Economic Impact of Beatrice Offshore Windfarm Limited

A Report to Beatrice Offshore Windfarm Limited
23 July 2019

Contents

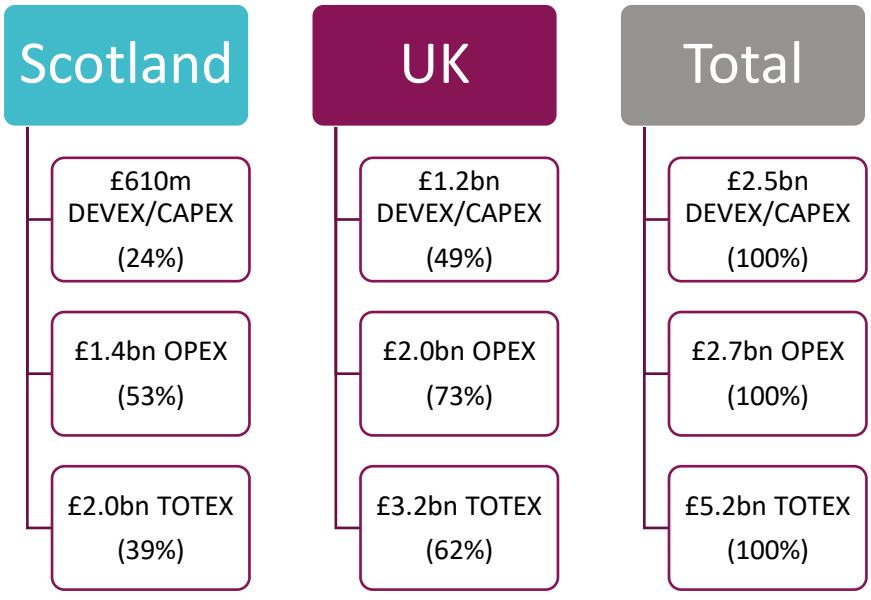
1. Executive Summary

The development, construction and operation of Beatrice Offshore Windfarm Ltd has generated a significant level of economic activity in the Scottish and UK economies and will continue to do so over the next 25 years.

Beatrice Offshore Windfarm Ltd project (BOWL) required an investment of £2.5 billion during its development and construction, making it the largest ever private sector investment in Scottish history. The Scottish economy benefited from the opportunities that this investment created and Scotland's share of contracts was worth £610 million during these phases. This is equivalent to 24% of the total development and capital expenditure. Half of the total contract value was secured across the UK, equivalent to £1.2 billion.

The impacts have been measured across three different project stages: development expenditure (DEVEX), capital expenditure (CAPEX) and operational expenditure (OPEX) and greatest opportunities for the Scottish and UK economies are still to come. During the 25-year operational life of BOWL, it is expected that £2.7 billion will be spent on the operations and maintenance of the wind farm. Companies and organisations in Scotland are expected to be awarded contracts worth approximately £1.4 billion during this period and across the UK the value is expected to be £2.0 billion. Therefore, over the lifetime of the project, it is expected that Scotland may secure a share of contracts worth £2.0 billion and that the UK may secure contracts worth £3.2 billion, equivalent to 39% and 62% of the TOTEX respectively.

Figure 1.1 BOWL Contract Values and Shares by stage



This expenditure will drive economic activity through the Gross Value Added (GVA) and jobs that it supports. During the development and construction phase, BOWL supported:

- **7,200 job years** and generated **£460 million GVA** in Scotland; and

- **19,100 job years** and generated **£1.3 billion GVA** in the UK.

This economic activity and jobs include those directly employed by BOWL and its contractors, the supply chain companies who have allocated a proportion of their time to BOWL and the wider economy in which the wages of these workers are spent.

The sectors that benefited most during the development phase were professional, scientific and technical services. During the construction phase of the project, the sectors that benefited most were in engineering sectors, in particular those associated with the manufacturing of fabricated metal products and mining support services.

The economic impacts during the operational phase of the project will be long term and this phase represents the largest economic opportunity to both the Scottish and UK economies. In an average year, BOWL is expected to support:

- **370 jobs** and **£34 million GVA** in Scotland; and
- **800 jobs** and **£72 million GVA** in the UK.

