

Economic Impact Assessment of SSE Projects in the Great Glen

A report to SSE Renewables
February 2020





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1.

Executive Summary

The development, construction and operation of three wind farms in the Great Glen and the Glendoe Hydro Scheme has generated and will continue to generate substantial local, regional and national impacts.

Between 2009 and 2018 SSE Renewables completed four projects within the Great Glen area of the Highland region. These projects are:

- Glendoe Hydro Scheme, which has a capacity of 100MW, which became fully operational in 2012;
- Bhlaraidh Wind Farm, which has a capacity of 108MW, which became fully operational in 2017;
- Dunmaglass Wind Farm, which has a capacity of 94MW, which became fully operational in 2017; and
- Stronelaig Wind Farm, which has a capacity of 228MW, which became fully operational in 2018.

These projects were developed and built at a cost of **£1.1 billion** in 2018 prices (DEVEX/CAPEX). Operational expenditure (OPEX) is expected to amount to **£1.1 billion** over their operational lifetimes/25 years. The expected total expenditure (TOTEX) is therefore **£2.2 billion**.

During the development and construction phases, it was estimated that the UK secured contracts worth **£686.1 million**. The area is expected to secure **£1.0 billion** in OPEX contracts over the operational lifetimes of the projects (£39.7 million annually). Overall, the expenditure secured in the UK is expected to be **£1.7 billion, or 77% of TOTEX**.

It was also estimated that

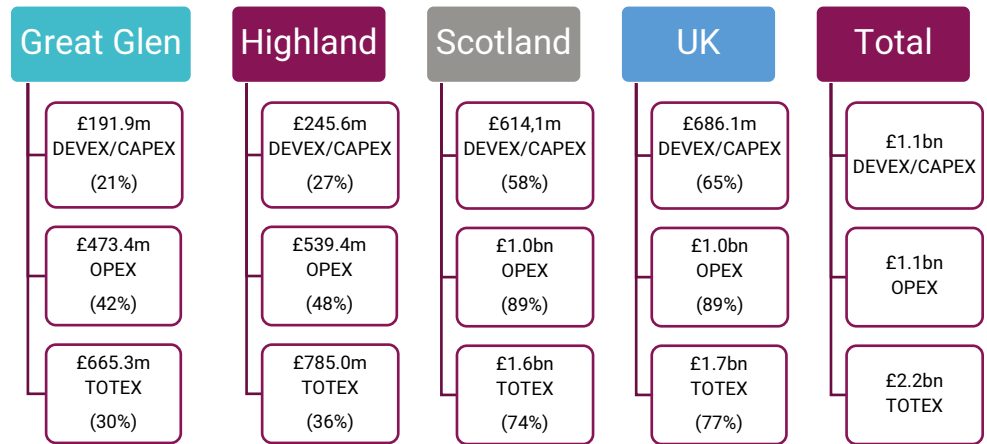
- Scotland secured **£614.1 million** in DEVEX/CAPEX contracts, and **£1.1 billion** in OPEX contracts (£39.7 million annually). Overall, it is expected to secure **£1.6 billion, or 74% of TOTEX**;
- Highland¹ secured **£245.6 million** in DEVEX/CAPEX contracts, and **£539.4 million** in OPEX contracts (£21.4 million annually). Overall, it is expected to secure **£785.0 million, or 36% of TOTEX**; and

¹ 'Highland' is defined as the Highland Council Area



- the Great Glen² secured **£191.9 million** in DEVEX/CAPEX contracts, and **£473.4 million** in OPEX contracts (£18.9 million annually). Overall, it is expected to secure **£665.3 million**, or **30% of TOTEX**.

Figure 1.1 Great Glen Projects – Contract Values and Shares by Stage



This expenditure supports local economic activity measured in terms of Gross Value Added (GVA), which is a measure of economic activity that includes wages and profits, and employment.

The four projects engaged with a wide range of suppliers across the UK. This included a large number in Scotland and suppliers throughout the Great Glen Area.

Figure 1.2 Location of Identified Suppliers to SSE projects in the Great Glen



During the development and construction phase it was estimated that the four projects supported:

² The Great Glen is defined by the council wards of Aird and Loch Ness, Caol and Mallaig, Fort William & Ardnamurchan, Inverness; (Ness-side, West, Central, Milburn & South)



-
- **£89.6 million GVA** and **1,171 years of employment** in the Great Glen;
 - **£139.3 million GVA** and **1,861 years of employment** in Highland;
 - **£463.6 million GVA** and **6,449 years of employment** in Scotland; and
 - **£746.8 million GVA** and **10,939 years of employment** in the UK.

This economic activity includes the contractors directly employed to build the four projects, and it also includes the wider economic impact associated with these companies spending in their supply chain (the indirect impact) and the spending of their employees in the wider economy (the induced impact).

There would also be long-term economic impacts associated with the projects as a result of the OPEX, which includes the direct, indirect and induced impacts. It was estimated that in an average year, the projects would support:

- **£10.9 million GVA** and **126 jobs** in the Great Glen;
- **£13.6 million GVA** and **166 jobs** in Highland;
- **£28.8 million GVA** and **376 jobs** in Scotland; and
- **£43.2 million GVA** and **520 jobs** in the UK.



2.

Introduction

In 2019, BiGGAR Economics was commissioned by SSE Renewables to undertake a socio-economic impact assessment of four of its developments in the Great Glen.

2.1 Background

Between 2009 and 2018, SSE Renewables completed four projects in the Great Glen area, including:

- Glendoe Hydro Scheme is located south-east of Fort Augustus and has a capacity of 100MW. It initially became operational in 2008, but following an interruption in 2009 it required repairs that were completed in 2012;
- Bhlairaidh Wind Farm is a 32-turbine wind farm located north-west of Glenmoriston, which has a capacity of 108MW and has been fully operational since 2017;
- Dunmaglass Wind Farm is a 33-turbine wind farm located 25km south of Inverness, which has a capacity of 94MW and has been fully operational since 2017; and
- Stronelairg Wind Farm³ is a 66-turbine wind farm located south-east of Fort Augustus, which has a capacity of 228MW and has been fully operational since 2018.

2.2 Approach

2.2.1 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
- Years of employment – 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
- Jobs – this is a measure of employment which considers the headcount employment in an organisation or industry.

³ Both Dunmaglass and Stronelairg were developed by SSE Renewables but are now joint ventures between SSE Renewables and Greencoat UK Wind Plc.



2.2.2 Study Areas

The study areas considered as part of this report are:

- the Great Glen, which is represented by the council wards of Aird and Loch Ness, Caol and Mallaig, Fort William and Ardnamurchan, Inverness Ness-side, Inverness West, Inverness Central, Inverness Milburn and Inverness South;
- Highland, which is the Highland Council Area;
- Scotland; and
- the UK.

2.2.3 Types of Impact

The economic impacts associated with development and capital expenditure, and operational expenditure have been assessed. Development and capital expenditure impacts have already occurred, while operational impacts have either occurred or are expected to occur over the lifetime of the project.

For each contract, an assumption was made about the proportion that would be secured in each study area and they were then assigned a sector. On the basis of these sectors, economic ratios and multipliers were derived which were then used to estimate economic impacts.

