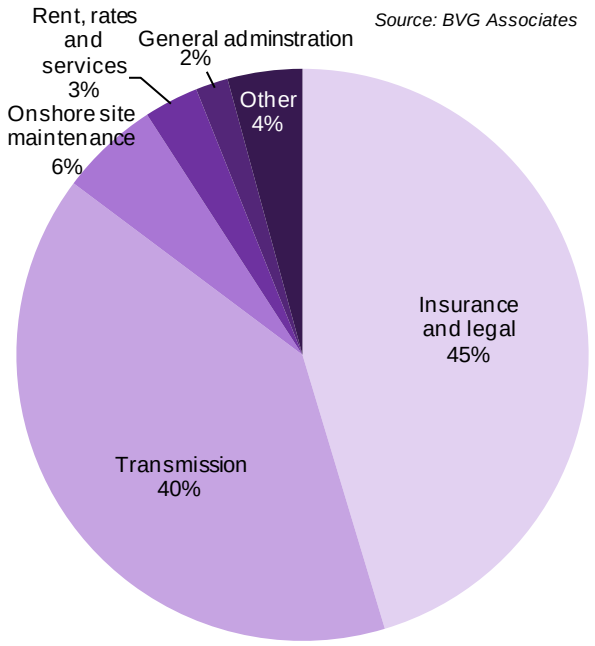

Figure 3.3 Breakdown of fixed costs and overheads.

Figure 3.4 shows that most of the fixed costs and overheads were retained in the UK but little was local to the wind farm. There was a significant overseas element, through internal payments to E.ON in Germany. Much of the expenditure that was not for insurance and legal services was spent locally on services for onshore base maintenance.

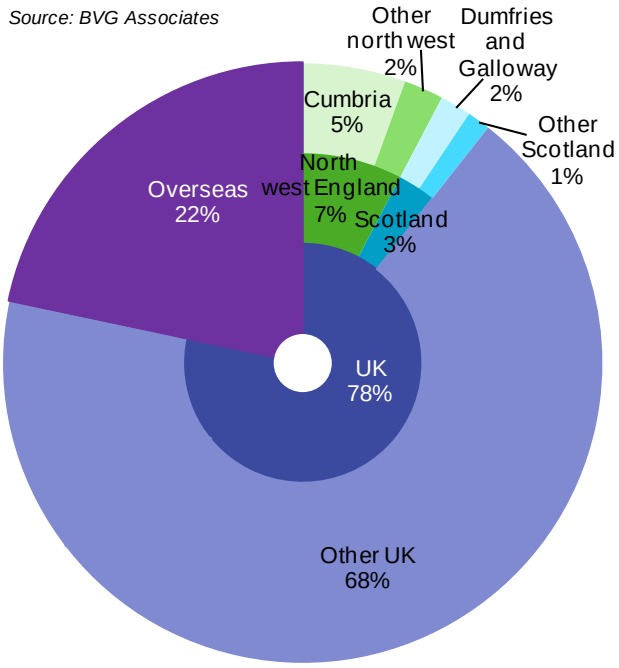

Figure 3.4 UK, regional and local content in fixed costs and overheads expenditure.

Turbine maintenance

Figure 3.5 shows that three quarters of the value of the turbine maintenance expenditure went to NW England and most of this was to Cumbria. The non-UK element reflected Vestas's Denmark overhead and EC&R's purchase of spares and consumables. The remaining value went to other UK companies, mostly for one-off services.

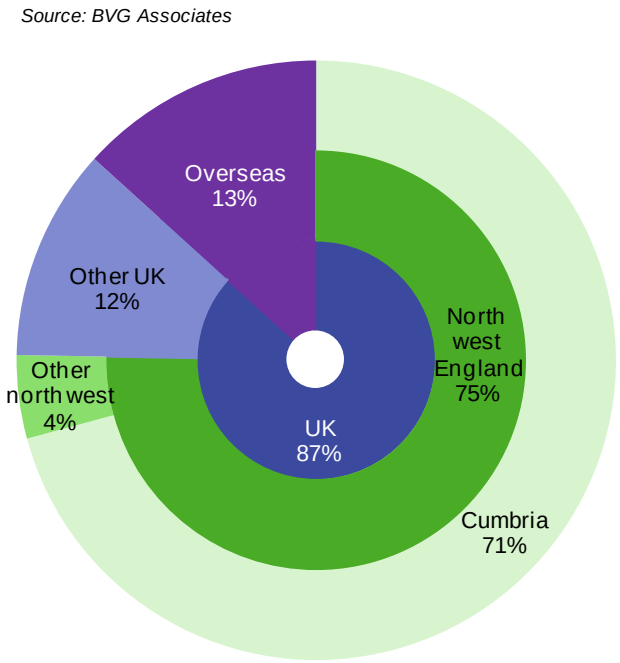

Figure 3.5 UK, regional and local content in turbine maintenance expenditure.