The sectors that are expected to benefit most from the operations and maintenance contracts will be network operations and the construction sector.

During the operational phase of BOWL, the cumulative economic benefit is expected to be:

- **£850 million GVA** in Scotland with a net present value of **£540 million GVA**; and
- **£1.8 billion GVA** in the UK with a net present value of **£1.2 billion GVA**.

When the development, construction and discounted operational impacts are combined the total impact is expected to be:

- **£1.0 billion GVA** in Scotland; and
- **£2.4 billion GVA** in the UK.

2. Introduction

In 2019, BiGGAR Economics was commissioned by Beatrice Offshore Windfarm Limited (BOWL)[1] to undertake an economic impact assessment of the wind farm's development, construction and operation.

2.1 Background

BOWL is the largest offshore wind farm in Scotland, with 84 turbines and a combined capacity of 588MW, enough to power 450,000 homes per year. It is located 13km from the Caithness coast, with a significant onshore presence in Wick and in Moray.

Onshore construction began in May 2016, offshore construction began in April 2017 and the first turbine was installed in July 2018. The last turbine was installed in May 2019 when the site became fully operational. BOWL required a £2.5 billion[2] investment in its development and construction making it the largest private sector infrastructure investment in Scotland to date.

2.2 Previous Study

In 2017, SSE Renewables, with support from NEF Consulting, undertook an economic impact assessment of BOWL. The study was based on estimated development and capital expenditure of £2.6 billion, using actual expenditure that had occurred by 2017 and extrapolating the total impact based on that data. It found that 22% of CAPEX expenditure would be within Scotland and 45% would be within the UK.

It was estimated that, including direct, indirect and induced impacts, BOWL would contribute £1.13 billion GVA to the UK economy, supporting 18,100 job years of employment. In Scotland it would contribute £530 million GVA to the economy and support 5,800 job years of employment.

2.3 Report Structure

The remainder of this report is structured as follows:

- Chapter 3 quantifies the economic impact of BOWL; and
- Chapter 4 provides the methodology used to assess the economic impacts of BOWL.

[1] BOWL is a joint venture partnership between SSE Renewables (40%), Copenhagen Infrastructure Partners (35%) and Red Rock Power Limited (25%) with development, construction and now operation led by SSE Renewables on behalf of the partnership.
[2] The total investment in BOWL was £100 million less than the initial budget of £2.6 billion

3. Economic Impact of BOWL

This section discusses the economic impacts associated with BOWL in Scotland and the UK.

The impacts considered in this chapter are:

- development impacts, which arise from the initial phase of developing BOWL;
- capital impacts, arising from the cost of building BOWL; and
- operational impacts, which relate to the operation and maintenance of BOWL.

3.1 Development Expenditure

The cost of developing BOWL was £24 million. This phase of the project involved the initial designs of the wind farm and the process of gaining the appropriate consents required to proceed with the construction. During this phase, companies in Scotland were awarded contracts with a value of £20 million, equivalent to 81.6% of the total development expenditure (DEVEX). Across the UK companies were awarded contracts with a value of £22 million, equivalent to 93.3% of the DEVEX.

Table 3.1 Development Expenditure by Study Area (£m)

	Scotland	UK	Total
Turnover	20	22	24
Turnover (%)	81.6%	93.3%	-

Source: SSE Renewables/BiGGAR Economics Assumptions

By applying the GVA/turnover ratio to each transaction it was estimated that the direct impact in Scotland and the UK would be £10 million GVA and £12 million GVA respectively.

To fully capture the impacts of this spending it is necessary to consider the activity further down the supply chain (indirect impacts) and activity that results from the spending of staff salaries (induced impacts). These impacts are estimated by applying Type I and Type II multipliers to the direct GVA (more details on the methodology are described in Section 4). Therefore, it was estimated that the total impact would be £16 million GVA in Scotland and £27 million GVA in the UK.