There are three significant types of economic impact associated with the SSE Renewables projects in the Great Glen:

- direct impact – this is the direct impact associated with Tier 1 supplier, including employing and paying staff, and generating profits. This impact is calculated by dividing the expenditure on a contract by the turnover/GVA and turnover/employee for the relevant sectors⁴ to estimate direct GVA and employment impacts;
- indirect impact – this is the impact associated with spending in the supply chain of Tier 1 suppliers. This is captured by applying Type 1 economic multipliers^{5 6} to the direct economic impacts;
- induced impact – this is the impact associated with staff spending their wages in the wider economy, and is captured by subtracting Type 1 multipliers from Type 2 multipliers, and applying this to the direct impact.

More detail about how these impacts have been estimated and the assumptions that have made in apportioning expenditure to each study area are discussed in Chapter 6. Additionally, given the differences in time periods for each of the projects it was necessary to adjust for inflation and productivity improvements and these are also discussed in Chapter 6.

⁴ Office for National Statistics (2019), Annual Business Survey – 2017

⁵ Scottish Government (2018), Input-Output Tables 2015

⁶ ONS (2018), UK Input-Output Tables 2015



2.2.4 Consultations

A small number of consultations were undertaken with staff within SSE and with a number of contractors to gain a better understanding of the economic impact of these projects. A list of consultees is provided in Chapter 7.

2.3 Report Structure

The remainder of this report is structured as follows:

- Chapter 3 quantifies the impacts associated with the Great Glen Wind Farms;
- Chapter 4 quantifies the economic impact associated with Glendoe Hydro Scheme;
- Chapter 5 summarises the economic impact of all the Great Glen projects;
- Chapter 6 is an appendix that provides an overview of the methodology;
- Chapter 7 is an appendix that lists the consultations undertaken to inform the analysis; and
- Chapter 8 is an appendix that assesses the contribution of the Great Glen Wind Farms individually.



3. Economic Impact of Great Glen Wind Farms

This chapter considers the economic impact of the Great Glen Wind Farms in their development and construction, and operational phases.

3.1 Development and Construction

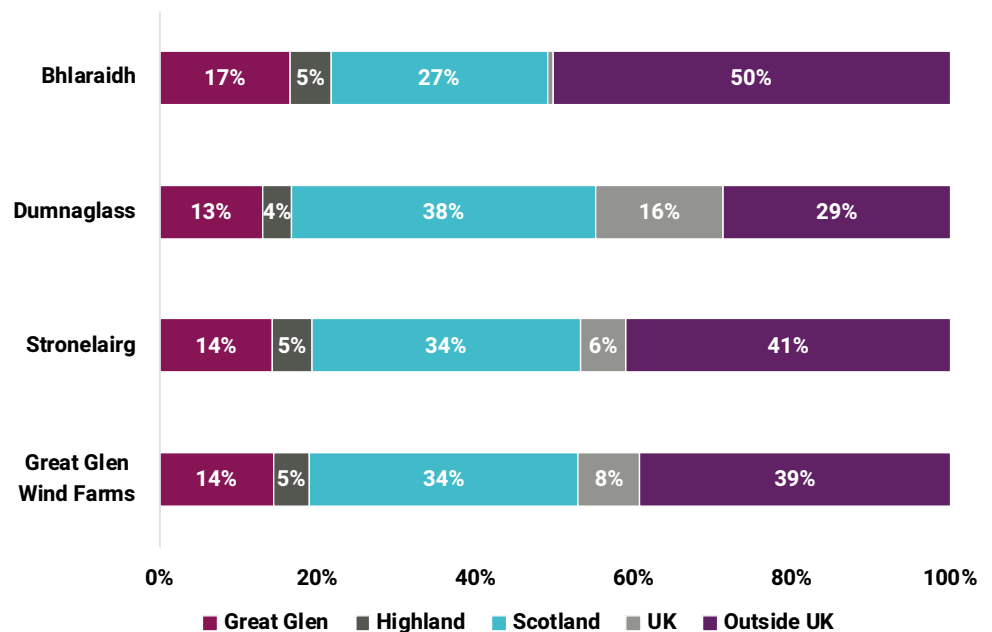
The development and capital expenditure (DEVEX and CAPEX) for developing and constructing each of the wind farms was £663.7 million, denominated in 2018 prices. The cost of the development and construction of Bhlairaidh Wind Farm was £123.1 million, Dunmaglass Wind Farm was £187.2 million and Stronelairg Wind Farm was £353.5 million.

Overall, it was assumed that 14% of contracts by turnover would be secured in the Great Glen (Figure 3.1), with a total value of £95.3 million. In total, 19% of contracts would be secured in Highland (£125.9 million), 53% would be secured in Scotland (£351.8 million), and 61% would be secured in the UK (£403.5 million).

Dunmaglass Wind Farm has a different expenditure profile, compared to the other wind farms due in part to SSE purchasing the project after RES had developed it. This will include a profit element for RES, which is expected to accrue in Scotland and the UK, that would otherwise not be assessed as part of the development and construction phase.



Figure 3.1 Share of Development and Construction Expenditure by Study Area



Source: SSE Renewables/BiGGAR Economics Assumptions

Each contract secured by a company represents an increase in turnover of that company, which will in turn generate an increase in its economic impact. For each transaction an economic sector was assigned, for example construction, and the turnover to GVA ratio was then applied to estimate the direct GVA created.

Wider impacts as a result of spending in the supply chain (indirect impacts) and spending by staff (induced impacts) were captured by applying Type I and Type II economic multipliers to the direct GVA.

Therefore, it was estimated that during development and construction, the Great Glen Wind Farms generated £43.3 million GVA in the Great Glen, £69.8 million GVA in Highland, £267.2 million GVA in Scotland and £448.8 million GVA in the UK.

Table 3.1 Economic Impact of Development and Construction Expenditure, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	37.2	48.9	160.0	181.6
Indirect impact	2.0	10.8	62.7	138.0
Induced impact	4.2	10.2	44.5	129.2
Total	43.3	69.8	267.2	448.8

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



RJ McLeod

Highland based RJ McLeod were one of the main contractors involved in the wind farm projects.

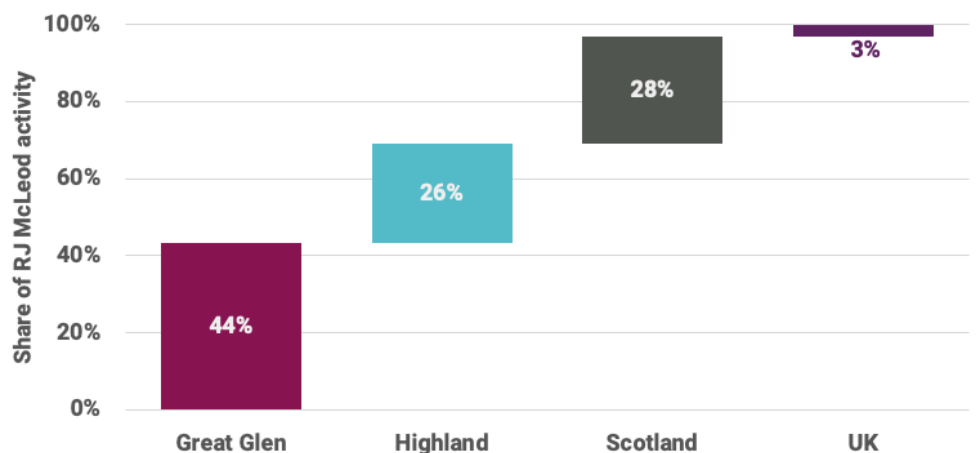
RJ McLeod is a civil engineering company founded in 1951 which operates through offices in Glasgow and Dingwall. It is one of the largest privately-owned construction companies in Scotland, with turnover in 2018 of £88 million and over 400 staff and operatives. It has a strong track record in the renewable energy sector in Scotland and has worked on multiple projects for SSE Renewables and other developers.

