BVGassociates

Economic benefits from onshore wind farms

A report for ScottishPower Renewables

September 2017

Document history

Revision	Description	Circulation classification	Authored	Checked	Approved	Date
3	For client	Client discretion	CED	SGM	AER	15 Sept 2017

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 industry. BVG Associates has more than 150 combined 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 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, on most continents, and
- Government agencies and industry bodies around the world.

The views expressed in this report are those of BVG Associates. The content of this report does not necessarily reflect the views of ScottishPower Renewables.

Front cover image courtesy of ScottishPower Renewables.

Executive summary

ScottishPower Renewables (SPR) recognises the importance of the economic benefits to Scotland and the rest of the UK from investing in onshore wind generation. SPR commissioned BVG Associates (BVGA) to assess the UK, Scotland and local (south west Scotland) economic benefits created by eight onshore wind farms in south west Scotland commissioned between 2016 and 2017. The wind farms have a combined capacity of 474MW. This report shows the contribution onshore wind can make in the Government's future industrial and energy strategies.

UK, Scottish and local content

The analysis uses the methodology BVGA has developed for the Offshore Wind Programme Board to calculate the content in UK offshore wind projects.

In this report, 'UK content' is the value of all supplies sourced from within England, Northern Ireland, Scotland and Wales that accrues as earnings from employment and business profits. It is the sum of 'direct' and 'indirect' impacts. 'Scottish content' is the value captured in Scotland. 'Local content' refers to the south west Scotland.

UK content in total expenditure (TOTEX) relating to the eight onshore wind farms analysed in this study over the whole period covered is calculated at 66% and 51% is Scottish content (77% of the UK content figure), including 16% local content. Non-UK content accounts for 34% of wind farm related expenditure. The development, commissioning and operation of the eight wind farms will represent a total investment of around £1.6 billion by SPR, which is almost £3.4 million per MW.

Source: BVG Associates

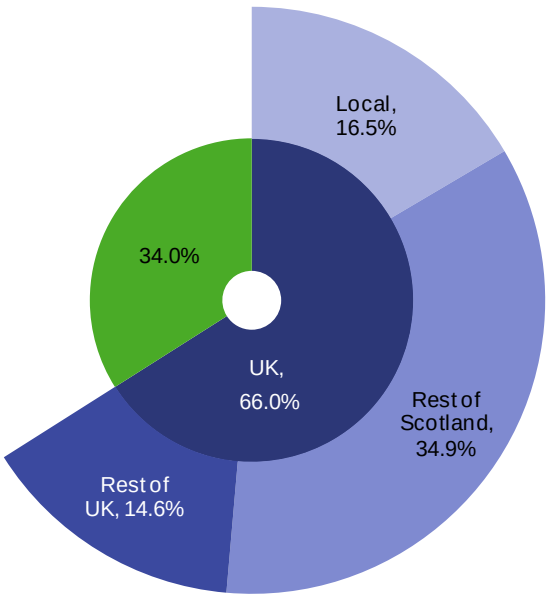


Figure A UK content aggregated across the eight wind farms.

Total investment and impacts of ScottishPower Renewables' eight onshore wind farms (474MW)

- £1.6 billion investment

Content in total expenditure

- 66% UK content
- 51% Scottish content, including 16% local (south west Scotland) content

Economic impact over the lifetime of the projects

- £1,276 million gross value-added in the UK
- £297 million local value-added
- 31,118 UK FTE years, including 7,768 local FTE years
- £814 million UK earnings, including £194 million local earnings
- £59 million community benefit funding

Table A Summary of content by geographic region aggregated across the eight wind farms.

Category	Region	% content of TOTEX	% content of category
DEVEX	Local	0.2%	11.6%
	Scottish	1.5%	74.4%
	UK	2.0%	93.6%
CAPEX	Local	1.1%	2.3%
	Scottish	9.3%	25.0%
	UK	12.5%	33.8%
OPEX	Local	15.2%	25.1%
	Scottish	40.6%	67.0%
	UK	51.5%	85.1%
TOTEX	Local	16.5%	16.5%
	Scottish	51.4%	51.4%
	UK	66.0%	66.0%

The UK content in SPR's wind farms is higher than previously reported for other projects and the main factor appears to be relative proportions of CAPEX and OPEX.[1]

Economic impact

Economic impact is considered in terms of local value-added (LVA), gross value-added (GVA) in the UK, full-time equivalent (FTE) years employment and earnings.[2] All data presented is given in real prices at final investment decision (FID), that is, not adjusted for future inflation. A summary of economic impacts is shown in Table B.

Table B Summary of direct. Indirect and induced economic impact.

Impact	UK	Local
Value-added	£1,276 million	£297 million
FTE years	31,118	7,768
Earnings	£814 million	£194 million

Of the total £1,276 million GVA created, 49% is direct value-added (shown in Figure B). Direct value-added relates to work undertaken by SPR and its immediate suppliers' own staff within the UK. GVA averages £41,000/FTE year between 2013 and 2040.[2]

Of the total £297 million LVA created, 51% is direct value-added (shown in Figure C). Direct value-added relates to work undertaken by a contractor's own staff within south west Scotland. LVA averages £38,000/FTE year between 2013 and 2040.

The number of local FTE years created over the lifetime of the projects is 7,768, with 31,118 UK FTE years created over the lifetime of the projects. A local FTE year is an FTE working for a company that is operating within the local (south west Scotland) area.

Total local earnings created over the lifetime of the projects are £194 million. Annual local earnings average £25,000/FTE year between 2013 and 2040. Total UK earnings created over the lifetime of the projects is £814 million. Annual UK earnings average £26,000/FTE year between 2013 and 2040.

Across the eight onshore wind farms, the annual funds available for distribution by communities from 2015 total almost £2.5 million at 2016 prices. Over 25 years, this gives total community benefit funding income of £59 million.

Source: BVG Associates

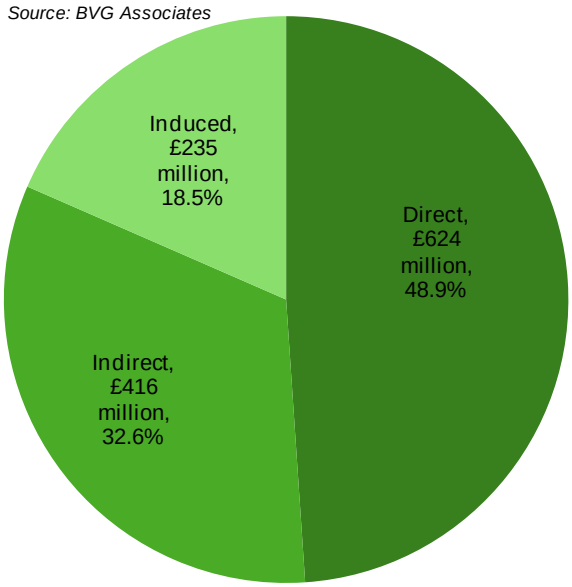


Figure B Gross value-added by direct, indirect and induced to 2040.

Source: BVG Associates

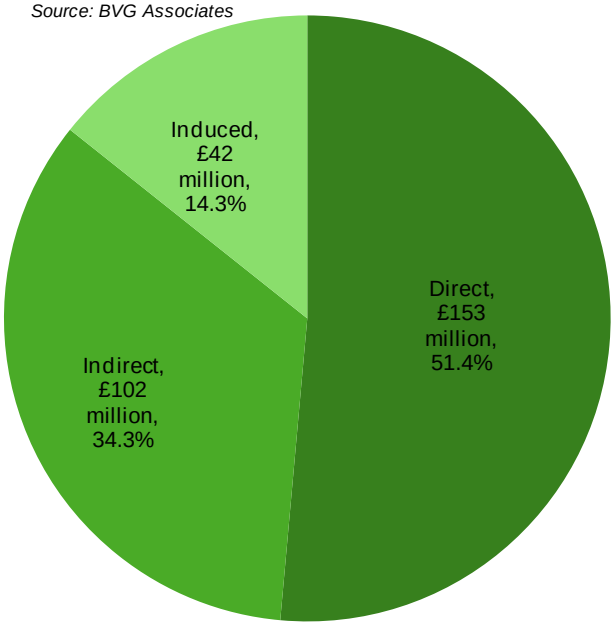


Figure C Local value-added by direct, indirect and induced to 2040.

[1] For each of the eight wind farms, actual DEVEX and CAPEX transaction data was available. OPEX data was mostly budgetary.

[2] Value-added calculations exclude that generated from SPR's profits.

Contents

List of figures

List of tables

1. Introduction

ScottishPower Renewables (SPR) recognises the importance of the economic benefits to Scotland and the rest of the UK from investing in onshore wind farms. To measure the scale of these benefits, SPR commissioned BVG Associates (BVGA) to assess the UK, Scotland and local (south west Scotland) economic benefits created by eight onshore wind farms commissioned in 2016 and 2017. This report includes assessments on UK content, local value-added (LVA), gross value-added (GVA), full-time equivalent years of employment (FTE years) and earnings. It also includes an assessment of the secondary benefits of the projects on the local economy.

The work was completed in partnership with Steve Westbrook[3], an economist who specialises in analysing the economic impacts from infrastructure investments.

Figure 1 shows the locations of the eight projects in south west Scotland. For the purposes of this analysis, south west Scotland is defined as being the local authority areas in which at least one of the wind farms is situated, namely: Dumfries and Galloway, East Ayrshire, North Lanarkshire and South Ayrshire.

Figure 1 Location of ScottishPower Renewable wind farms considered in the study. Circle size shows relative wind farm capacity.

Table 1 lists the wind farms considered. The development, commissioning and operation of the eight wind farms represents a total lifetime investment of around £1.6 billion by SPR.

Table 1 Onshore wind farm project data.

Wind farm	Capacity (MW)	Commission date	Number of turbines
1. Black Law Extension (a)	30.06	2016	18
2. Black Law Extension (b)	33.37	2016	16
3. Dersalloch	69.0	2016	23
4. Ewe Hill 1	13.8	2016	6
5. Ewe Hill 2	36.8	2017	16
6. Glen App	22.0	2017	11
7. Hare Hill Extension	29.75	2017	35
8. Kilgallioch	239.0	2017[4]	96

[3] https://www.uhi.ac.uk/en/media/find-an-expert/steve-westbrook

[4] Anticipated fully commissioned in September 2017.