Table 3.2 Economic Impact of Development Expenditure, GVA (£m)

	Scotland	UK
Direct impact	10	12
Indirect impact	3	7
Induced impact	3	8
Total	**16**	**27**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

The main categories of development spend related to the development of the Environmental Statement and preliminary engineering works. Many industries were involved in this phase of the project however some industries had a greater role than others. In both Scotland and the UK, the largest component of impact is within the

professional, scientific and technical services sector. Other areas of significant spend include fabricated metal products and construction.

The contracts also supported employment in the companies that were awarded them and throughout the wider economy. During the development phase expenditure was managed through a series of short-term contracts. Therefore employment is measured in terms of the number of years of employment these contracts supported.

Directly, the contracts that were awarded during the development phase had an impact of 160 job years of employment in Scotland and 170 job years of employment in the UK. By applying employment multipliers, it was estimated that the total employment impact was 240 job years in Scotland and 400 job years in the UK.

Table 3.3 Economic Impact of Development Expenditure, Employment (job years)

	Scotland	UK
Direct impact	160	170
Indirect impact	50	110
Induced impact	40	120
Total	**240**	**400**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.2 Capital Expenditure

At the time of writing, BOWL's total capital expenditure (CAPEX) was £2.5 billion[3], of which, contracts with a value of £590 million were secured in Scotland. This is equivalent to 23.7% of the total CAPEX. The UK secured contracts with a value of £1.2 billion, equivalent to 49% of the total CAPEX. Some of the contracts secured in Scotland/the UK will include companies with an international presence and a significant operational base in Scotland/the UK, in which case a proportion of this contract has been assumed to take place in Scotland/the UK.

Table 3.4 Capital Expenditure by Study Area (£m)

	Scotland	UK	Total
Turnover (to date)	530	1,110	2,260
Turnover (%)	23.7%	49.1%	-
Turnover (upon completion)	590	1,220	2,480

Source: SSE Renewables/BiGGAR Economics Assumptions

As with DEVEX, the direct impact of CAPEX was estimated by applying GVA/turnover ratios to the contract values. The indirect and induced impacts were then captured by applying Type I and Type II GVA multipliers. Therefore, the direct impact in Scotland was estimated to be £450 million GVA in Scotland and £1.3 billion GVA in the UK.

[3] At the time of writing, BOWL's total capital expenditure (CAPEX) was £2.3 billion. Once all payments have been finalised the total CAPEX figure is expected to increase by 10% to £2.5 billion. Expenditure and impacts associated with CAPEX were grossed up to match this figure and this has formed the basis for impacts reported in this section.

Table 3.5 Economic Impact of Capital Expenditure, GVA (£m)

	Scotland	UK
Direct impact	270	570
Indirect impact	100	360
Induced impact	80	340
Total	**450**	**1,270**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

As with DEVEX, some industries benefited more than others from the contracts awarded during the CAPEX phase. In particular, the engineering sector in Scotland has benefitted the most from the CAPEX phase of BOWL. Contracts awarded during this phase involved a range of companies and activities, the largest of which has been those associated with the manufacturing of fabricated metal products sector. The total impact from the contracts awarded to these companies was £120 million GVA in Scotland.

The largest industry to benefit from the CAPEX phase of BOWL in the UK is the offshore support industry, which is officially classified as 'Mining Support Services' and includes companies that have previously worked in the oil and gas sector providing support activities for oil and natural gas extraction. The total impact from the contracts awarded to these companies was £380 million GVA in the UK.

The construction sector was the second largest beneficiary and driver of impact, with a total GVA impact in Scotland of £100 million. Electrical equipment was also a significant source of impact, as well as other professional, scientific and technical services and architectural and engineering services. Across the UK, the construction and manufacturing of electrical equipment sectors represented the second and third largest value added to the economy, as both sectors contributed between £270 and £280 million GVA.

As with DEVEX, the employment impact of BOWL was estimated by dividing turnover by the ratio of turnover/employee and applying Type I and Type II employment multipliers. In this way, it was estimated that the total employment impact was 6,940 job years in Scotland and 18,710 job years in the UK.