RJ McLeod was commissioned to undertake the main civil engineering and enabling works for Bhlaraidh Wind Farm in 2014. This included road building, substation building and the crane hard standing areas. RJ McLeod were also commissioned to do similar work for Stronelaig Wind Farm and Dunmaglass Wind Farm. These projects involved over 50 RJ McLeod employees being located at a base camp near the site. This included engineers, plant operators and tradespeople.

RJ McLeod aims to secure as much as possible from Highland and form strong local relationships

The total contract value for RJ McLeod from these projects was approximately £100 million. An analysis of these contract found the majority of the activity was within Highland. Highland accounted for 70% of this spend, including 44% in the Great Glen.

Figure 3.2 RJ McLeod Contract Activity by area



Source: BIGGAR Economics analysis of RJ McLeod data, note that values are approximate



The contracts also supported employment in these companies, which was estimated by applying turnover per employee ratios for the relevant sectors. Jobs associated with indirect and induced effects were estimated using employment multipliers for the relevant sector. As the contracts are short term, the employment impact is measured in years of employment.

Therefore, it was estimated that during development and construction, the Great Glen Wind Farms supported 547 years of employment in the Great Glen, 915 years of employment in Highland, 3,694 years of employment in Scotland and 6,283 years of employment in the UK.

Table 3.2 Economic Impact of Development and Construction Expenditure, Employment (years of employment)

	Great Glen	Highland	Scotland	UK
Direct impact	471	647	2,272	2,517
Indirect impact	27	148	889	1,913
Induced impact	50	120	532	1,854
Total	547	915	3,694	6,283

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

3.2 Operational Impacts

This section considers the long-term impact that will occur during the 25-year lifetimes of the Great Glen Wind Farms.

SSE Renewables provided financial data and projections on each of the projects. This indicates that over the lifetimes of each project, operational expenditure (OPEX) is expected to be £1.0 billion, with OPEX at Bhlairidh Wind Farm of £237.0 million, OPEX at Dunmaglass Wind Farm of £177.9 million and OPEX at Stronelaig Wind Farm of £584.7 million. This excludes the capital repayment component of the transmission charges paid to the network operator, which covers the initial costs of setting up the grid connection and is included as part of the construction expenditure.

As these impacts occur over a longer period of time, they are treated differently from the construction phase. As a result, the impacts 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
- Net Present Value (NPV) impact, which applies a discount rate to the figures provided by the financial analysis to account for present impacts being more highly valued than future impacts (see Chapter 6).

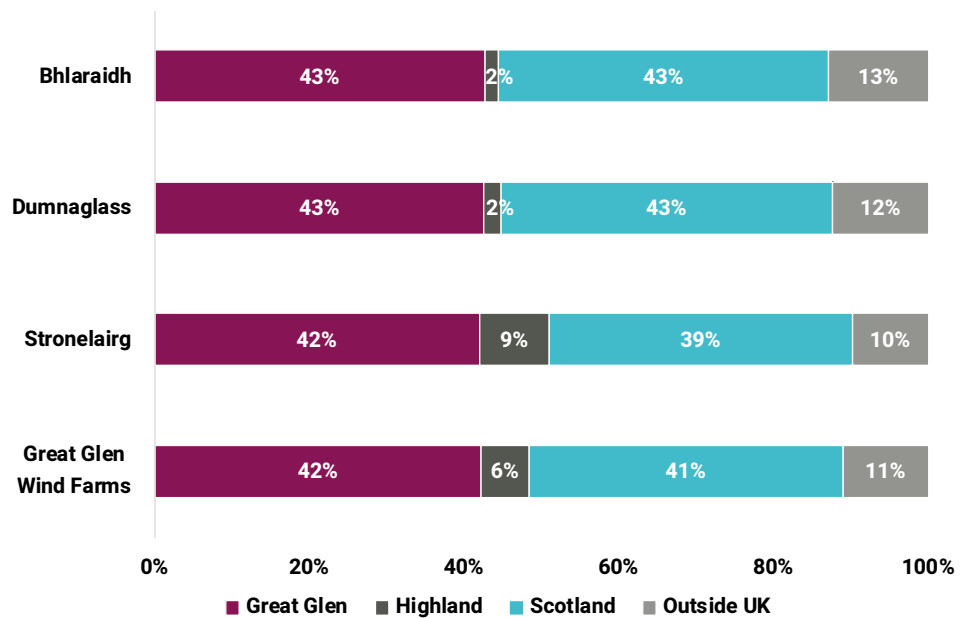


3.2.1 Average Annual Operational Expenditure

After applying assumptions about the proportion of contracts secured in each study area and the sector of each contract using the methodology outlined in Chapter 6, it was estimated that the Great Glen could secure 42% of contracts, that Highland could secure 48% of contracts, and that Scotland and the UK could each secure 89% of contracts.

It is expected that the average annual OPEX for the Great Glen Wind Farms would be £39.6 million and over the operational lifetimes of the projects would be £1.0 billion. Of this, £16.8 million is expected to take place in the Great Glen (£248.5 million over the operational lifetime), £19.2 million taking place in Highland (£310.7 million), and £35.3 million taking place in Scotland and the UK (£889.5 million).

Figure 3.3 Operational Expenditure by Study Area



Source: SSE Renewables/BiGGAR Economics Assumptions



Corrie Construction

Fort William based Corrie Construction worked on Stronelairst, Bhlaraidh and Glendoe Hydro Scheme.

Corrie Construction is a construction and civil engineering company based in Fort William which employs 60 people directly. It specialises in utilities work and the majority of its activity is from large infrastructure developments in the Highlands and Islands.

Corrie Construction initially worked on the site preparation work for the Glendoe Hydro during its first period of construction. It was then commissioned to work on the Bhlaraidh Wind Farm. This work included the construction a new control building and the associated draining that this building would require. The contract accounted for almost 10% of the activity of the company at the time. Corrie Construction was also commissioned to do similar work for the Stronelairst Wind Farm and moved straight onto this on completion of the work at Bhlaraidh.

The continuity of work from Stronelairst right after Bhlaraidh was of real value to the business

Companies such as Corrie Construction, that work on large projects, need to plan ahead to manage their workload and fluctuations in demand. Corrie Construction have worked with SSE for over 20 years and this relationship, particularly for consecutive projects such as the Great Glen Wind Farms, enables stability in business planning.