2. Methodology

To assess the economic benefits from onshore wind farms BVGA used a two-step methodology:

1. A content analysis, and
2. An analysis of the economic benefits of gross value-added (GVA), local value-added (LVA) and full-time equivalent (FTE) years employment, using the content data.

2.1. UK, Scottish and local content

The analysis uses the methodology BVGA has developed for the Offshore Wind Programme Board (OWPB) to calculate the content in UK offshore wind projects.[5]

As defined for this report, 'UK content' is the value of all supplies sourced from within England, Northern Ireland, Scotland and Wales that accrues as earnings from employment and business profits. It is the sum of 'direct' plus 'indirect' impacts. Similarly, 'Scottish content' is the value captured in Scotland and 'local content' is value captured in south west Scotland. Scottish content is the sum of local content and rest of Scotland content. UK content is the sum of Scottish content and rest of UK content. 'Non-UK content' is the value captured elsewhere.

According to BVGA's OWPB methodology, UK content is reported as:

- UK content in development expenditure (DEVEX)
- UK content in capital expenditure (CAPEX)
- UK content in lifetime operational expenditure, including decommissioning (OPEX), and
- UK content in total expenditure (TOTEX).

All data presented is given at real prices at final investment decision (FID). For each of the eight wind farms, actual DEVEX and CAPEX data was available for the analysis. Budgeted estimates were used for OPEX. DEVEX includes capitalised salaries for SPR's development and construction staff but excludes other indirect or corporate overhead. SPR profits are not included in the data.

The OWPB methodology states that for contracts issued for £10 million or greater, the supplier should be asked to provide their content assessment. BVGA approached the relevant suppliers, requested additional data and derived suitable figures for local (south west Scotland), UK and non-UK content. Where it was not possible to speak to relevant suppliers, BVGA used its detailed supply chain knowledge supplemented with information provided by SPR project managers to derive local and UK content figures.

For contracts less than £10 million, BVGA estimated content figures. BVGA allocated the value as accurately as possible to the location where the value was generated.

Each contract value was assigned to one or more relevant elements of the supply chain outlined in Table 2 on page 9.

We weighted data by the individual wind farm capacity to derive overall UK content in DEVEX, CAPEX, OPEX and TOTEX.

2.2. Economic impact

To model the impacts of the wind farms' development, construction and operation, we used an innovative methodology which is based on a detailed understanding of the wind and transmission supply chains. The methodology is explained in Appendices A and B and uses a structured local content (defined as the direct and indirect value added) analysis from a modelling methodology originally developed by BVGA. The following is analysed:

- Direct and indirect gross value added (GVA) and local value-added (LVA)[6]
- Direct and indirect earnings, and
- Direct and indirect full-time equivalent (FTE) job years.

Full-time equivalent (FTE) employment is derived from an understanding of:

- Typical profit margins
- Costs of employment, and
- Salary levels.

Where possible, this information was established through discussions with suppliers and was supplemented with additional research.

'Direct' impacts relate to work undertaken by a contractor's own staff. 'Indirect' impacts relate to employment generated by the purchase of supplies and services by the contractor.

The induced values for these measures were calculated using historical data from other sectors because expenditure patterns of workers in other sectors with comparable average earnings are unlikely to differ significantly.

[5] *Methodology for measuring the UK content of UK offshore wind farms*, May 2015, BVG Associates for Department of Energy and Climate Change, The Crown Estate and RenewableUK. Available online at https://bvgassociates.com/publications/. Last accessed September 2017

[6] Gross value-added is a national measure. The term local value-added is used to measure the value captured in south west Scotland.

The methodology allocates value to the place of work. Some contractors hire workers resident in south west Scotland so we treated local workers engaged to work on the projects as directly employed but with a place of work the same as the place of residence.

The figures only include the impacts from building and operating the wind farms. They do not consider the impacts of profits made by SPR or from central UK Government revenue generated through taxes.

OPEX is assumed to be spread over the operating life of the wind farm.

We also provide data on local and UK gross earnings.

Table 2 Supply chain descriptions.

Expenditure	Supply chain area	Description
DEVEX	Project development and management	The processes up to the point of financial close or placing firm orders to proceed with wind farm construction, and project management costs incurred by SPR.
CAPEX	Turbine	The activity by wind turbine manufacturers and their suppliers, covering nacelle component manufacture and assembly and blade and tower manufacture. It includes transport, installation and commissioning. It excludes the turbine service agreement.
	Civil works	The activity by civil contractors and their suppliers; covering roads and drainage, crane pads, turbine foundation, meteorological mast foundations, cable trenches and buildings for electrical switch gear, SCADA equipment and its installation, and a maintenance and spare part facility.
	Electrical works	The activity by electrical contractors and their suppliers, covering cables, electrical switch gear, protection and control system, maintenance facilities and grid connection.
OPEX	Transmission OMS	Activity during the lifetime operation of the wind farm, covering grid connection and transmission costs
	Wind farm operations, maintenance and service (OMS)	Activity during the lifetime operation of the wind farm, including land rental costs, business rates, operations and maintenance costs relating to the wind farm, community benefit funds and environmental costs
	Decommissioning	The costs associated with the removal of the wind farm components at the end of its operating life

3. Results

3.1. UK, Scottish and local content

Figure 2 shows the UK content across the eight wind farms is 66% and 51% is Scottish content (77% of the UK content figure), including 16% local content. Non-UK content accounts for 34% of the wind farm expenditure. The total investment across the wind farms is £1.6 billion, equivalent to almost £3.4 million per MW. A summary of weighted local and other UK content by expenditure category is shown in Table 3.

Table 3 Summary of content by geographic region aggregated across the eight wind farms.

Category	Region	% content of TOTEX	% content of category
DEVEX	Local	0.2%	11.6%
	Scottish	1.5%	74.4%
	UK	2.0%	93.6%
CAPEX	Local	1.1%	2.3%
	Scottish	9.3%	25.0%
	UK	12.5%	33.8%
OPEX	Local	15.2%	25.1%
	Scottish	40.6%	67.0%
	UK	51.5%	85.1%
TOTEX	Local	16.5%	16.5%
	Scottish	51.4%	51.4%
	UK	66.0%	66.0%

Source: BVG Associates

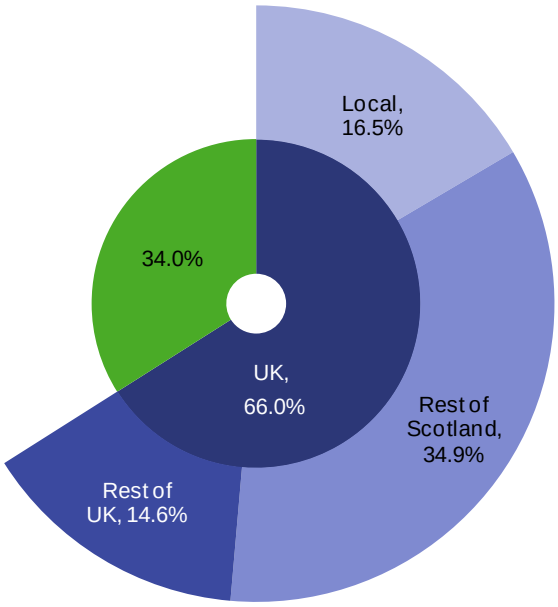


Figure 2 Content by geographic region aggregated across the eight wind farms.

Local content comes from three main sources:

- Local suppliers working on the wind farms
- Accommodation for workers working on the wind farms, and
- Expenditure from community payments, rent and rates.

The variation in local content is primarily because of the selection of significant suppliers that happen to be located in south west Scotland. For OPEX, the main driver for variation is a result of grid charges. TNUoS is estimated to have lower UK content than distribution network charges. The highest levels of local content (shown in Figure 3) were 22% for TOTEX, 21% for DEVEX, 5% for CAPEX and 34% for OPEX.[7]

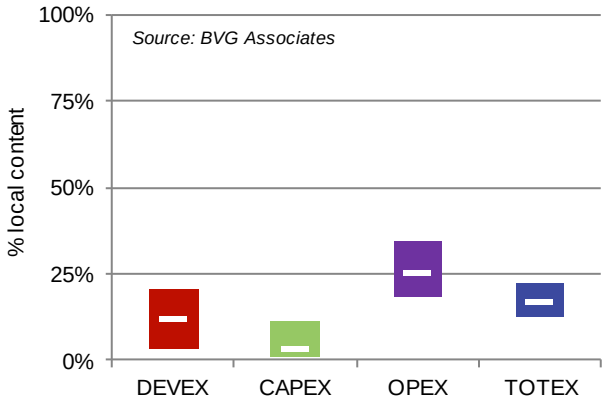


Figure 3 Local content range between wind farms.

[7] These figures do not come from the same wind farm.

Variations in UK content are largely due to differences in the UK content in the CAPEX and this is mainly because of the workforces of the civils contractors. The highest levels of UK content (shown in Figure 4) were 74% for TOTEX, 95% for DEVEX, 42% for CAPEX and 90% for OPEX.[7]

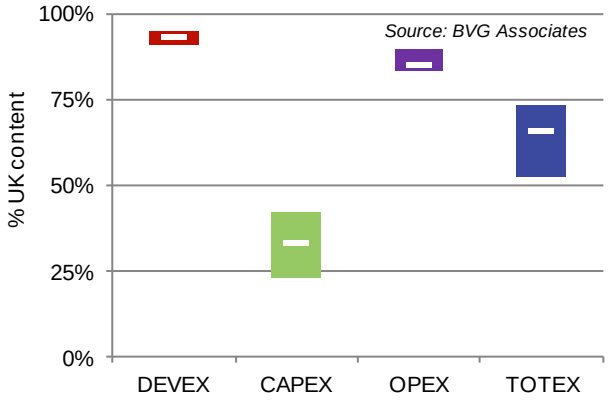


Figure 4 UK content range between wind farms.

Development and capital expenditure

Figure 5 shows UK content in DEVEX and CAPEX to be 36.5%. Table 4 shows 28% of this is Scottish content (76% of the UK figure), including 2.8% local content. The largest contribution to UK content in DEVEX and CAPEX is through civil works, which contributes 25.3%. Turbine is the largest expenditure category within DEVEX and CAPEX but it contributes a smaller amount (1.8%) to UK content than the other expenditure categories.