Table 3.6 Economic Impact of Capital Expenditure, Employment (job years)

	Scotland	UK
Direct impact	4,110	7,870
Indirect impact	1,630	5,730
Induced impact	1,190	5,110
Total	**6,940**	**18,710**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.2.1 Open 4 Business

During the construction of BOWL, the developer tendered several contracts through the Open 4 Business (O4B) platform, which is an initiative aimed at increasing the local content of major regional projects and supporting the development of the local supply chain in the Highlands and Islands.

The scheme was originally set up by SSE and is now run by Highlands and Islands Enterprise. Through this, the developer awarded several contracts relating to the

construction of the BOWL Substation, Wick Harbour and site transport, in addition to a number of other contracts that were not included in the O4B scheme. These contracts have all been included as part of the modelling exercise.

3.3 Operational Impacts

This section considers the long-term impacts that will occur during the 25-year lifetime of BOWL, referred to here as the operational phase of expenditure (OPEX). These impacts are different from those arising during the development and construction phases of the project due to their longevity. As a result, the impacts in this section are presented in three formats:

- average impact, which considers the average annual impact;
- undiscounted impact, which uses the gross figures provided by the financial analysis; and
- NPV impact, which applies a discount rate to the figures provided in the financial analysis.

The financial projections provided by SSE Renewables indicate that between 2019/20 and 2043/44, a period of 25 years, operations and maintenance expenditure is expected to be £2.7 billion, this excludes the capital repayment component of the Offshore Transmission Owner (OFTO) contract which relates to economic activity that has already occurred during the construction phase.

In order to assess the potential economic impact of this expenditure, it was necessary to make an assumption about the proportion of contracts that could be secured in Scotland and in the UK for each of the main categories of expenditure. In some cases, it was known that the operational expenditure will be fully retained in Scotland or the UK, for example rates payments paid to Scottish local authorities or networks charges paid to National Grid. However, it was necessary to make assumptions about the proportion of other elements of operations and maintenance expenditure that could be secured in Scotland and in the UK for each of the main categories of expenditure. These assumptions were based a number of sources and experience, including:

- SSE Renewables' expertise and experience of operating and maintaining renewable assets;
- BiGGAR Economics' expertise and experience of economic analysis of renewable assets;
- other economic impact studies of renewable projects in the local area; and
- Government data on electricity generation and transmission.

The system use charges will be paid to local and national network operators and the maintenance and operations of their systems. The specialised construction and repair sectors will also benefit from the other operational and contingency contracts.

Applying the percentages of contracts for Scotland and the UK to the total for each category suggests that Scotland could secure 53.3% of the OPEX contracts and that the UK could secure around 73.1%.

3.3.1 Average Annual Impact

Over 25 years, the average annual OPEX was projected to be £110 million, with £60 million taking place in Scotland and £80 million in the UK (the cost and impact over the lifetime of BOWL is discussed in Section 3.3.3).

Table 3.7 Average Operational Expenditure by Study Area (£m)

	Scotland	UK	Total
Turnover	60	80	110
Turnover (%)	53.3%	73.1%	-

Source: BiGGAR Economics Calculations

Applying the appropriate ratios and multipliers indicates that operations and maintenance expenditure would, on average, support £34 million GVA and 370 jobs in Scotland and £72 million GVA and 800 jobs in the UK each year. This includes staff who are based at the operations and maintenance base in Wick.

Table 3.8 Average Economic Impact of Operational Expenditure, GVA (£m)

	Scotland	UK
Direct impact	18	25
Indirect impact	11	33
Induced impact	4	15
Total	**34**	**72**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

Table 3.9 Average Economic Impact of Operational Expenditure, Employment (jobs)

	Scotland	UK
Direct impact	160	230
Indirect impact	130	330
Induced impact	70	240
Total	**370**	**800**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.3.2 Undiscounted Impact

Over its 25 year lifespan, Scotland could secure about £1.4 billion in contracts related to the operation and maintenance of BOWL (53.3% of the total) and the UK could secure around £2.0 billion (73.1%).