In addition to the work that done directly by Corrie Construction on these projects, it also utilised its own supply chain and subcontractors for specific components of the contract. These subcontractors included:

- Leiths Concrete in Fort William;
- Korrie Technical Services in Inverness;
- AJ Engineering in Forres; and
- Pat Munro Ltd in Alness.

Using the same approach as for DEVEX and CAPEX, appropriate economic ratios and multipliers were applied to OPEX, indicating that this could support £9.9 million GVA (£248.5 million GVA over the operational lifetimes) and 114 jobs in the Great Glen



annually, £12.3 million GVA (£310.7 million GVA) and 152 jobs in Highland, £25.8 million GVA (£651.7 million GVA) and 341 jobs in Scotland, and £38.5 million GVA (£971.4 million GVA) and 469 jobs in the UK.

Table 3.3 Economic Impact of Annual OPEX, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	8.9	9.7	17.2	17.2
Indirect impact	0.2	1.1	4.9	10.9
Induced impact	0.8	1.5	3.7	10.4
Annual	9.9	12.3	25.8	38.5
Lifetime	248.5	310.7	651.7	971.4

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

Table 3.4 Economic Impact of Annual OPEX, Employment (jobs)

	Great Glen	Highland	Scotland	UK
Direct impact	98	108	192	192
Indirect impact	5	20	89	144
Induced impact	12	24	61	134
Total	114	152	341	469

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

3.2.2 Net Present Value Impact

Over the operational lifetimes, the NPV of OPEX was projected to be £630.4 million, with £265.9 million taking place in the Great Glen, £304.2 million taking place in Highland, and £560.1 million taking place in Scotland and the UK.

Table 3.5 NPV Operational Expenditure by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
Turnover	265.9	304.2	560.1	560.1	630.4
Turnover (%)	42%	48%	89%	89%	-

Source: SSE Renewables/BiGGAR Economics Assumptions

Applying appropriate economic ratios and multipliers indicates that this expenditure could support £156.8 million GVA in the Great Glen, £195.8 million GVA in Highland, £410.9 million GVA in Scotland, and £612.7 million GVA in the UK.



Tourism in the Great Glen

The relationship between the tourism sector in the Great Glen and large energy projects has been generally positive.

The tourism sector is particularly important within the Great Glen and provides employment for over 16,000 people across the Highland region. The tourism sector is particularly seasonal within the rural areas of the Great Glen and many hotels are closed between November and March.

The energy projects developed within the Great Glen resulted in an increased demand for the services of the tourism sector from business visitors. This has been particularly important during the bookends of the tourism season and has enabled some hotels to extend the months in which they are open. Corporate clients, such as SSE Renewables, can find it difficult to get rooms in the busy summer months because rooms are usually booked well in advance by leisure guests and therefore planned activities on project sites usually occur in the quieter periods. Therefore, one hotel reported that in October and November almost 90% of its demand was from business tourism and much of that was connected to projects such as Stronelairg, Bhlairaidh and Dunmaglass wind farms.

“The last few years have been pretty good for us as there were a lot of [energy] projects on the go”

Ailsa McInnes, Glenmoriston Arms

As part of this study, BiGGAR Economics consulted with owners of 5 hotels in the area to identify any impact of the development of these energy projects on leisure tourism. These owners reported that there had not been any negative changes to visitor numbers or spending as a result of these energy developments. The vast majority of visitors were unaware of these projects and they were only likely to discuss them when ongoing construction work was visible.

The involvement of SSE Renewables in the Highlands and Islands Tourism Awards was identified as the biggest impact that the company had on the local tourism sector. SSE Renewables has sponsored these awards for 7 and helped to identify and exhibit the most successful tourism sector stories in the area.



Table 3.6 NPV Economic Impact of Operational Expenditure, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	141.1	154.4	273.7	273.7
Indirect impact	3.7	17.7	78.4	173.7
Induced impact	12.0	23.6	58.9	165.3
Total	156.8	195.8	410.9	612.7

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

3.3 Summary of Great Glen Wind Farms Economic Impact

It is expected that the total expenditure associated with the DEVEX, CAPEX and OPEX of the Great Glen Wind Farms would be £1.7 billion, of which;

- £517.3 million is expected to be secured in the Great Glen (31%);
- £609.0 million is expected to be secured in Highland (37%);
- £1.2 billion is expected to be secured in Scotland (75%); and
- £1.3 billion is expected to be secured in the UK (78%).

Table 3.7 Total Expenditure: Turnover by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
CAPEX	95.3	125.9	351.8	403.5	663.7
OPEX	422.0	483.1	889.1	889.1	999.5
Total	517.3	609.0	1,240.9	1,292.7	1,663.3
Total (%)	31%	37%	75%	78%	-

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

Over the lifetime of the wind farms, total expenditure associated with these contracts is expected to support:

- £291.8 million GVA in Great Glen;
- £380.5 million GVA in Highland;
- £918.9 million GVA in Scotland; and
- £1.4 billion GVA in the UK.



Table 3.8 Total Expenditure: Economic Impact, GVA (£m)

	Great Glen	Highland	Scotland	UK
CAPEX	43.3	69.8	267.2	448.8
OPEX	248.5	310.7	651.7	971.4
Total	291.8	380.5	918.9	1,420.2

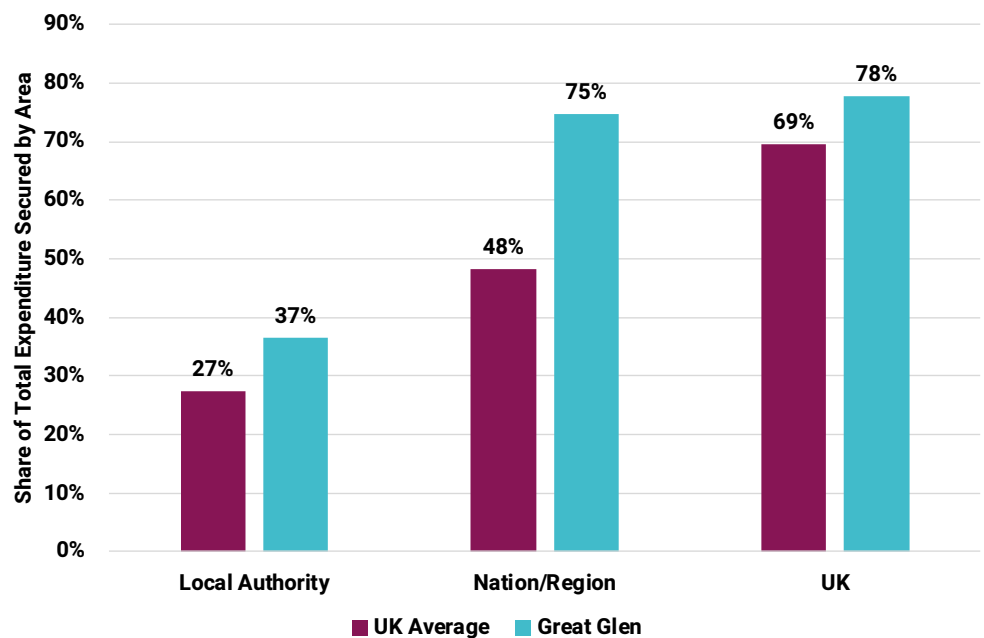
Source: BiGGAR Economics Calculations. Note, totals may not sum due to rounding

3.4 Impact in Context

The analysis of the contracts awarded during the development, construction and operation of the Great Glen Wind Farms found that a greater share of contracts was awarded at the local and Scottish level than the average for the sector across the UK.