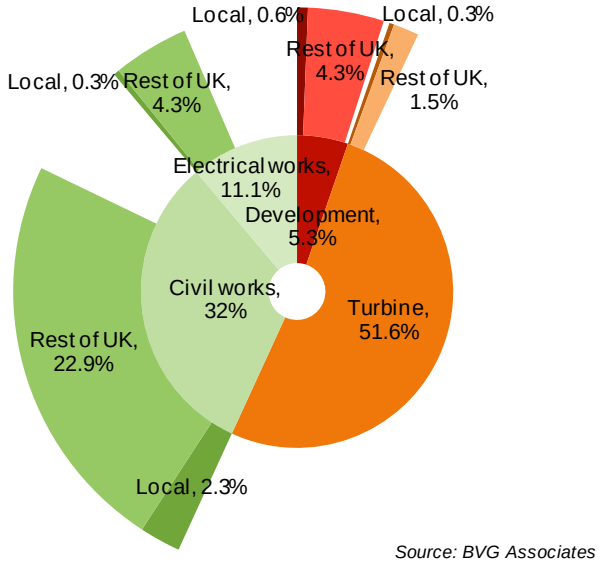


Figure 5 Aggregated UK content (split by local and rest of UK) in DEVEX and CAPEX.

Table 4 shows the aggregated local and UK content figures as a percentage of each expenditure category.

Table 4 Aggregated local, Scottish and UK content within each expenditure category.

Category	Region	% content in DEVEX + CAPEX	% content in category
Development	Local	0.6%	11.6%
	Scottish	4.0%	74.4%
	UK	4.9%	93.6%
Turbine	Local	0.3%	0.6%
	Scottish	1.0%	1.9%
	UK	1.8%	3.5%
Civil works	Local	1.7%	5.3%
	Scottish	21.0%	65.6%
	UK	25.2%	79.1%
Electrical works	Local	0.2%	1.8%
	Scottish	2.0%	18.1%
	UK	4.6%	42.7%
Total DEVEX and CAPEX	Local	2.8%	2.8%
	Scottish	28.0%	28.0%
	UK	36.5%	36.5%

Operational expenditure

Figure 6 shows UK content in OPEX to be 85.3%. Table 5 shows 66.8% of this is Scottish content (78% of the UK figure), including 25.0% local content. The largest contribution to UK content in OPEX is through wind farm OMS, which contributes 68% to UK content.

Source: BVG Associates

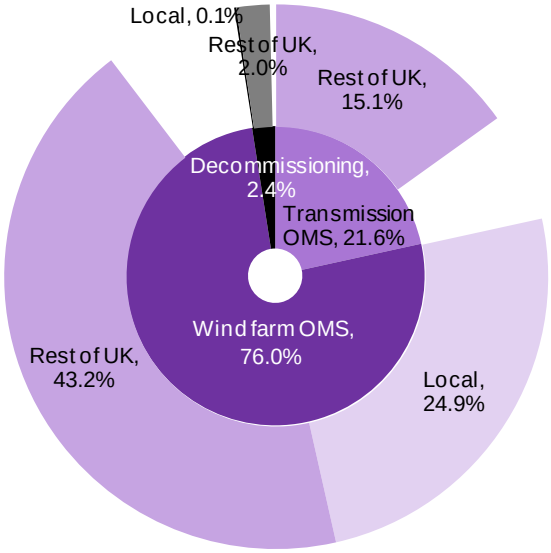


Figure 6 Aggregated local and UK content in OPEX.

Table 5 Aggregated local, Scottish and UK content within each expenditure category.

Category	Region	% content in OPEX	% content in category
Transmission OMS	Local	0%	0%
	Scottish	5.0%	22.7%
	UK	15.1%	68.1%
Wind farm OMS	Local	24.9%	19.0%
	Scottish	60.0%	79.0%
	UK	68.1%	89.9%
Decommissioning	Local	0.1%	4.0%
	Scottish	1.8%	72.0%
	UK	2.1%	84.0%
Total OPEX	Local	25.0%	25.0%
	Scottish	66.8%	66.8%
	UK	85.3%	85.3%

3.2. Economic impact

Economic impact is considered as:

- LVA
- GVA, and
- FTEs.

Earnings and community benefits are also discussed.

In Section 3.2, figures are presented to 2040, which is the projected date for the final decommissioning of five of the wind farms. For the purpose of this study, OPEX has been averaged over the lifetime of the projects. The remaining three wind farms' final decommissioning is projected for 2041. There is also likely to be a good case for either life extension after this or repowering but the impacts of this have not been modelled. There will also continue to be economic impacts from the maintenance of the grid connection and other renewable energy investments.

Table 6 summarises LVA, GVA, FTE years and earnings by expenditure and direct, indirect and induced.

Appendix C includes graphs showing the annual impacts.

Table 6 Economic impacts, 2013 to 2040.

Supply chain element	Type	Local value-added (£million)	Gross value-added (£million)	Local FTE years	UK FTE years	Local earnings (£million)	UK earnings (£million)
Development	Direct	£1.1	£9.0	14	108	0.5	4.3
	Indirect	£0.7	£6.0	23	179	0.5	4.2
	Induced	£0.3	£3.5	5	51	0.1	1.4
	Total	£2.2	£18.5	43	338	1.2	9.9
Turbine	Direct	£1.0	£6.4	13	134	0.6	3.6
	Indirect	£0.7	£4.3	23	140	0.5	3.3
	Induced	£0.3	£2.4	5	42	0.1	1.1
	Total	£2.0	£13.0	42	316	1.2	7.9
Civil works	Direct	£6.5	£96.0	176	2,459	4.4	65.2
	Indirect	£4.3	£64.0	119	1,667	2.9	43.4
	Induced	£2.0	£38.4	44	825	0.9	17.4
	Total	£12.7	£198.4	339	4,951	8.2	125.9
Electrical works	Direct	£0.6	£18.0	15	388	0.4	12.2
	Indirect	£0.4	£12.0	10	283	0.3	8.2
	Induced	£0.2	£7.9	4	154	0.1	3.3
	Total	£1.3	£37.8	29	825	0.8	23.7
Transmission OMS	Direct	£0.0	£88.8	-	1,826	0.0	60.3
	Indirect	£0.0	£59.2	-	1,722	0.0	40.5
	Induced	£0.0	£35.8	-	646	0.0	16.1
	Total	£0.0	£183.8	-	4,194	0.0	116.8
Wind farm OMS	Direct	£142.9	£394.1	3,593	9,553	97.0	267.5
	Indirect	£95.3	£262.7	2,868	7,571	64.5	177.9
	Induced	£39.5	£143.2	818	2,839	19.9	71.3
	Total	£277.7	£800.0	7,278	19,963	181.5	516.7
Decommissioning	Direct	£0.7	£12.2	19	217	0.5	5.8
	Indirect	£0.5	£8.1	14	243	0.3	5.7
	Induced	£0.2	£4.3	4	70	0.1	1.8
	Total	£1.3	£24.6	37	530	0.9	13.3
Total	Direct	£152.8	£624.4	3,829	14,685	103.4	418.7
	Indirect	£101.9	£416.3	3,058	11,805	69.1	283.2
	Induced	£42.5	£235.5	881	4,628	21.3	112.3
	Total	£297.2	£1,276.2	7,768	31,118	193.8	814.2

Gross and local value-added

Total GVA created between 2013 and 2040 is estimated at £1,276 million, of this £297 million is total LVA.[8]

GVA averages £41,000/FTE year between 2013 and 2040. This is typical of activity with a significant level of manual labour. LVA is estimated to average £38,000/FTE year between 2013 and 2040. This is lower than GVA/FTE year because, although there are some significant suppliers in south west Scotland, many of the jobs will be in providing accommodation and local services to the wind farms.

Full-time equivalent years employment

UK FTE years created over the lifetime of the projects is estimated to be 31,118. Of these, local FTE years are created over the lifetime of the projects is 7,768.

A local FTE year is considered as somebody working for a company that is operating within the local (south west Scotland) area.

Earnings

The total UK earnings created over the lifetime of the project is estimated to be £814 million, of this £194 million. is local earnings created over the lifetime of the project. Annual local earnings are on average £25,000/FTE year between 2013 and 2040. Annual UK earnings are on average £26,000/FTE year between 2013 and 2040.

Community benefit

Across the eight SPR wind farms in south west Scotland, the annual funds available for distribution by communities total almost £2.5 million at 2016 prices. Annual contributions by SPR will be index linked. Over 25 years, this gives total community benefit fund (CBF) income of almost £59 million.

An estimated total of 9,300 FTE years is created locally from CBFs. At an estimated average of £23,000 gross earnings per FTE year; this would give additional local area earnings totalling around £213 million at 2016 prices.

Economic impacts from the CBF are included in the economic impact analysis discussed above as they are part of wind farm OMS expenditure. Potential economic impacts arising specifically from CBFs are discussed in more detail in Appendix D.

[8] GVA does not include SPR profits

4. Discussion

The weighted average UK content in TOTEX of the eight wind farms analysed in this study is calculated as 66%. Scottish content is 51%, including 16% Local Content. These figures can be usefully compared with data for other onshore wind farms and for offshore wind farms. This section will focus on the results for local and UK content because they provide data that can be readily compared with other analyses.

4.1. Onshore wind UK content

The most recent public analysis was conducted by BVGA for EDF Energy Renewables (EDF) in relation to its planned development of wind farms on the Isle of Lewis.[9] Table 7 shows that UK content in TOTEX was calculated to be 56.5% compared with 66% in SPR's fleet of eight onshore wind farms delivered in the period 2016-2017. UK content in the turbine was 10% in the Isle of Lewis study compared with 7% for SPR's projects. The main reason for this was the assumption of UK-sourced towers for the EDF projects. Similar conclusions were reached for civil and electrical works. The main reason for the differences in UK content in TOTEX is because of differences in the proportion of costs between expenditure categories, and in particular the ratio of OPEX to CAPEX, which is higher in this study. If UK content in OPEX is high and it forms a higher proportion of TOTEX, it leads to a higher UK content in TOTEX.