Table 3.10 Undiscounted Operational Expenditure by Study Area (£m)

	Scotland	UK	Total
Turnover	1,440	1,970	2,700
Turnover (%)	53.3%	73.1%	-

Source: BiGGAR Economics Calculations

By applying GVA/turnover, as well as GVA multipliers, it was estimated that the total impact of BOWL over 25 years of operation and maintenance would be equal to £850 million GVA in Scotland and £1.8 billion GVA in the UK.

Table 3.11 Undiscounted Economic Impact of Operational Expenditure, GVA (£m)

	Scotland	UK
Direct impact	460	610
Indirect impact	280	820
Induced impact	110	370
Total	**850**	**1,800**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.3.3 Net Present Value Impact

The Net Present Value (NPV) is calculated by applying a discount rate of 3.5% to each year of impact, in order to account for time preference, as discussed in the methodology.

On this basis the NPV of OPEX would be £1.8 billion. Of this £920 million of contracts is expected to be secured in Scotland (51.7%) and £1.3 billion in the UK (71.3%). The discounted proportions of expenditure in Scotland and the UK are lower than the undiscounted proportion as, over time, the share of spending in these areas will increase and the NPV approach places less emphasis on impacts that occur in the future.

Table 3.12 NPV Operational Expenditure by Study Area

	Scotland	UK	Total
Turnover	920	1,260	1,770
Turnover (%)	51.7%	71.3%	-

Source: BiGGAR Economics Calculations

Applying the appropriate ratios and multipliers indicates that operations and maintenance expenditure would support NPV of £540 million GVA in Scotland and £1.2 billion GVA in the UK each year. This is shown in Table 3.13.

Table 3.13 NPV Economic Impact of Operational Expenditure, GVA (£m)

	Scotland	UK
Direct impact	290	390
Indirect impact	180	520
Induced impact	70	240
Total	**540**	**1,160**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.3.4 Community Benefit Fund

There are two community benefit funds that are supported through BOWL:

- the Beatrice Partnership Fund; and
- the Beatrice Community Funds.

The funds are open to applications from the designated communities that surround the coast of the Moray Firth and are decided by panels of experts and local stakeholders. While BOWL is operational, it will provide £6 million to community projects through these two funds which support the identified priorities of each one.

The Beatrice Partnership Fund has funded 58 projects to date, with an average grant award of £31,000. The aims of the Partnership Fund are to support projects which:

- create opportunities for education and employment;
- empower communities to become more resilient and protect vulnerable residents; or
- stimulate sustainable places through meaningful regeneration.

Examples of projects that have been supported through this fund include the Findhorn Social Enterprise Hub and the employment of a community development manager for the Dornoch Area Community Interest Company.

The Beatrice Community Funds have supported 116 projects to date, with an average grant award of £6,000. The aims of the Beatrice Community Funds are to support projects which:

- encourage community activity and promote community spirit;
- ensure adequate access to services for all community members including those with disabilities;
- improve local infrastructure and connectivity;
- build the local economy including opportunities for apprenticeships and training;
- build community capacity and cohesion between groups;
- develop or maintain community assets;
- support heritage, culture and the arts; or
- improve health and wellbeing, including sports.

The projects that have been supported through this fund have included the refurbishment of local play parks for the Lybster Community Improvement Fundraising Group and the funding of a University trip for senior school pupils at Wick High School.

3.4 Total Impacts

The total expenditure (TOTEX) associated with BOWL, including its development, construction and operation over 25 years is estimated to be £5.2 billion, of which 0.5% is expected to be DEVEX, 47.7% is expected to be CAPEX and 51.8% is expected to be OPEX.

Of this expenditure, £2.0 billion (39.4%) is expected to be retained in Scotland and £3.2 billion (61.7%) is expected to be retained in the UK.

Table 3.14 Total Expenditure by Study Area (£m)

	Scotland	UK	Total
DEVEX	20	22	24
CAPEX	590	1,220	2,480
OPEX	1,440	1,970	2,700
TOTEX	**2,040**	**3,210**	**5,200**
TOTEX (%)	**39.3%**	**61.7%**	**-**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

Over the lifetime of the project, the total discounted impact of BOWL is estimated to be £1.0 billion GVA in Scotland, and £2.4 billion GVA in the UK. This is shown by phase in Table 3.15.