Marine operations

The largest cost elements of marine operations were vessel charter (including crew) and vessel maintenance (see Figure 3.6). Robin Rigg had two workboats, which were used for transferring personnel and materials to the offshore turbines. Both were permanently stationed at the Port of Workington. The first was owned by EC&R and was operated by a local company, Solway Maritime, which was a new business started up directly as a result of Robin Rigg. The second was provided on a charter basis by Windcat Workboats, which was based in the east of England but which had a satellite base at Fleetwood in NW.

Source: BVG Associates

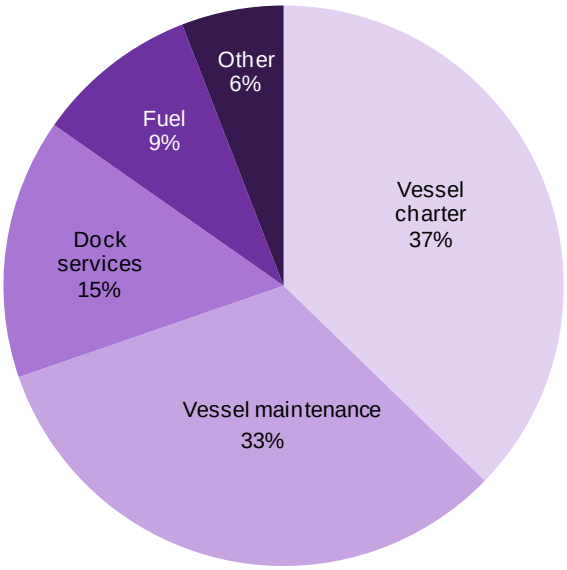

Figure 3.6 Breakdown of marine operations expenditure.

Figure 3.7 shows that all marine operations expenditure was in the UK, with around half of this in Cumbria and almost 10 per cent in Scotland. The Scottish expenditure was to a fuel supplier.

Source: BVG Associates

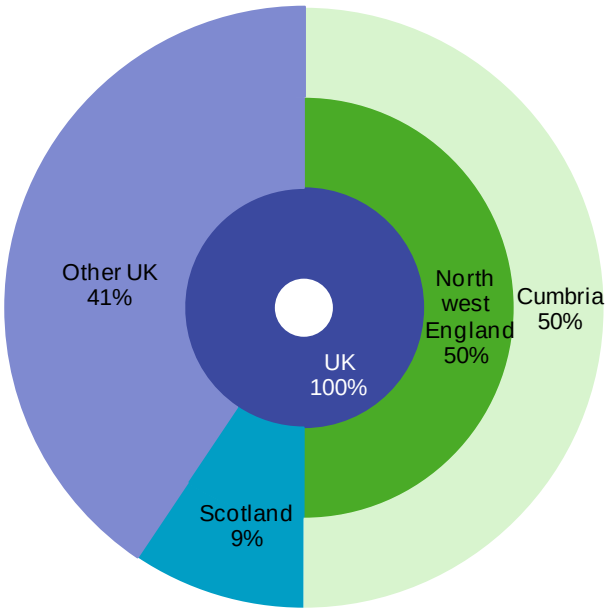

Figure 3.7 UK, regional and local content in marine operations expenditure.

Environmental services

Figure 3.8 shows that almost all of the environmental services expenditure went to companies in Scotland and NW England, with 83 per cent captured in Dumfries and Galloway alone.