Table 7 UK content in planned wind farms on the Isle of Lewis.[9]

Category	% of TOTEX	Country	% content of TOTEX	% content of category
DEVEX	4.8%	UK	4.3%	90.0%
		Non-UK	0.5%	10.0%
CAPEX	49.2%	UK	13.3%	27.1%
		Non-UK	35.8%	72.9%
OPEX	46.1%	UK	38.9%	84.5%
		Non-UK	7.1%	15.5%
TOTEX	100.0%	UK	56.5%	56.5%

Before the Isle of Lewis study, the most comprehensive analysis of UK content in onshore wind was undertaken by GL Garrad Hassan and published by RenewableUK in 2010.[10] It reported UK content in TOTEX to be 53.9%, with 24% UK content in CAPEX and 92% in OPEX. The data suggests the projects did not use UK-sourced towers because the study reported a UK content figure for turbines of only 4%.

A second study for RenewableUK, undertaken by Biggar Economics, was published in 2015 and analysed data from 20 wind farms built between 2011 and 2014.[11] It reported a UK content in TOTEX of 69%.This analysis appears to have assumed a UK content of 100% for major contracts, which would be unlikely if the analysis had used the now formally adopted methodology for offshore wind.

In conclusion, the UK content in SPR's wind farms is higher than previously reported for other projects and the main factor appears to be the relative proportions of CAPEX and OPEX. There is uncertainty around content reported for other projects where calculations are solely made using budgetary data.

Comparisons in local content are difficult because the area defined as local is largely dependent on the needs of the organisation that commissioned the study. In both this analysis and the Isle of Lewis study, we used the local authority areas for which at least one wind farm was located. In this current study, local content in TOTEX was 23% compared with up to 24% for the Western Isles.[12] Although similar, the source of the local content was different. In the Western Isles, local content (excluding community benefit expenditures) came from the recruitment of local labour during construction and the presence of a permanent maintenance team on the islands. In this study, the main contribution to local content is the presence in the area of a few significant suppliers.

[9] *Economic benefits from the development of wind farms in the Western Isles,* February 2017, BVG Associates for EDF Energy Renewables. Available online at https://bvgassociates.com/publications/. Last accessed August 2017.

[10] *Onshore Cost / Benefits Study*, November 2010, GL Garrad Hassan for RenewableUK. No longer available online.

[11] *Onshore Wind: Economic Impacts in 2014*, April 2015, Biggar Economics for RenewableUK. Available online at http://www.renewableuk-cymru.com/wp-content/uploads/2015/04/Benefits-of-onshore-wind-report.pdf. Last accessed September 2016.

[12] The local content was constrained by the availability of local labour. At peak periods of construction, more labour needed to be brought onto the island.

4.2. Offshore wind UK content

RenewableUK published offshore wind UK content data in 2017 for DEVEX, CAPEX and OPEX (see Figure 7).[13] It showed an average UK content in TOTEX of 48%. UK content in CAPEX was 29%. This is lower than observed for onshore wind because of the strong non-UK supply chain for offshore foundations and the use of non-UK vessels and contractors for installation. UK content in OPEX is also lower because of the use of non-UK vessels and contractors.

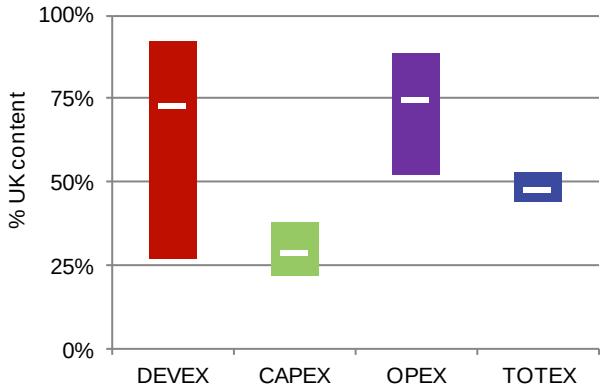


Figure 7 UK content in offshore wind farms. The bars show the range of results from different wind farms.

The Offshore Wind Developers Forum (the predecessor to the Offshore Wind Industry Council) declared in 2012 a 'vision' that the UK content in offshore wind farms would be 50%. Although this is not a formal target, some wind farm owners see this as the benchmark against which their wind farms will be judged.

4.3. Differences between ScottishPower Renewables wind farms

Figure 3 and Figure 4 in Section 3.1 show the range in local and UK content respectively for DEVEX, CAPEX, OPEX and TOTEX. For local content, the variation is primarily due to the presence of suppliers in the local area. In these cases, the local presence is largely coincidental and their designation as local companies is based on the presence of the Blacklaw wind farm extensions. If the Blacklaw wind farm extensions were excluded, the content associated with these suppliers would have been classified as a combination of Scottish and UK content.

For UK content figures the variation between wind farms comes mainly from CAPEX and, in particular, the civils contract. Most of the civils contractors delivered the work from Scottish offices using a UK labour force. Local and community impacts

Major components of OPEX are land rent, voluntary community benefit payments and business rates. We have assumed significant of local content in the expenditure of these payments. They therefore dominate the local content figures. Cumulative local employment impacts will be substantial over the lifetime of the projects.

4.4. Conclusions

The results from this analysis show that the local and UK content in the eight onshore wind farms considered is higher than previously reported for other onshore wind farms and offshore wind farms. The main drivers for UK content are:

1. Differential costs for the main packages and areas of expenditure such as turbine, civil works and transmission OMS
2. The recruitment of labour for the civils contract, and
3. The availability of UK-sourced towers.

For SPR's wind farms, the first of these was largely favourable in increasing UK content by virtue of OPEX values being relatively higher than in other studies, either because OPEX was high or because civils or turbine contract prices are lower. For the second, SPR, contracted a civils company who typically use a proportion of labour brought over from the Republic of Ireland, which leads to a lower proportion of UK content.

The only option for UK-sourced towers is CS Wind UK, based in Campbeltown. It did not supply towers for any of SPR's wind farms. It was assumed to be the supplier for the Western Isles wind farms analysis, because EDF Energy Renewables signed a framework agreement covering all its UK onshore wind farms.[14]

[13] *Offshore Wind Industry Investment in the UK: 2017 Report on Offshore Wind UK Content*, September 2017, RenewableUK. Available online at www.renewableuk.com/resource/resmgr/publications/Offshore_Wind_Investment_V4.pdf. Last accessed September 2017.

[14] http://www.cswinduk.com/newsfeed/2

Appendix A: Economic impact assessment methodology

Conventional modeling of economic impacts for most industrial sectors relies on government statistics, for example those based on Standard Industry Classification (SIC) codes and use input-output tables and other production and employment ratios, for example those produced by the Office of National Statistics

SIC code data can be appropriate for traditional industries at a national level. The development of new codes for a maturing sector, however, takes time. This means that conventional SIC analyses of offshore wind need to map existing NAICS data onto offshore wind activities, which is not easy and a source of error. Analyses using SIC codes also have to rely on generalised data.

Offshore wind is ideally suited to a more robust approach that considers current and future capability of local supply chains because:

- Projects tend be large and have distinct procurement processes from one another, and
- Projects tend to use comparable technologies and share supply chains.

It therefore enables a realistic analysis of the local, regional and national content of projects even where there are gaps in the data.

The methodology proposed here has been developed jointly by BVGA and Steve Westbrook of the University of the Highlands and Islands and has been used for a series of major clients,.

The methodology's first input is the cost per MW of each of the 18 supply chain subelements at the time of wind farm completion.

The remaining expenditure is analogous to the direct and indirect gross value added (GVA) created. GVA is the aggregate of labour costs and operational profits. We can therefore model full time equivalent (FTE) employment from GVA, provided we understand some key variables. In our economic impact methodology, employment impacts are calculated using the following equation:

$$FTE_a = \frac{(GVA - M)}{Y_a + W_a}$$

Where:

FTE_a = Annual FTE employment

GVA = Gross value added ($)

M = Total operating margin ($)

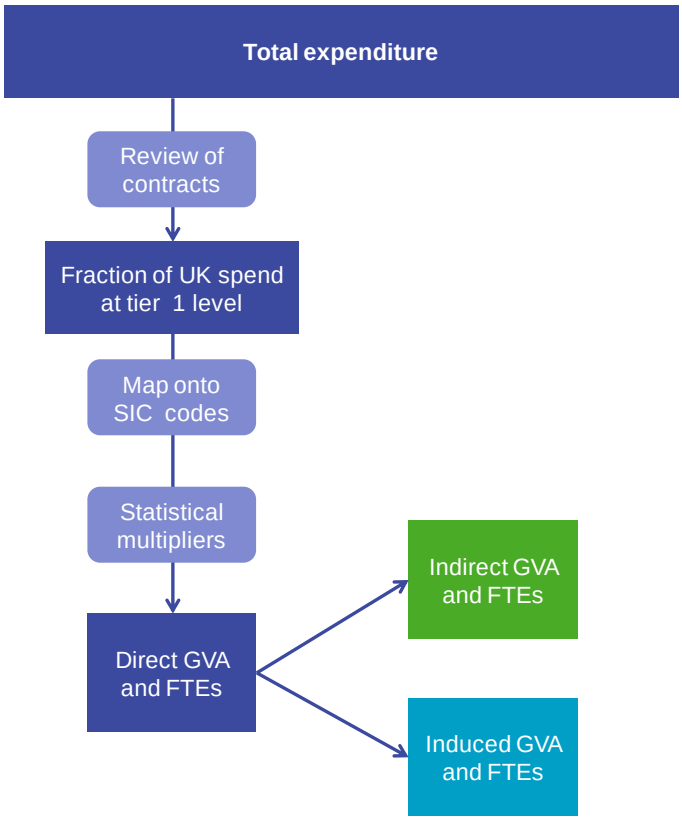
Y_a = Average annual wage ($), and

W_a = Non-wage average annual cost of employment ($).