Table 3.15 Total Discounted Economic Impact by Phase, GVA (£m)

	Scotland	UK
DEVEX	16	27
CAPEX	450	1,270
OPEX	540	1,160
TOTEX	**1,010**	**2,450**

Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.5 UK Offshore Sector Deal

In February 2019, the UK government published the Offshore Wind Sector Deal[4] as part of the wider UK Industrial Strategy. This includes a target to increase the lifetime UK content of offshore wind farms. In particular, the strategy states:

The sector will have a target of achieving total lifetime UK content of 60% for projects commissioning from 2030 onwards including increasing levels of UK content in the capital expenditure phase.

The methodology that will be used for calculating the level of UK content in offshore wind farms in UK waters has not been agreed. Therefore, the method used to evaluate the sector against this target may differ from the approach taken to calculate the share of TOTEX in this study of BOWL. However, the estimated share of UK TOTEX for BOWL is 61.7% and therefore compares well against this target.

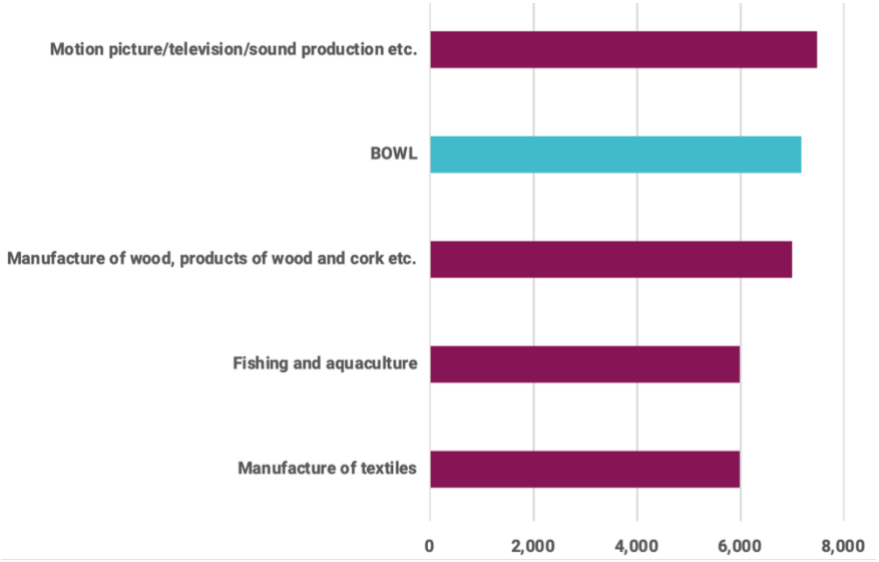
3.6 Impact in Context

The impact of BOWL in Scotland during the development and construction phases is significant and its magnitude is best understood by comparing it to other industries across Scotland.

BOWL supported a total of 7,180 job years of employment in Scotland during the development and construction phase of the project. For comparison, the fishing and aquaculture sectors in Scotland directly employed 6,000 people in Scotland, as did the manufacturing of textiles. The manufacture of wood and wood products employed slightly more, as did the production of motion pictures, television and sound.

[4] HM Government (2019) Industrial Strategy - Offshore Wind Sector Deal

Figure 3.1 Employment Impact of BOWL and other industries in Scotland



Source: BiGGAR Economics Calculations, ONS (2019) - Business Register and Employment Survey 2017

BOWL supported 19,110 job years in the UK during the development and construction phase. For comparison, the forestry and logging sector employs 16,000 people in the UK and the other mining and quarrying sector employs 16,500 people. Three further sectors: sewerage, manufacture of wearing apparel and mining support services sectors each employ around 20,000 people.

4. Methodology

This section gives a detailed discussion of the methodology used to estimate the economic impact of BOWL.