Source: BVG Associates

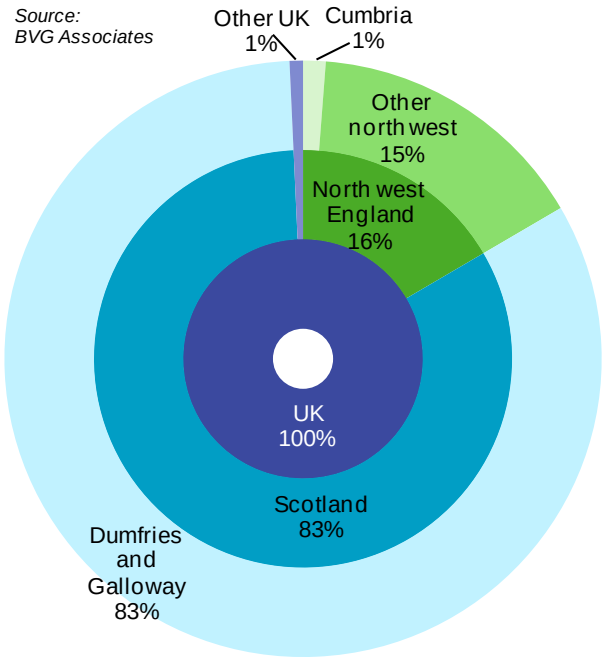

Figure 3.8 UK, regional and local content in environmental services expenditure.

Balance of plant

Balance of plant maintenance was a relatively small element of expenditure and much of this work related to maintaining the substations and inspecting foundations and cables (see Figure 3.9).

Source: BVG Associates

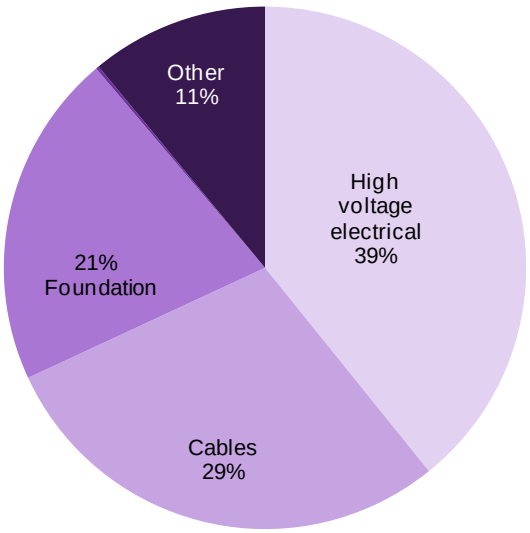

Figure 3.9 Breakdown of balance of plant maintenance expenditure.

Figure 3.10 shows that a significant amount of balance of plant maintenance was undertaken by companies in NW England. It was unclear whether this indicated any regional bias as a significant amount of this value was accounted for by payments to a survey company based in the region, which undertook a number of cable surveys.

Source: BVG Associates

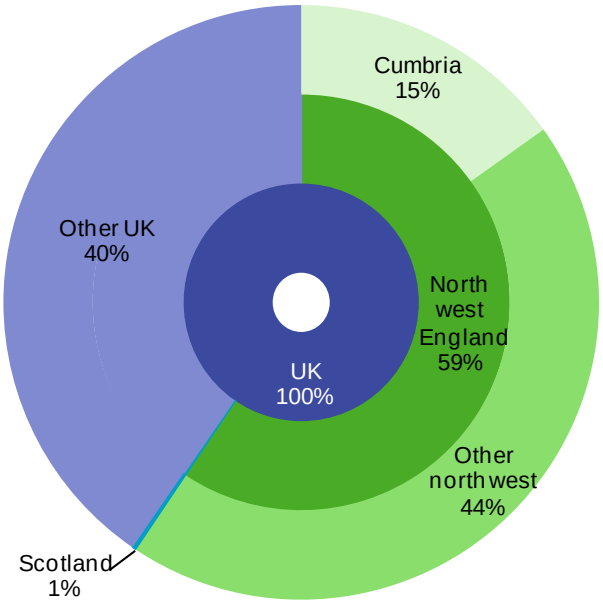

Figure 3.10 UK, regional and local content in balance of plant maintenance expenditure.

3.3. GVA and jobs

The total UK GVA generated between 1 May 2010 and 30 April 2011 was £15 million, of which 21 per cent was generated directly by the wind farm, 41 per cent through indirect activity and the remaining 38 per cent from induced economic activity.

Of this total UK figure, 27 per cent was generated within Cumbria and a further 4 per cent in Dumfries and Galloway (see Figure 3.11).