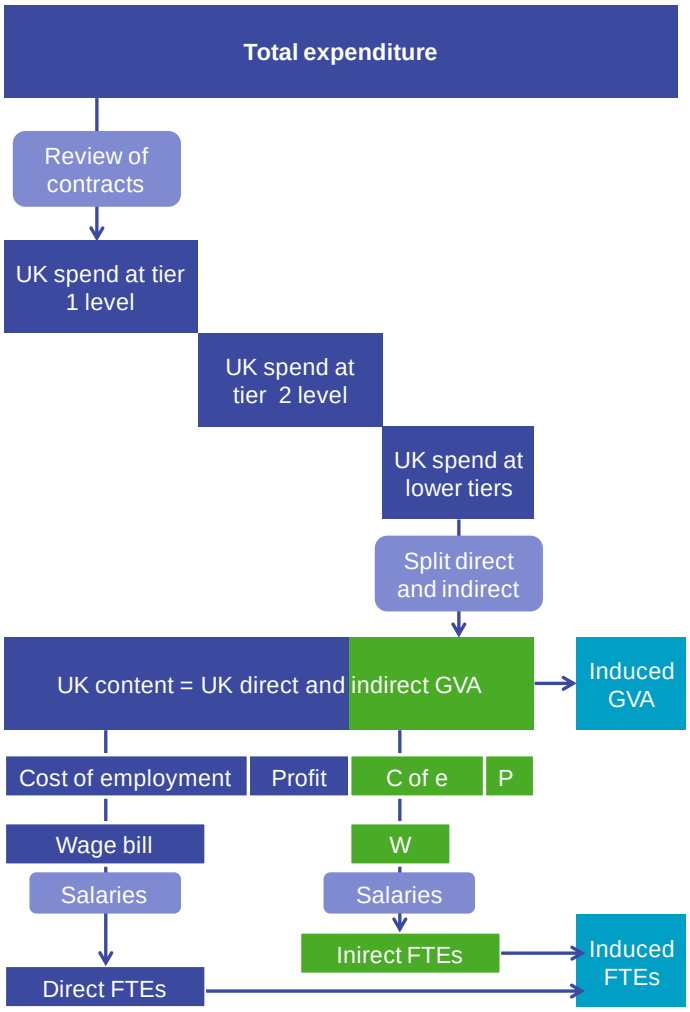
To make robust assessments, therefore, we consider each major component in the offshore wind supply chain and estimate typical salary levels, costs of employment and profit margins, bringing together BVGA's specific sector knowledge and research into typical labor costs for the work undertaken in each supply chain subelement.

Appendix B: Comparison with conventional economic impact methodologies

Conventional method



BVG Associates method



In a conventional analysis, multipliers are used that are based on statistics of expenditure flows in different sectors. Once the analysis has established what contracts have been awarded to companies in the UK, the contractors are associated with one of more sectors used in the Standard Industry Classification. Input-output tables created, for example, by the Office of National Statistics are used to develop multipliers. These multipliers are used to calculate how demand in each of the SIC sectors leads to direct, indirect and induced impacts.

The multipliers used in conventional analysis in effect ignore the supply chain in detail, assuming that sector statistics are valid. The BVGA method is based on the offshore wind UK content methodology that seeks to understand the supply chain in the lower tiers and produces a figure that is equivalent to direct and indirect GVA. Calculating a UK content figure, and having an understanding of profit margins, costs of employment and salaries enables direct and indirect FTEs to be calculated. Induced impacts are calculated using conventional multipliers. The same methodology is followed for local content.

Appendix C: Economic impact graphs

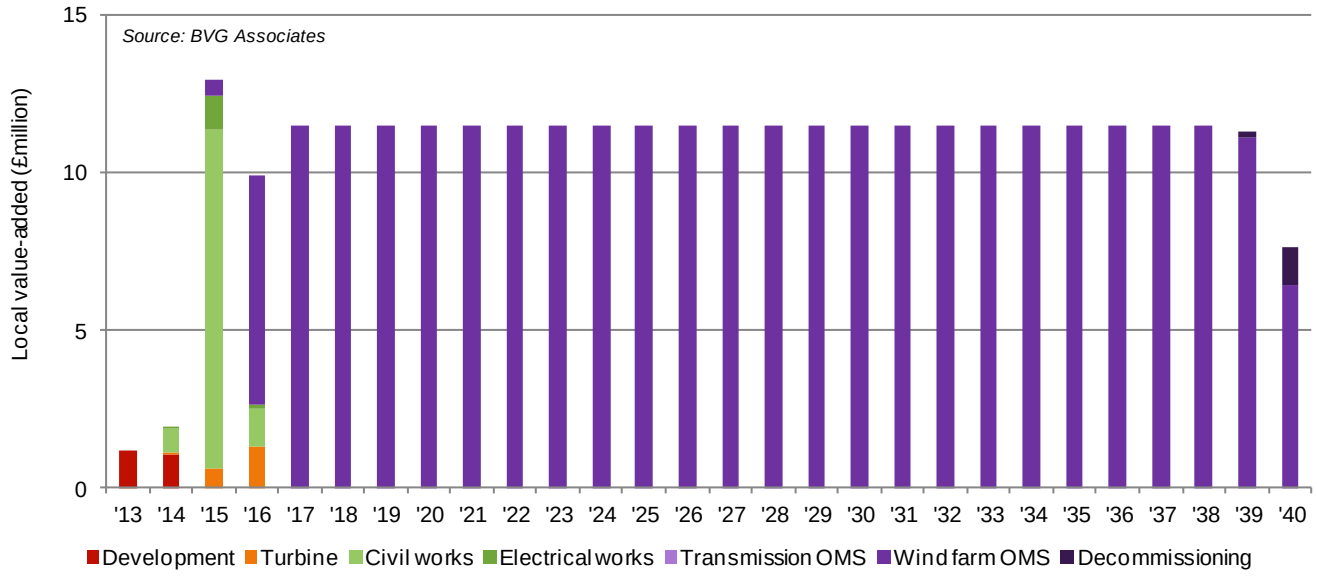


Figure 8 Annual undiscounted local value-added by expenditure type to 2040.

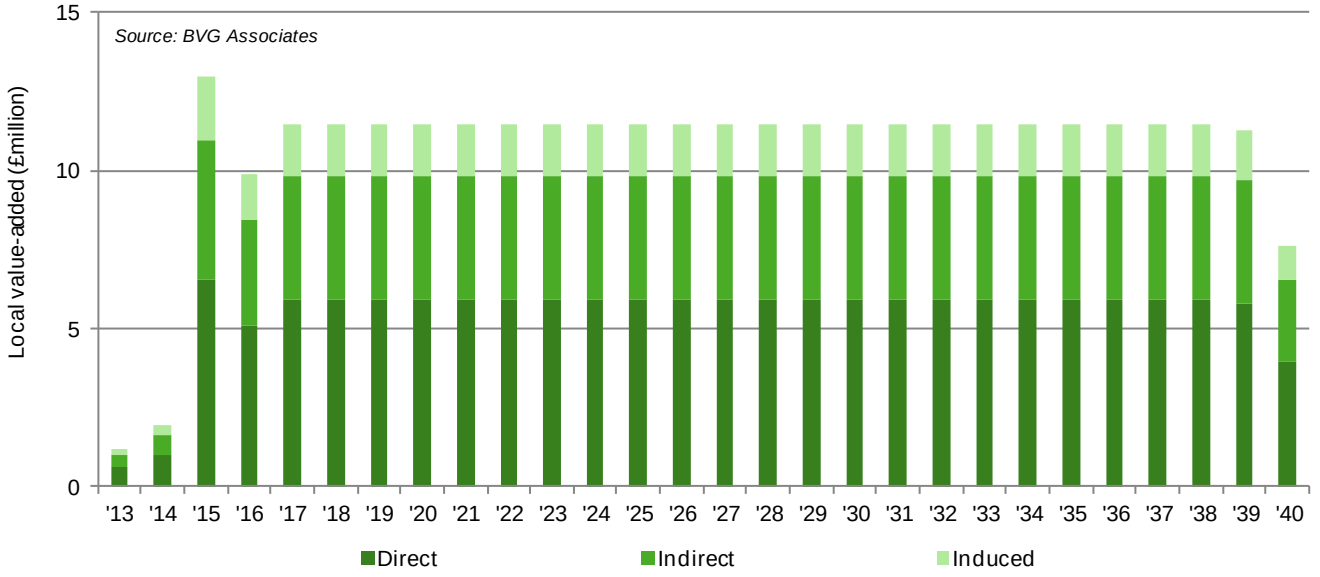


Figure 9 Annual undiscounted local value-added by direct, indirect and induced to 2040.

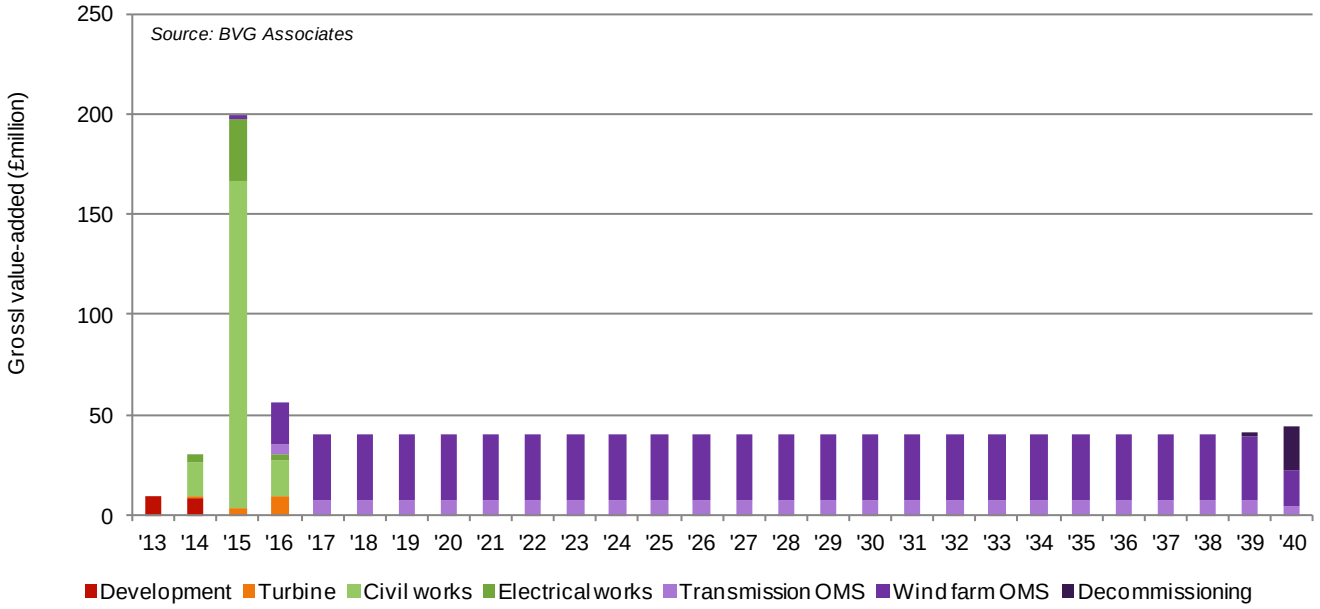


Figure 10 Annual undiscounted gross value-added by expenditure type to 2040.