In 2015, BiGGAR Economics undertook a study of wind farm developments across the UK⁷ that considered the local and national component of their expenditure. This found that an average wind farm constructed in that period had 69% of UK content, of which 48% was at a national/regional level and 27% was within the local authority that the wind farm was developed.

Figure 3.4 TOTEX Share by Area, Great vs UK Average



Source: BiGGAR Economics Analysis

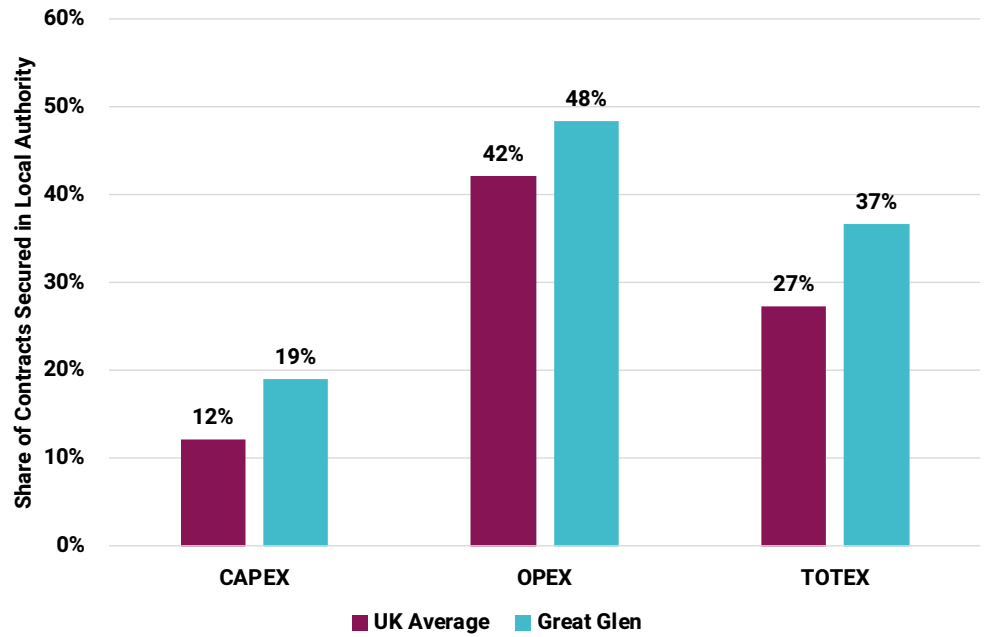
Highland is expected to secure 37% of TOTEX for the Great Glen Wind Farms, compared to the average wind farm across the UK, where the local authority typically secures 27% of expenditure. This is equivalent to an additional £155 million worth of contracts in Highland over the lifetime of the wind farm. As shown in Figure 3.5, the

⁷ RenewableUK (2015) Onshore Wind Economic Impacts in 2014



largest difference is in the CAPEX phase, where organisations in Highland secured 19% of the contract value, as a result of using local contractors such as RJ McLeod, compared to the UK average of 12%.

Figure 3.5 Contract Share in Local Authority, Great Glen vs UK Average



Source: BiGGAR Economics Analysis

4. Economic Impact of Glendoe Hydro Scheme

This chapter considers the economic impact of the Glendoe Hydro Scheme in its original construction, repair and operational phases.

4.1 Development and Construction

4.1.1 Original

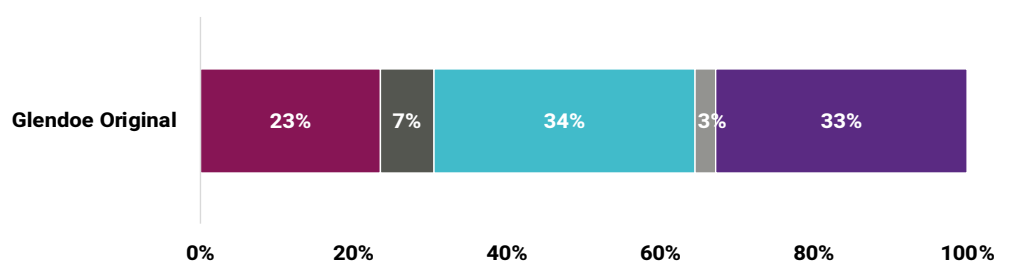
The original construction of the Glendoe Hydro Scheme was completed in 2008 at a cost of around £166.1 million (equal to £226.9 million in 2018 prices).

Using the same methodology outlined for assessing the value of contracts secured in the Great Glen Wind Farms, it was estimated that 23% of contracts (£53.2 million) were secured in the Great Glen, 30% were secured in Highland (£69.0 million), 65% were secured in Scotland (£146.4 million) and 67% were secured in the UK (£152.3 million).

Contracts in the Great Glen area were mainly secured in the civil engineering elements of the project, such as the aqueduct tunnels, access road and tailrace tunnels which also included setting up and operating a local quarry and concrete plant. The main contractor for the project was Hochtief, a German firm with operations in the UK, which employed people within the local area as well as subcontracting to local firms such as Tarmac Aggregate Products and Highland Quality Construction.

At any one time there were up to 700 people working on site, and given the remoteness of the development, as well as accessibility issues due to adverse weather conditions, two worker camps were constructed. These camps accommodated 400 and 200 people each, and were supplied by local businesses and operated by local people.

Figure 4.1 Glendoe Original Expenditure by Study Area



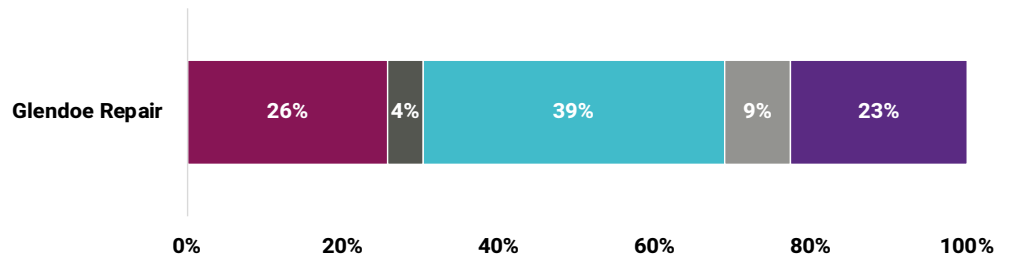
Source: SSE Renewables/BiGGAR Economics Assumptions

4.1.2 Repair

There was an interruption in service in 2009, not long after the original construction was completed, requiring extensive repairs to be undertaken. This came to a cost of £140.8 million (£168.2 million in 2018 prices).