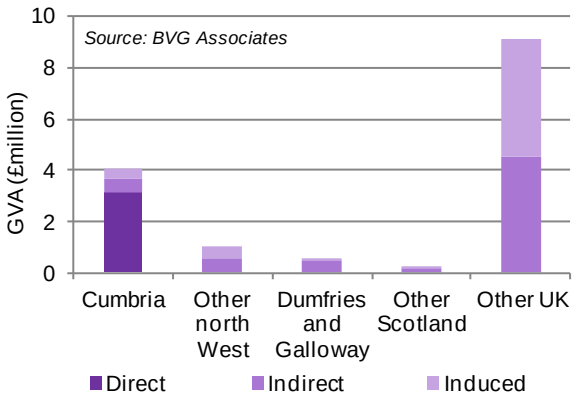

Figure 3.11 Annual direct, indirect and induced GVA by location.

Modelling suggests that the equivalent of 183 FTE jobs were sustained through direct, indirect and induced economic activity over the period considered in this study (see Figure 3.12). We calculated that the equivalent of 37 of these FTE jobs was created in Cumbria. The indirect jobs in NW England include a small Vestas Offshore team in Warrington, Cheshire. Ten jobs were created in Scotland, of which five were in Dumfries and Galloway.

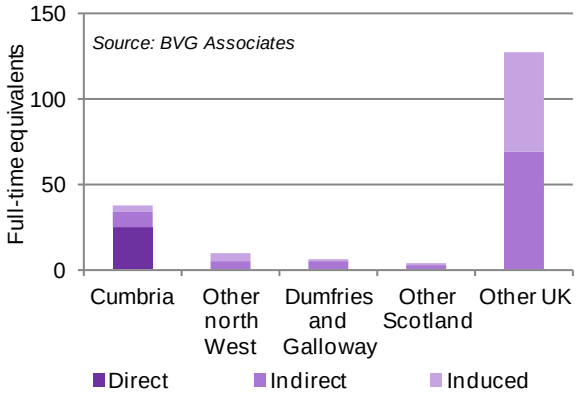

Figure 3.12 Annual direct, indirect and induced jobs by location.

4. Discussion

4.1. UK content

During the first full year of operation, a high proportion (86 per cent) of the O&M expenditure was retained in the UK. Almost half of this went to companies operating in Cumbria, reflecting the location of the operations base at Workington and the grid connection at Seaton. This shows a significant local benefit but also reflects the requirement for specialist services provided by companies operating nationally.

The only overseas content identified related to Vestas and E.ON operations in Denmark and Germany respectively. While it was possible that UK suppliers had overseas subcontractors, most were service providers and there were likely to be few imported components other than those supplied by Vestas.

Environmental services had the highest level of local content of all the different activities undertaken. Turbine maintenance also had a high level of local content, which reflected the requirement to have technicians available on a daily basis to perform planned and unplanned maintenance. Balance of plant maintenance was undertaken less frequently and for shorter periods, and by specialist suppliers which can be located anywhere in the UK. EC&R has been working to develop opportunities for local companies, especially in the area of vessel services and monopile inspections, with some success.

We are unaware of any other reports in the public domain that present UK or local content analyses of offshore wind O&M. Some studies have made assumptions of local or UK content in order to forecast future job creation under a range of scenarios. A study commissioned by Vestas in 2011 assumed UK content figures for scenarios ranging from 95 to 97 per cent.[2] The Carbon Trust's 2008 report *Offshore wind power: big challenge, big opportunity* reported that the UK was likely to secure 80 to 100 per cent of the O&M industry.[3]

A report issued by Scottish Renewables[4] assumed a Scottish content in the O&M of Scottish wind farms of 33 per cent for a low scenario and 45 per cent for the high scenario, which is the same as the figure for Scotland and NW England combined in this analysis.

4.2. Jobs and GVA

Few studies have sought to establish the jobs created through offshore wind O&M. The Vestas study mentioned above concluded that the UK's then-generating capacity of 1GW supported 0.45 jobs per MW (direct and indirect jobs across the supply chain). It forecast that a 20.5GW generating capacity would support 0.35 jobs per MW. The Scottish Renewables report discussed in Section 4.1 assumed that up to 100 jobs in O&M would be created for each 500MW installed. A report commissioned from BVG Associates by the DECC's Renewables Advisory Board concluded that 0.5 jobs per MW would be generated by O&M in the UK from domestic offshore wind farms.[5] The equivalent figure calculated here for Robin Rigg of 0.54 jobs per MW was higher than both estimates but is for a smaller wind farm.