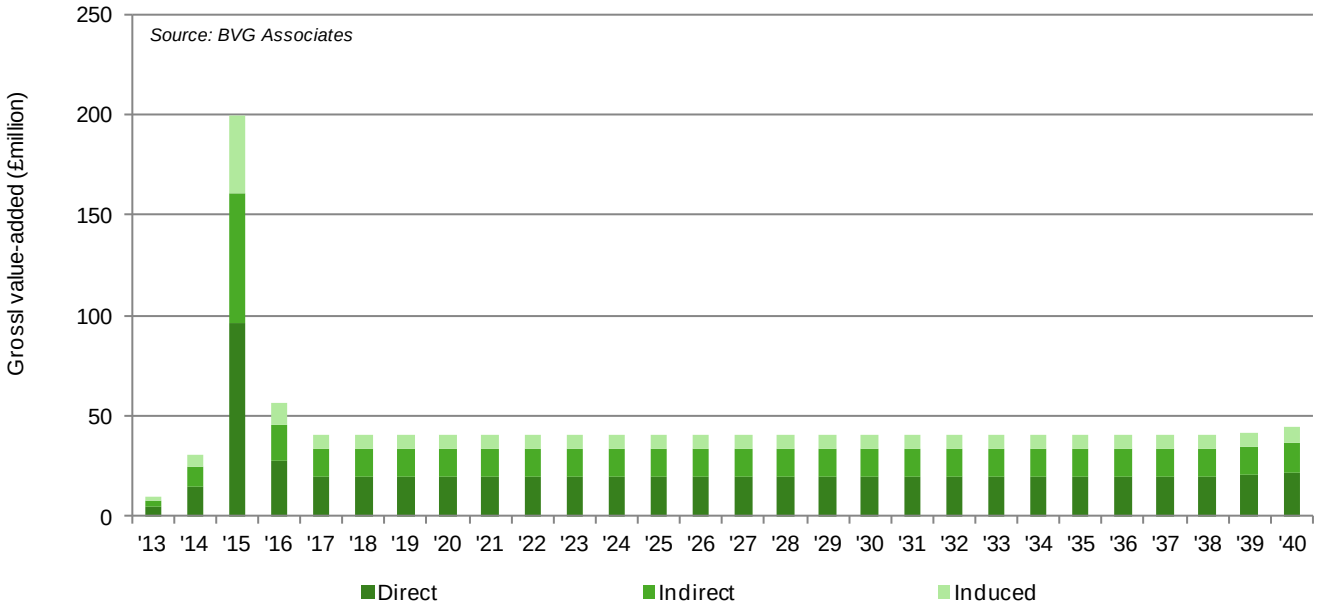


Figure 11 Annual undiscounted gross value-added by direct, indirect and induced to 2040.

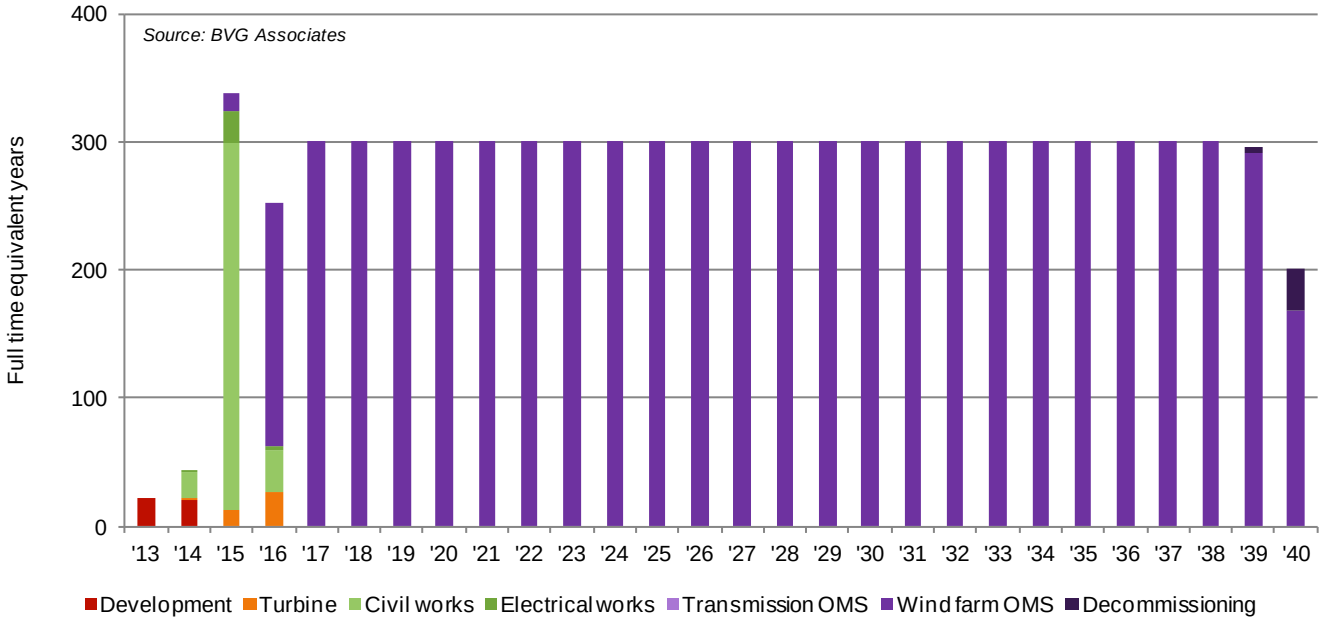


Figure 12 Annual undiscounted local FTEs by expenditure type to 2040.

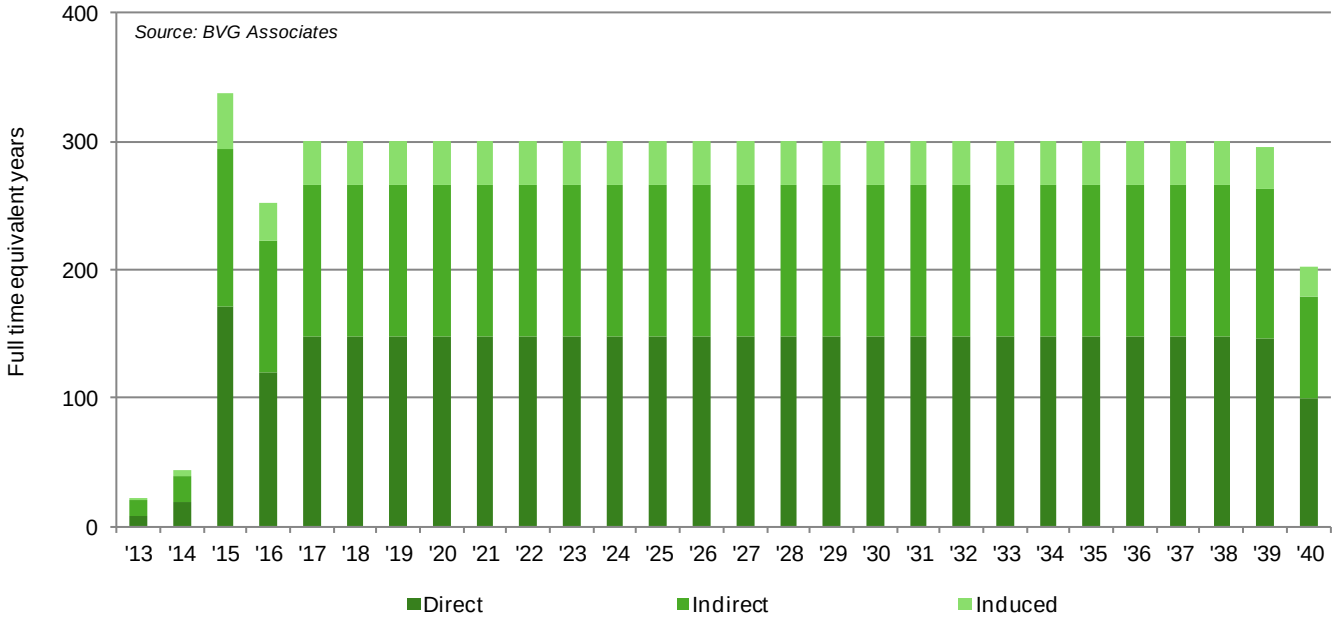


Figure 13 Annual undiscounted local FTEs by direct, indirect and induced to 2040.