The main contracts were civil engineering works undertaken to circumvent the tunnel that had collapsed and the main contractor was BAM Nuttall. It was estimated that 26% of the contracts for this work were secured in Great Glen (£43.4 million), 30% in Highland (£50.8 million), 69% in Scotland (£115.9 million), and 77% in the UK (£130.3 million).

Figure 4.2 Glendoe Repair Expenditure by Study Area



Source: SSE Renewables/BiGGAR Economics Assumptions

4.1.3 Economic Impact

After applying appropriate economic ratios and multipliers, it was estimated that the original Glendoe supported £46.3 million GVA and 624 years of employment of employment in the Great Glen, £69.5 million GVA and 946 years of employment in Highland, £196.4 million GVA and 2,755 years of employment in Scotland, and £298.0 million GVA and 4,655 years of employment in the UK. The breakdown by Glendoe Original and Glendoe Repair is provided in Chapter 8.



Table 4.1 Economic Impact of Glendoe Expenditure, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	39.3	48.1	103.7	112.2
Indirect impact	2.2	10.8	59.0	109.9
Induced impact	4.8	10.6	33.8	76.0
Total	46.3	69.5	196.4	298.0

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

Table 4.2 Economic Impact of Glendoe Expenditure, Employment (years of employment)

	Great Glen	Highland	Scotland	UK
Direct impact	536	667	1,503	1,631
Indirect impact	31	155	851	1,831
Induced impact	57	124	401	1,193
Total	624	946	2,755	4,655

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

4.2 Operation

The section considers the long-term impact that will occur over a 25-year period, though the operational lifetime of Glendoe Hydro Scheme is expected to be considerably more than 25 years.

Data on the OPEX associated with Glendoe is not currently available, and therefore it was estimated based on the level of expenditure typically associated with the operation of large hydropower schemes. According to the International Renewable Energy Agency (IRENA), annual OPEX is approximately 2.2% of CAPEX⁸. This suggests, based on the original CAPEX of £226.9 million, that OPEX is £5.0 million annually, which is £50,000 per MW.

⁸ IRENA (2012), Renewable Energy Technologies: Cost Analysis Series



As with the Great Glen Wind Farms, the impacts are presented in three formats:

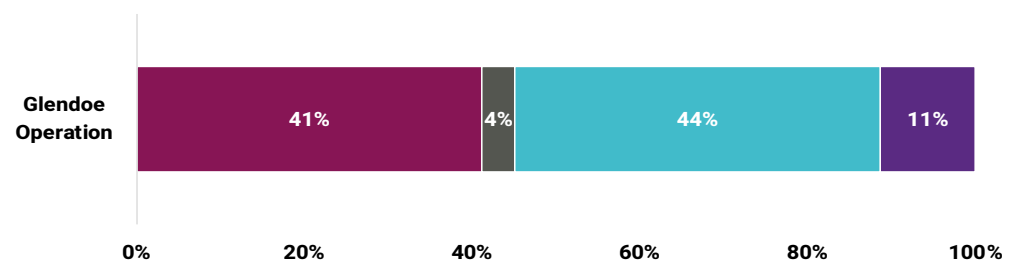
- average impact, which considers the average annual impact;
- undiscounted impact, which uses the gross figures provided by the financial analysis; and
- Net Present Value (NPV) impact, which applies a discount rate to the figures provided by the financial analysis to account for present impacts being more highly valued than future impacts (see Chapter 6).

4.2.1 Annual

It was assumed that the breakdown of spending by sector, e.g. rents and rates, transmission costs, operational maintenance, would be similar to the Great Glen Wind Farms. On this basis, it was assumed that 41% of contracts would be secured in the Great Glen, 45% in Highland, and 89% in Scotland and the UK.

It is expected that the annual average operational expenditure would be £5.0 million (£124.8 million over 25 years), with £2.1 million secured in the Great Glen (£51.4 million), £2.3 million secured in Highland (£56.3 million), and £4.4 million secured in Scotland and Highland (£110.6 million).

Figure 4.3 Operational Expenditure by Study Area



Source: SSE Renewables/BigGAR Economics Assumptions

After applying the appropriate economic multipliers, this indicates that the annual economic impact would support £1.0 million GVA (£25.7 million GVA over 25 years) and 11 jobs in the Great Glen annually, £1.2 million GVA (£31.1 million GVA) and 14 jobs in Highland, £3.0 million GVA (£74.5 million GVA) and 35 jobs in Scotland, and £4.7 million GVA (£116.7 million GVA) and 51 jobs in the UK.

Table 4.3 Economic Impact of Annual OPEX, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	0.9	1.0	1.9	1.9
Indirect impact	0.0	0.1	0.7	1.5
Induced impact	0.1	0.2	0.4	1.2
Total	1.0	1.2	3.0	4.7
Over 25 years	25.7	31.1	74.5	116.7

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



Table 4.4 Economic Impact of Annual OPEX, Employment (jobs)

	Great Glen	Highland	Scotland	UK
Direct impact	10	10	20	20
Indirect impact	0	2	9	17
Induced impact	1	2	6	14
Total	11	14	35	51

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

4.2.2 Net Present Value

Over the operational lifetimes, the NPV of OPEX was projected to be £680.8 million, with £348.1 million taking place in the Great Glen, £348.1 million taking place in Highland, and £610.6 million taking place in Scotland and the UK.

Table 4.5 NPV Operational Expenditure by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
Turnover	309.2	348.1	610.6	610.6	680.8
Turnover (%)	45%	51%	90%	90%	-

Source: SSE Renewables/BiGGAR Economics Assumptions

Applying appropriate economic ratios and multipliers indicates that this expenditure could support £175.3 million GVA in the Great Glen, £217.3 million GVA in Highland, £433.8 million GVA in Scotland, and £650.1 million GVA in the UK.

Table 4.6 NPV Economic Impact of Operational Expenditure, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	158.2	171.7	284.5	284.5
Indirect impact	4.4	20.7	88.5	195.3
Induced impact	12.7	25.0	60.8	170.3
Total	175.3	217.3	433.8	650.1

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

4.3 Summary of Glendoe Hydro Scheme Economic Impact

Expenditure associated with Glendoe Hydro Scheme in its construction, repair and next 25 years of operation is expected to be £519.9 million. Of this, contracts worth:

- £148.0 million are expected to be secured in the Great Glen (28%);
- £176.1 million are expected to be secured in Highland (34%);
- £372.9 million are expected to be secured in Scotland (72%); and



- £393.2 million are expected to be secured in the UK (76%).

Table 4.7 Total Expenditure: Turnover by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
Original	53.2	69.0	146.4	152.3	226.9
Repair	43.4	50.8	115.9	130.3	168.2
OPEX	51.4	56.3	110.6	110.6	124.8
Total	148.0	176.1	372.9	393.2	519.9
Total (%)	28%	34%	72%	76%	-

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

Over its construction, repair and next 25 years of operation, expenditure associated with Glendoe Hydro Scheme is expected to support:

- £72.0 million GVA in the Great Glen;
- £100.6 million GVA in Highland;
- £270.9 million GVA in Scotland; and
- £414.7 million GVA in the UK.