Reports on job creation from O&M activity have often been made before the wind farm is fully operational (see Table 4.1). While it was not always evident what jobs (direct, indirect or induced) are considered, it seems likely that the figures refer to the direct jobs created at or around the

Table 4.1 Reports of job creation in offshore wind O&M. Note: these figures have been gathered from media sources and may not reflect the data provided by developers.

Wind farm	Owner	Capacity (MW)	Number of Turbines	Jobs	Jobs per MW	Jobs per turbine
Rhyl Flats and North Hoyle	RWE	150	55	60	0.40	1.09
Lynn and Inner Dowsing	Centrica	194	54	42	0.22	0.78
Gunfleet Sands/Burbo/Barrow	Dong	353	103	75	0.21	0.73
London Array 1	E.ON/DONG	630	175	100	0.16	0.57
Thanet	Vattenfall	300	100	30	0.10	0.30
Sheringham Shoal	Statoil/Statkraft	317	88	50	0.16	0.57
Greater Gabbard	SSE/RWE	504	140	100	0.20	0.71
Walney	Dong/SSE	367	102	60	0.16	0.59
Ormonde	Vattenfall	150	30	28	0.19	0.93
Barrow	Centrica/Dong	90	30	25	0.28	0.83
Gwynt Y Môr	RWE	576	160	100	0.17	0.63

operations base and therefore under-report the jobs created by suppliers and the centrally based personnel of the turbine manufacturer and developer.

4.3. Future

The local content for Robin Rigg is likely to be fairly typical of UK projects of a comparable size. EC&R was able to draw on local services from companies that supply other sectors but more specialist requirements needed to be supplied from elsewhere in the UK. This may change as these specialist requirements will remain for the lifetime of the wind: specialist suppliers may see the value of investing in local facilities, existing local companies may broaden their range of activities or new businesses may be established. This would be most likely if further offshore wind farms are developed in the area.

This study considered the O&M expenditure by EC&R while the turbines were under warranty, and the costs incurred by Vestas in fulfilling its contractual obligations were therefore not analysed. This included the costs of components, which could be sourced from overseas or the UK, and possibly additional vessels. Incorporating these costs into the analysis could increase the UK content estimated in this report. A further study could usefully analyse the turbine manufacturer's supply chain during the O&M phase of offshore wind farms.

Appendix A: Assumptions used in deriving GVA and jobs

Induced GVA multipliers.

Catchment	Induced value multiplier
Cumbria	1.1
North west England	1.2
Dumfries and Galloway	1.1
Scotland	1.2
UK	1.6

Relative salary levels by location and activity type.

Activity	Cumbria	NW England	Dumfries and Galloway	Scotland	Other UK
Turbine maintenance	1.00	1.00	1.00	1.00	1.00
Balance of plant maintenance	0.87	0.92	0.87	0.92	1.00
Marine operations	0.76	0.80	0.76	0.80	0.88
Environmental services	1.09	1.15	1.09	1.15	1.25
Fixed costs and overheads	0.44	0.46	0.44	0.46	0.50

Endnotes

Web links were checked shortly before publication.

[1] BVG Associates for E.ON Climate & Renewables, *UK content analysis of Robin Rigg offshore wind farm,* (September 2011), available at www.eon-uk.com/E.ON_Robin_Rigg_UK_content_report_October_2011.pdf

[2] Oxford Economics for Vestas Offshore, *Analysis of the Employment Effects of the Operation and Maintenance of Offshore Wind Parks in the UK*, (June 2010), available at www.oxfordeconomics.com/SAMPLES/VESTAS.PDF

[3] The Carbon Trust, *Offshore wind power: big challenge, big opportunity. Maximising the environmental, economic and security benefits*, (October 2010), available at www.carbontrust.com/media/42162/ctc743-offshore-wind-power.pdf

[4] IPA Energy + Water Economics for Scottish Renewables, *Scottish Offshore Wind: Creating an Industry*, (August 2010), available at www.scottish-enterprise.com/~/media/publications%20archive/News/Scottish-Offshore-Wind-CreatingAnIndustry.ashx

[5] BVG Associates for the Renewables Advisory Board, *Value breakdown for the offshore wind sector*, (February 2010), available at www.decc.gov.uk/assets/decc/11/meeting-energy-demand/wind/2806-value-breakdown-offshore-wind-sector.pdf