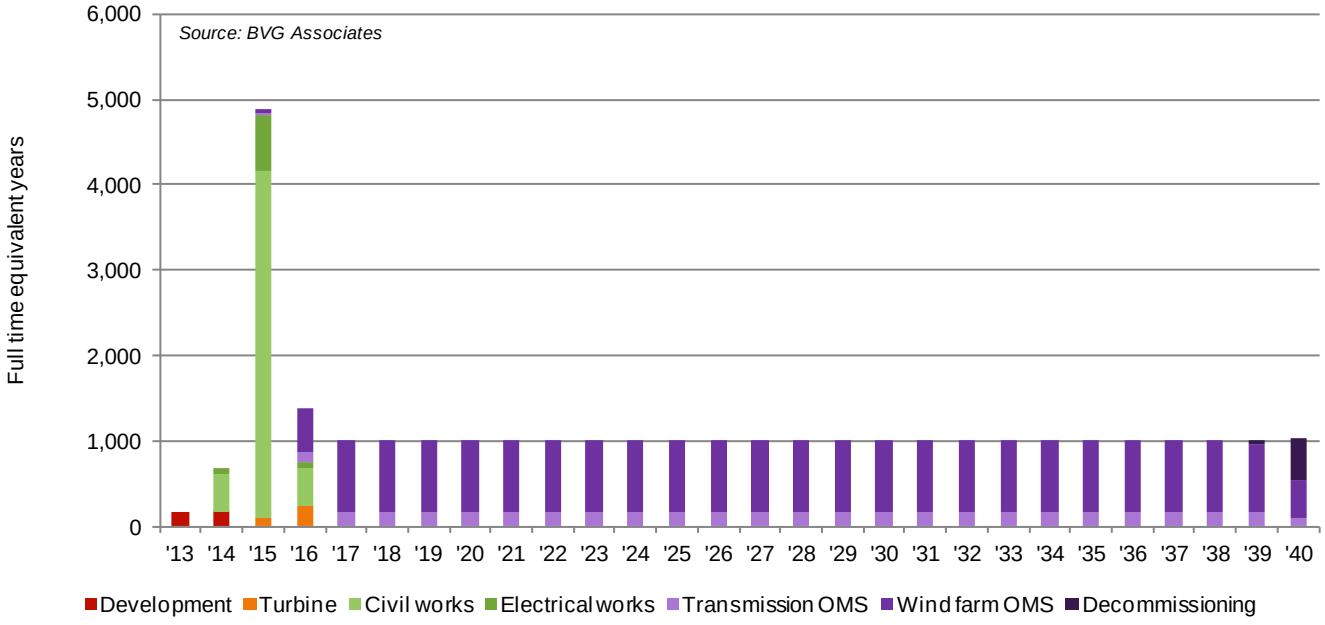


Figure 14 Annual undiscounted UK FTEs by expenditure type to 2040

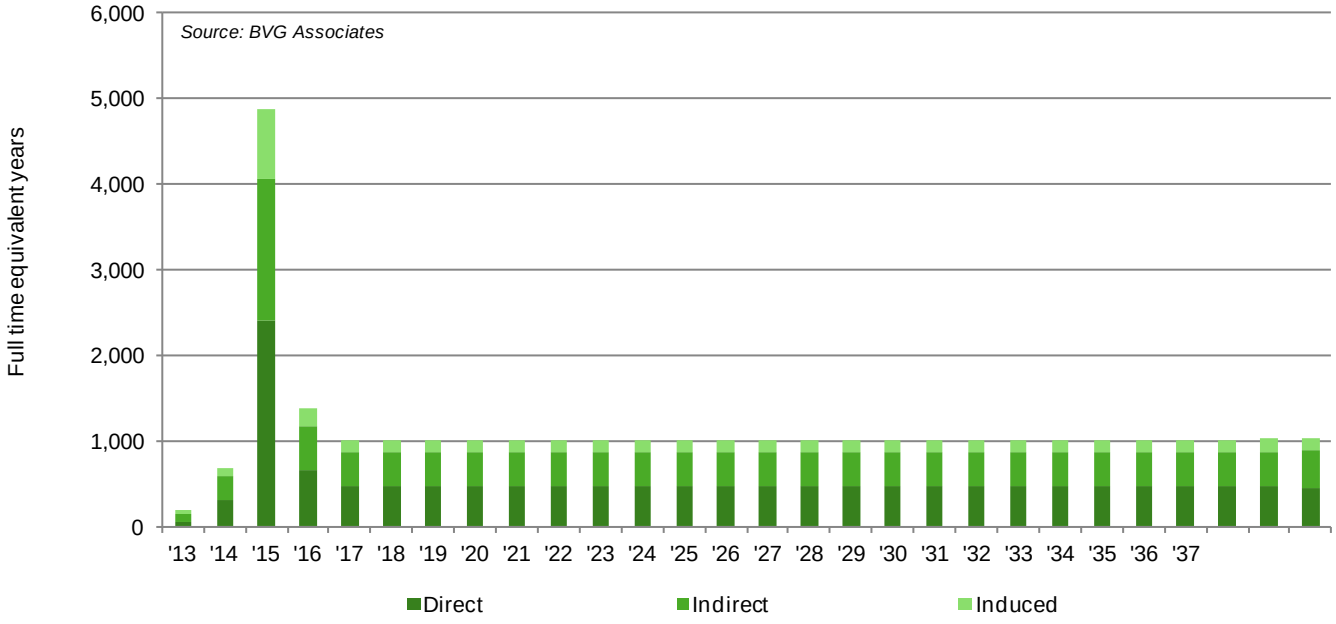


Figure 15 Annual undiscounted UK FTEs by direct, indirect and induced to 2040.

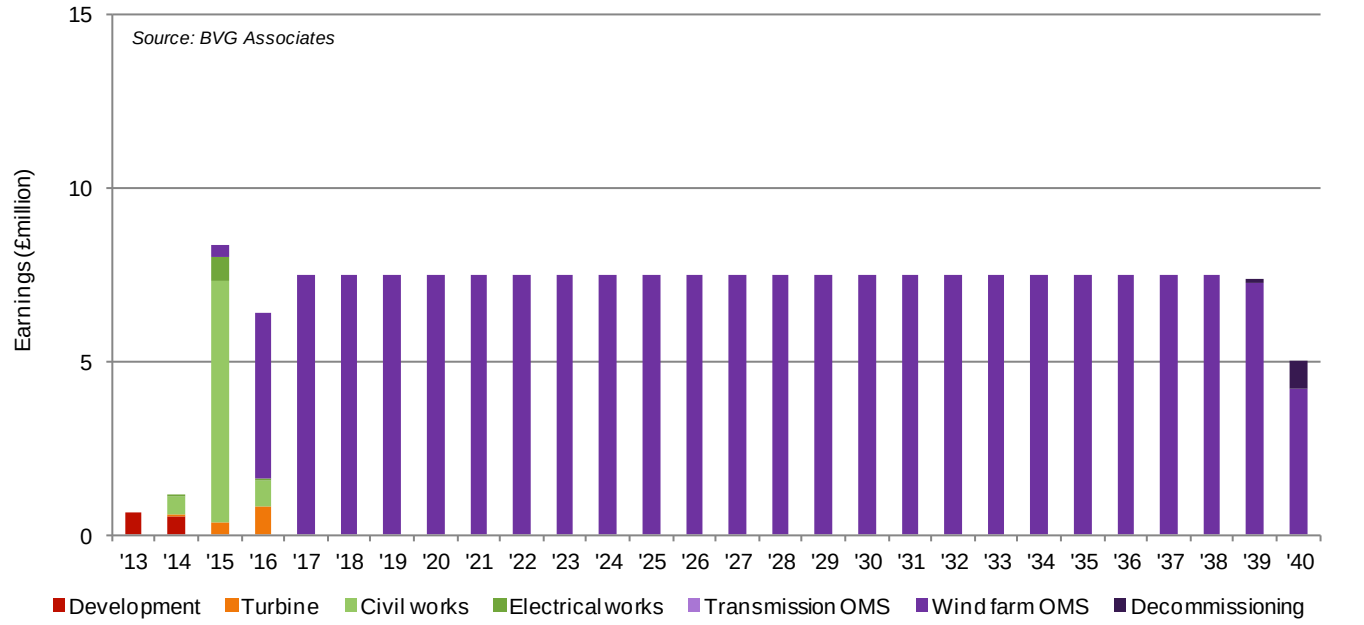


Figure 16 Annual undiscounted local earnings by expenditure type to 2040.

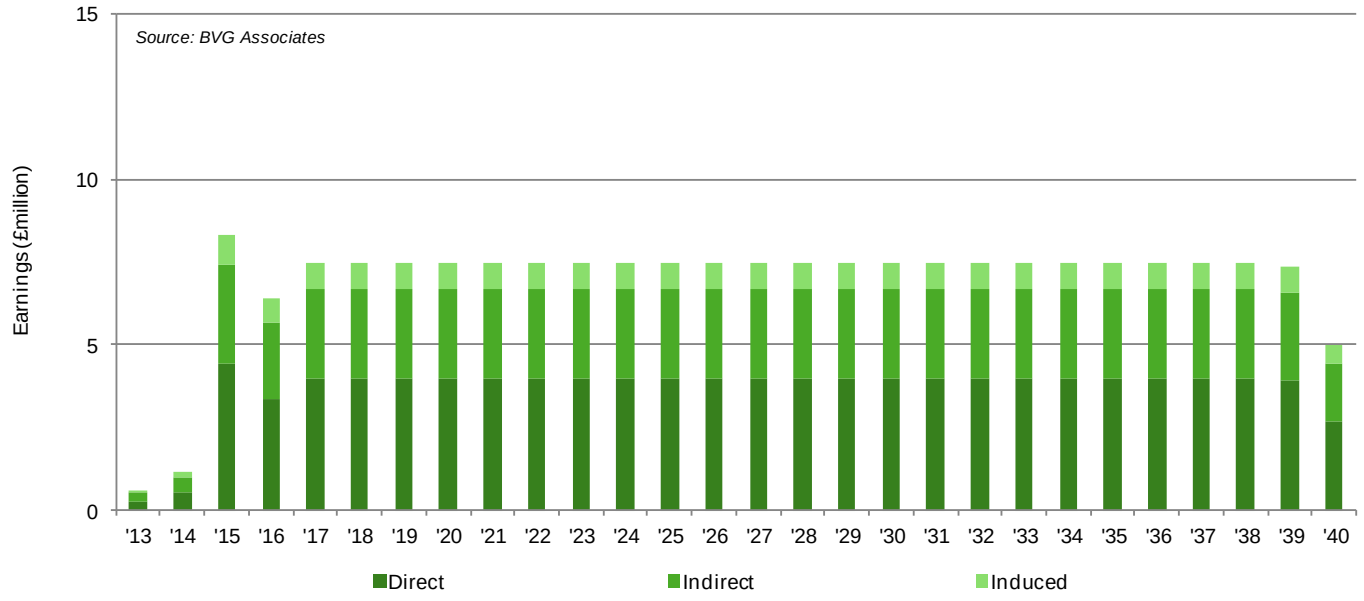


Figure 17 Annual undiscounted local earnings by direct, indirect and induced to 2040.