4.1 Metrics of Assessment

The primary metrics of assessment used in this report are:

- Gross Value Added (GVA) – this is a measure of economic value added by an organisation or industry. It is typically estimated by subtracting the non-staff operational costs from the revenues of an organisation; and
- Job years – this is a measure of the employment which is equivalent to one person being employed for an entire year and is typically used when considering short-term employment impacts, such as those associated with construction and infrastructure projects; and
- Jobs – this is a measure of employment which considers the headcount employment in an organisation or industry.

In addition, in some instances where impacts are expected to occur over a number of years, a discount rate has been applied. This allows impacts that occur sooner to be valued more highly than impacts that occur in the future, a concept known as time preference. In this instance a discount rate of 3.5% has been chosen, which is in line with the UK Government's Green Book[5].

4.2 Types of Impact

Impacts have been measured across three different project stages: development expenditure (DEVEX), capital expenditure (CAPEX) and operational expenditure (OPEX). DEVEX and CAPEX have already occurred (or will occur in the very near future), and OPEX is expected to occur in the over the 25-year operational lifetime of BOWL.

There are three significant types of economic impact associated with BOWL:

- direct impact – this is the direct impact associated with Tier 1 suppliers, which will include employing and paying staff, and generating profits;
- indirect impact – this is the impact associated with spending in the supply chain of Tier 1 suppliers; and
- induced impact – this is the impact associated with staff spending their wages in the wider economy.

This approach captures the economic activity that may not be immediately identifiable as deriving from BOWL. For example, if a hotel receives a significant level of custom for half a year from contractors working on BOWL, then the jobs supported in this time at the hotel will be captured in this model. These will be in addition to the direct jobs of the contractors. Similarly, if BOWL procured the services of a helicopter rental company, the helicopter pilot would be included in the jobs impact. A proportion of a mechanics job, who was paid to maintain the helicopter would also be included in this model.

[5] HM Treasury (2018), The Green Book: Central Government Guidance on Appraisal and Evaluation

4.3 Input-Output Modelling

4.3.1 Study Areas
The two study areas for BOWL are:

- Scotland; and
- the UK.

4.3.2 Development Expenditure (DEVEX) and Capital Expenditure (CAPEX)
The first part of the Input-Output modelling exercise was to establish the inputs. This was the cost of each contract, and this data was provided by SSE Renewables, which managed the project. As well as representing a cost to the developer, these transactions represent an increase in turnover to the company providing the service, supporting economic activity.

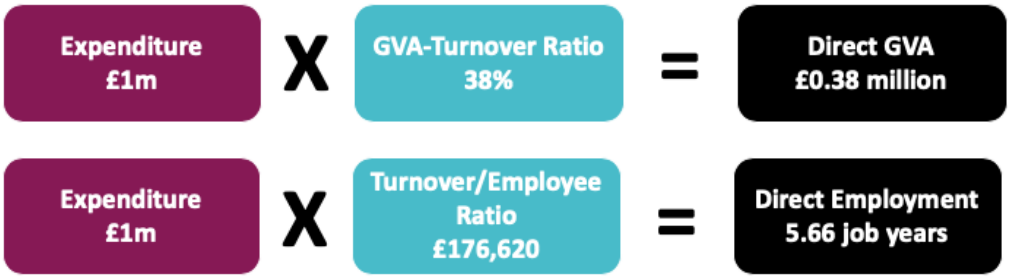
Each transaction was categorised as being either UK or non-UK, and if the contractor was based in the UK it was also considered whether the impact was Scottish or non-Scottish. In some instances, where the supplier is based abroad but a portion of the economic activity is likely to occur in either of the study areas, an assumption was made about the proportion of the contract that might occur in Scotland or the UK.

Transactions were then categorised to one of the Input-Output sectors used by the Scottish and UK Governments in the Input-Output Tables, e.g. construction, mining support services, architectural and engineering services etc. These sectors were used as the basis for estimating GVA and employment impacts. Information on turnover, GVA and employment is sourced from the UK Annual Business Survey (ABS), which is published by the Office for National Statistics (ONS)[6]. In some cases, where data is not available in the ABS, this has been supplemented by data from the UK Input-Output Tables[7] and the Business Register and Employment Survey[8].