Table 4.8 Total Expenditure: Economic Impact, GVA (£m)

	Great Glen	Highland	Scotland	UK
CAPEX	46.3	69.5	196.4	298.0
OPEX	25.7	31.1	74.5	116.7
Total	72.0	100.6	270.9	414.7

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

5. Summary

Over their construction and 25 years of operation, expenditure associated with the Great Glen projects is expected to be £2.2 billion. Of this, contracts worth:

- £665.3 million are expected to be secured in the Great Glen (30%);
- £785.0 million are expected to be secured in Highland (36%);
- £1.6 billion are expected to be secured in Scotland (74%); and
- £1.7 billion are expected to be secured in the UK (77%).

Table 5.1 Total Expenditure: Turnover by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
Wind Farms	517.3	609.0	1,240.9	1,292.7	1,663.3
Glendoe	148.0	176.1	372.9	393.2	519.9
Total	665.3	785.0	1,613.8	1,685.9	2,183.1
Total (%)	30%	36%	74%	77%	-

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

Over their development, construction and the next 25 years of operation, expenditure associated with the Great Glen projects are expected to support:

- £363.9 million GVA in the Great Glen;
- £481.1 million GVA in Highland;
- £1.2 billion GVA in Scotland; and
- £1.8 billion GVA in the UK.

Table 5.2 Total Expenditure: Economic Impact, GVA (£m)

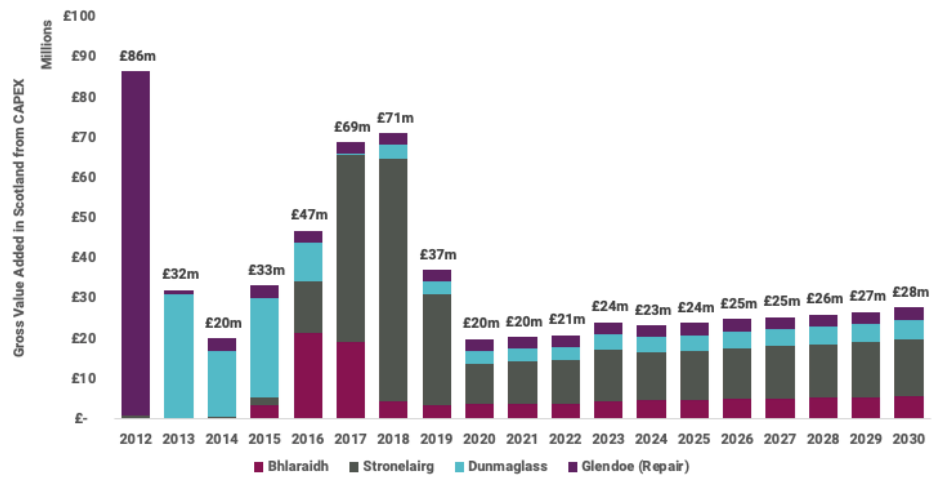
	Great Glen	Highland	Scotland	UK
Wind Farms	291.8	380.5	918.9	1,420.2
Glendoe	72.0	100.6	270.9	414.7
Total	363.9	481.1	1,189.8	1,834.9

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

The impact over time is shown for Scotland in Figure 5.1. This shows the largest annual impact occurred in 2012 during the repair of the Glendoe Hydro Plant. It also shows that, although the construction work is completed, the ongoing annual GVA impact during the operational period is significant.



Figure 5.1 Gross Value Added in Scotland by Year (2012 - 2030)



Source: BIGGAR Economics Analysis. Note, figures are presented in 2018 prices.



6.

Appendix A – Methodology

This section gives a detailed discussion of the methodology used to estimate the economic impact of the Great Glen projects.

6.1 Time Adjustments

Given the range of timescales over which the projects were undertaken it was necessary to adjust account for differences in the Consumer Price Inflation (CPI)⁹ and productivity growth in the construction sector¹⁰. When these adjustments are made, CAPEX in 2018 prices would be £1,058.8 million compared to an original spend of £937.3 million, as can be seen in Table 6.1.

Table 6.1 CAPEX by Project in 2018 Prices (£m)

	Original	2018 Prices
Bhlaraidh	118.9	123.1
Dunmaglass	167.8	187.2
Stronelairst	343.8	353.5
Glendoe Original	166.1	226.9
Glendoe Repair	140.8	168.2
Total	937.3	1,058.8

Source: SSE Renewables/BiGGAR Economics Assumptions

6.2 Input-Output Modelling

6.2.1 Assessing Economic Impact

In order to assess the potential economic impact of expenditure it was necessary to make an assumption about the sector of these contracts and the proportion of contracts that could be secured in each of the study areas. These assumptions were based on:

- SSE Renewables expertise and experience in operating and maintaining renewable assets;
- BiGGAR Economics expertise and experience of economic analysis of renewable assets; and
- consultations undertaken with relevant stakeholders, such as local businesses; and

⁹ ONS (2019), Consumer Price Inflation, Table 23

¹⁰ ONS (2019), Output per Hour: F SIC07



- other economic impact studies of renewable projects in the area.

For the Great Glen and Highland assumptions were made based on suppliers' locations, or whether larger contractors, such as RJ McLeod, have bases in the Great Glen area or have hired workers from the area to undertake part of the work. Evidence from other wind farm sites was also used to assess the share of operational contracts that could be secured in the area.

For Glendoe's original construction and subsequent repair, which were completed in 2009 and 2012, due to data limitations and other factors specific to the projects it was necessary to make assumptions about the share of contracts that could be secured in the Great Glen and Highland. This was informed by an understanding of the local economy, as well as consultations with staff that were involved in delivering the project.

6.2.2 Development and Capital Expenditure (DEVEX and 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 there would also be an impact one of the other areas. In some instances, where the supplier is based outside a study area, e.g. a turbine supplier, but a portion of the economic activity is likely to occur in one of the study areas, e.g. Scotland, an assumption was made about the proportion of the contract that might occur in each of the study areas.

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. 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)¹¹. In some cases, where data is not available in the ABS, this has been supplemented by data from the UK Input-Output Tables¹² and the Business Register and Employment Survey¹³.

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 6.1.

¹¹ Office for National Statistics (2019), Annual Business Survey – 2017

¹² ONS (2018), UK Input-Output Tables 2015

¹³ ONS (2019), Business Register and Employment Survey



Figure 6.1 Direct Impact

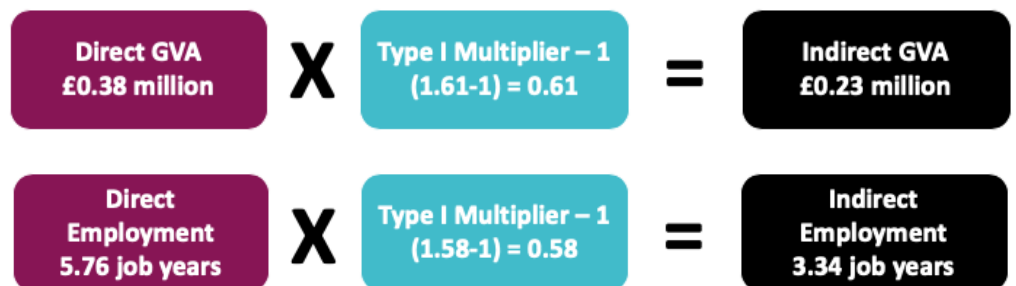


Source: BiGGAR Economics

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 employee expenditure. These impacts were estimated by applying sector-specific Type I (indirect) and Type II (indirect and induced) multipliers to the direct impact. These multipliers were sourced from the ONS¹⁴ and the Scottish Government¹⁵.