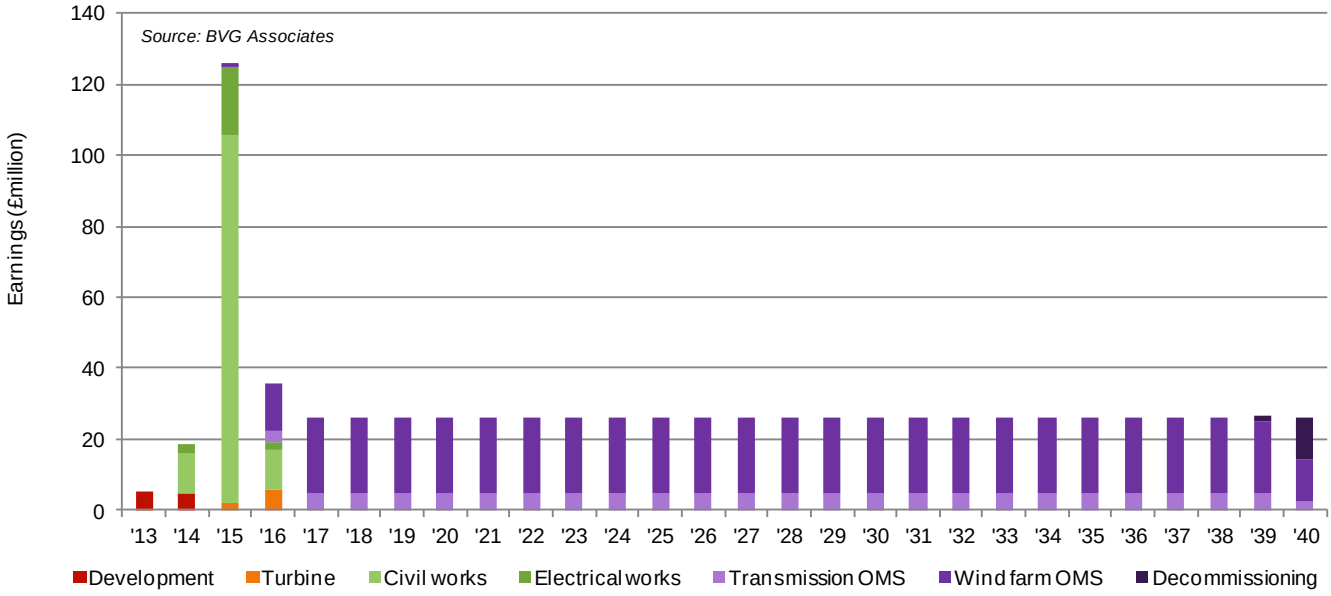


Figure 18 Annual undiscounted UK earnings by expenditure type to 2040.

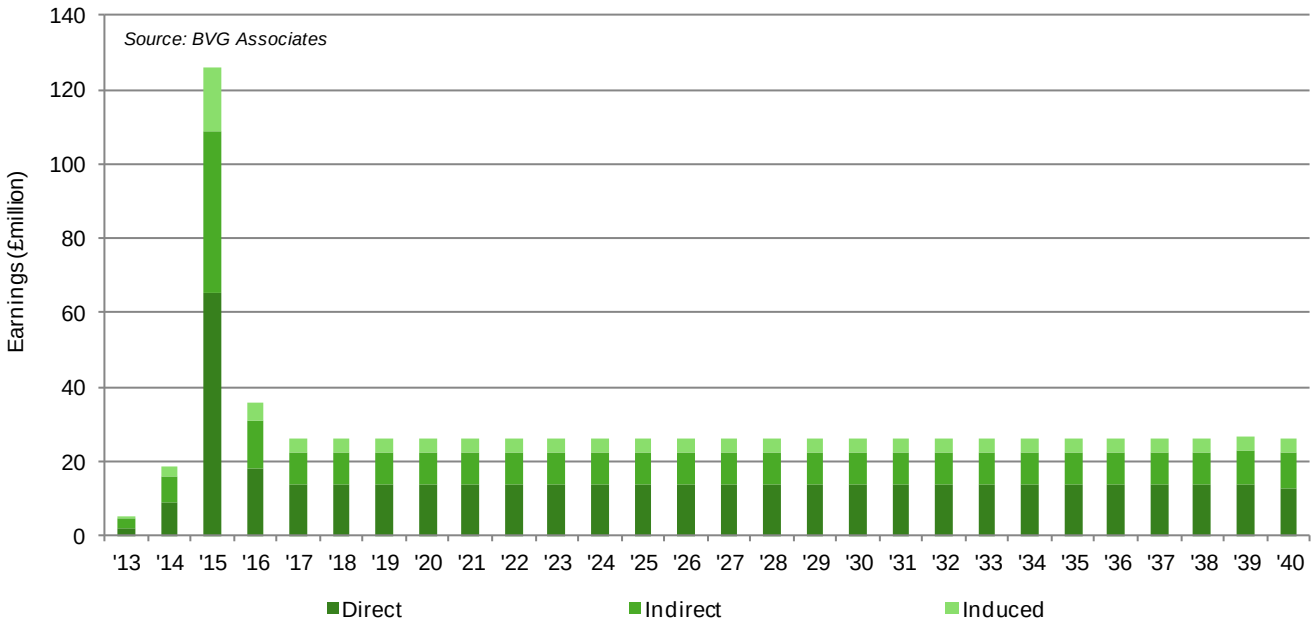


Figure 19 Annual undiscounted UK earnings by direct, indirect and induced to 2040.

Appendix D: Impacts from community benefit funds

In recognition that the communities surrounding its onshore wind farms host an energy facility that is of national benefit, SPR voluntarily provides community benefit funds (CBF). By August 2017, it had voluntarily contributed more than £22 million to communities across the UK. These funds are used for local improvement projects and often focus on promoting local tourism, providing bursaries for further education or improving and extending local facilities and services. SPR CBFs are managed locally and can be administered by the local communities. This allows local people to determine what initiatives are of greatest benefit to their community.

Across the eight SPR wind farms in South West Scotland, the annual funds available for distribution by communities total almost £2.5 million at 2016 prices. Over 25 years, at 2016 prices, this gives total community benefit fund (CBF) income of £59 million. With some constraints set by SPR, including not using the CBF to replace existing statutory funding, these organisations will be able to spend their portion of the CBF across a wide range of economic, social and environmental projects and activities.

Profiling how the CBF will be spent over the 25 years and what impacts will be is only indicative at this stage. The profiling takes into account early experience of spending by the distributing bodies and experience from other communities in Scotland that have planned how CBF money from wind farms and other renewables projects might be spent. Early expenditures are likely to span a range of local recreational and social groups, for example to improve premises, buy new equipment and travel to events. Funding substantial capital projects is expected to increase in focus over time – for example, investment in new or expanded community halls, sports facilities, tourism / visitor facilities and units for local business development. Some community funded projects will directly create local jobs, for example through construction contracts, operating new facilities and services, or attracting overnight stay visitors; whilst others will make areas more attractive to live in and create employment indirectly through increasing the local population, stimulating business development, improving energy efficiency in properties, town centre improvements, and stimulating private and third sector investment.

Impacts per pound accessed from community benefit funds will be higher where money is used as match funding for applications to the Scottish Government, the Lottery, and other sources across a range of support programmes. In some cases funding may be spent on projects undertaken in partnership with other local organisations. Early examples of spend from community benefit funds in South West Scotland include: purchases of minibuses, a contribution towards the running costs of affordable accessible community transport, shop front improvements, development officer employment costs, contributions to music festival costs (events can bring in visitors from other areas who spend locally), provision of play park equipment, and relief of fuel poverty measures.

Expenditures on community and environmental projects will mainly provide benefits for residents, although in some cases visitors to the area will also benefit from new and improved facilities and services. In relation to economic benefits, the focus below is on employment impacts within the local (south west Scotland) area as defined for the purposes of this report. There will be wider UK benefits, for example through construction and other development work undertaken within the area by companies or people from outside the area and operational expenditures on supplies and services from outside the area, as well as “induced” impacts through the multiplier. UK or Scotland benefits, however, are not possible to profile meaningfully net of displacement. Net impacts will be significantly lower in the UK and Scotland than in the local area due to expenditures by local residents and visitors in the area rather than in other areas, or by Lottery and other funding that would otherwise have gone to projects in other areas. A possible breakdown of community benefit spend over 25 years across the wind farms is assumed in Table 8.

Table 8 Community benefit spend by category of project.

Category	Spend per £million of revenue
Business development projects	£100,000
Community buildings and facilities	£500,000
Tourism and visitor facilities	£100,000
Community transport	£50,000
Energy efficiency measures	£100,000
Miscellaneous social and environmental projects and activities	£150,000

Construction

Across the above categories of spend it is assumed that £700,000 per £1 million of community benefit funding is spent on new or improved buildings, equipment, improved facilities and work by trades people that would support local employment. Adding levered funding from external sources such as the Scottish Government and Lottery funding might increase this to £1 million. Inclusive of

indirect and induced impacts this might, on average, support 15 FTEs in South West Scotland per £1 million of spend. This would give a total impact over 25 years of 885 FTE years.

Business development projects

Exclusive of construction, business development spend of £100,000 might support four FTEs inclusive of indirect and induced impacts, with FTEs lasting an average of 10 years. This allows for some support funding from external agencies such as Scottish Enterprise. This would give a total impact over 25 years of 2,360 FTE years.

Community buildings and facilities

It is assumed that buildings and improved facilities costing the community £500,000 (plus levered funding) might support, over twenty years from when the expenditures are made, an average of three FTEs per year, inclusive of indirect and induced impacts – including management, administration, maintenance, and other supplies and services for activities (excluding voluntary inputs). These impacts take into account support funding that might be provided under category seven below. This would give a total over 25 years of 3,540 FTE years.

Tourism and visitor facilities

It is assumed that new and improved tourism / visitor facilities might generate additional visitor spend in the area through day trips and overnight stays. This could total £90,000 per year from development spend of £100,000 (plus levered funding), inclusive of entry and parking charges that would support direct employment. Inclusive of indirect and induced impacts, each £60,000 of visitor spend in the area might support one FTE job year. This would give a total over 25 years of 1,770 FTE years.

Community transport

On average, spend of £50,000 on community transport provision and subsidies might generate one FTE year of local work for 10 years, inclusive of indirect and induced impacts. This would principally relate to driving and vehicle maintenance. This would give a total over 25 years of 590 FTE years.

Energy efficiency measures

Related employment impacts, where applicable, are covered under construction and business development impacts above.

Miscellaneous social and environmental projects and activities

Excluding impacts already covered above, it is assumed that expenditure of £150,000 might on average support two FTE years in the years in which the expenditures are made. This would give a total over 25 years of around 120 FTE years.

Table 9 summarises the FTE year impacts from CBFs. At an average of £23,000 gross earnings per FTE year, this results in local area earnings totalling around £170 million at 2016 prices.

Table 9 Summary of FTE year impacts from community benefit funds.

Breakdown	FTE years
Construction	885
Business development projects	2,360
Community buildings and facilities	3,540
Visitor facilities and sites	1,770
Community transport	590
Miscellaneous social and environmental projects and activities	120
Total	**9,265**