For each sector GVA can be presented as a % of turnover and therefore, in order to estimate the direct GVA impact, turnover is multiplied by GVA/turnover. Similarly, to estimate the direct employment impacts turnover in each contract is divided by turnover/employee in the relevant sector.

This is demonstrated in Figure 4.1.

Figure 4.1 Direct Impact



Source: BiGGAR Economics

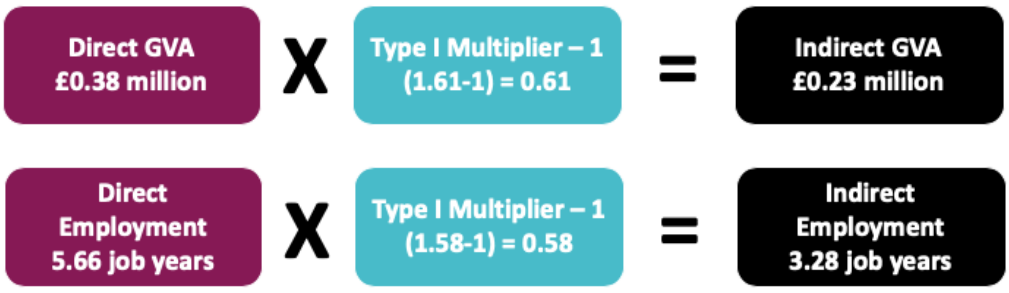
As well as the direct GVA and employment impacts, there will also be indirect and induced impacts associated with spending in the wider supply chain and employees expenditure. These impacts were estimated by applying sector-specific Type I

[6] Office for National Statistics (2018), Annual Business Survey – 2017 Provisional Results
[7] ONS (2018), UK Input-Output Tables 2015
[8] ONS (2019), Business Register and Employment Survey

(indirect) and Type II (indirect and induced) multipliers to the direct impact. These multipliers were sourced from the ONS[9] and the Scottish Government[10].

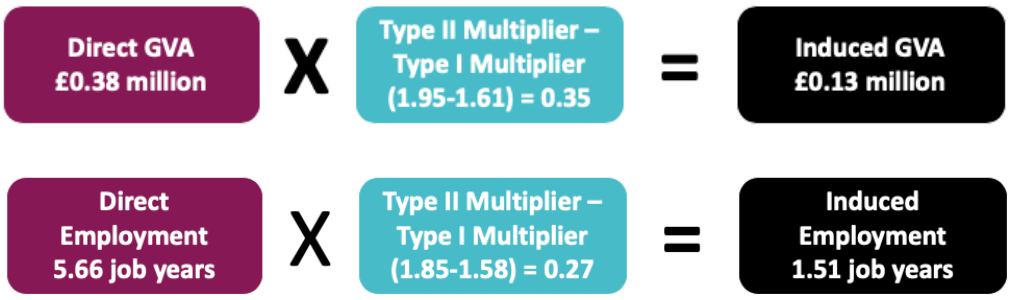
This is demonstrated in Figure 4.2 and Figure 4.3.

Figure 4.2 Indirect Impact



Source: BiGGAR Economics

Figure 4.3 Induced Impact



Source: BiGGAR Economics

The total GVA and employment impacts of BOWL are the direct impacts, added to the indirect and induced impacts (Figure 4.4).

Figure 4.4 Total Impact

Source: BiGGAR Economics

4.3.3 Operational Expenditure (OPEX)

As with the DEVEX and CAPEX, it was first necessary to establish the costs of operating the development, which was projected over a time period of 25 years. The basis of this was an internal financial modelling exercise at SSE Renewables, which considered different components of spending such as operational costs, grid costs and insurance.

[9] ONS (2018), UK Input-Output Tables 2015
[10] Scottish Government (2018), Input-Output Tables 2015

A proportion of each category of spend was assumed to take place either in Scotland or the UK, and each category was assigned to one of the Input-Output sectors. Direct GVA and employment impacts, as well as indirect and induced impacts, were then estimated using the same method as outlined for DEVEX and CAPEX.

As the impacts are expected to occur over 25 years, the net present value (NPV) of the impacts was estimated, as well as the average GVA and employment impacts per year.

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