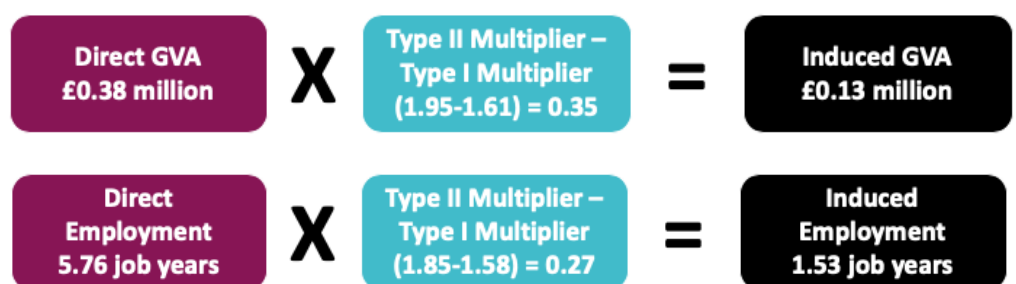
This is demonstrated in Figure 6.2 and Figure 6.3.

Figure 6.2 Indirect Impact



Source: BiGGAR Economics

Figure 6.3 Induced Impact



Source: BiGGAR Economics

The total GVA and employment impacts of each of the projects are the direct impacts, added to the indirect and induced impacts (Figure 6.4).

¹⁴ ONS (2018), UK Input-Output Tables 2015

¹⁵ Scottish Government (2018), Input-Output Tables 2015



Figure 6.4 Total Impact



Source: BIGGAR Economics

6.2.3 Operational Expenditure (OPEX)

As with the 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.

A proportion of each category of spend was assumed to take place either in each of the study areas, 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 CAPEX.

6.2.4 Net Present Value

The long-term impacts are represented in terms of their net present value (NPV). This is an adjustment made to impacts that will be realised in the future to reflect the fact that benefits realised in the future are valued less than those realised in present time.

To reflect this, impacts which are expected to be realised in the future are discounted at a rate of 3.5% has been chosen, which is in line with the UK Government's Green Book¹⁶. This is applied to all impacts that will occur after the 2019/20 financial year.

¹⁶ HM Treasury (2018). The Green Book: Central Government Guidance on Appraisal and Evaluation



7.

Appendix B – Consultations

Below is the list of people consulted as part of the consultation process, as well as their role and organisation.

Table 7.1 Consultations

Consultee	Role	Organisation	Case Study
Willie Cameron	Director	Cobbs Group	Case Study 3
Alan Ewing	Director	Corrie Construction	Case Study 2
Ailsa McInnes	Managing Partner	Glenmoriston Arms	Case Study 3
Angela Rae	Design Management Engineer	RJ McLeod	Case Study 1

8. Appendix C – Project Impacts

This appendix presents the impacts of each of the four projects individually.

8.1 Great Glen Wind Farms

8.1.1 Bhlaraidh Wind Farm

It is expected that the total expenditure associated with the CAPEX and OPEX of the Bhlaraidh Wind Farm would be £360.0 million, of which;

- £121.4 million is expected to be secured in the Great Glen (34%);
- £132.0 million is expected to be secured in Highland (37%);
- £266.7 million is expected to be secured in Scotland (74%); and
- £267.5 million is expected to be secured in the UK (74%).

Table 8.1 Bhlaraidh Wind Farm: Total Expenditure – Turnover by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
CAPEX	20.3	26.6	60.4	61.2	123.1
OPEX	101.0	105.4	206.3	206.3	237.0
Total	121.4	132.0	266.7	267.5	360.0
Total (%)	34%	37%	74%	74%	-

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

Over the lifetime of the wind farm, total expenditure associated with these contracts is expected to support:

- £70.1 million GVA in Great Glen;
- £84.3 million GVA in Highland;
- £203.8 million GVA in Scotland; and
- £304.9 million GVA in the UK.

Table 8.2 Bhlaraidh Wind Farm: Total Expenditure – Economic Impact, GVA (£m)

	Great Glen	Highland	Scotland	UK
CAPEX	9.1	14.6	44.0	64.9
OPEX	61.0	69.7	159.8	240.0
Total	70.1	84.3	203.8	304.9

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



8.1.2 Dunmaglass Wind Farm

It is expected that the total expenditure associated with the CAPEX and OPEX of the Dunmaglass Wind Farm would be £365.1 million, of which;

- £100.1 million is expected to be secured in the Great Glen (29%);
- £110.8 million is expected to be secured in Highland (33%);
- £259.1 million is expected to be secured in Scotland (71%); and
- £289.4 million is expected to be secured in the UK (79%).

Table 8.3 Dunmaglass Wind Farm: Total Expenditure – Turnover by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
CAPEX	24.4	31.3	103.3	133.6	187.2
OPEX	75.7	79.5	155.8	155.8	177.9
Total	100.1	110.8	259.1	289.4	365.1
Total (%)	27%	30%	71%	79%	-

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

Over the lifetime of the wind farm, total expenditure associated with these contracts is expected to support:

- £57.7 million GVA in Great Glen;
- £70.6 million GVA in Highland;
- £201.8 million GVA in Scotland; and
- £342.5 million GVA in the UK.

Table 8.4 Dunmaglass Wind Farm: Total Expenditure – Economic Impact, GVA (£m)

	Great Glen	Highland	Scotland	UK
CAPEX	12.1	18.3	81.9	162.1
OPEX	45.6	52.3	119.9	180.5
Total	57.7	70.6	201.8	342.5

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



8.1.3 Stronelaig Wind Farm

It is expected that the total expenditure associated with the CAPEX and OPEX of the Stronelaig Wind Farm would be £1,018.3 million, of which;

- £295.8 million is expected to be secured in the Great Glen (32%);
- £366.1 million is expected to be secured in Highland (39%);
- £715.1 million is expected to be secured in Scotland (76%); and
- £735.1 million is expected to be secured in the UK (78%).

Table 8.5 Stronelaig Wind Farm: Total Expenditure – Turnover by Study Area (£m)

	Great Glen	Highland	Scotland	UK	Total
CAPEX	50.6	67.9	188.1	208.8	353.5
OPEX	245.2	298.2	527.0	527.0	584.7
Total	295.8	366.1	715.1	735.7	938.1
Total (%)	32%	39%	76%	78%	-

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

Over the lifetime of the wind farm, total expenditure associated with these contracts is expected to support:

- £164.0 million GVA in Great Glen;
- £225.6 million GVA in Highland;
- £513.3 million GVA in Scotland; and
- £772.8 million GVA in the UK.

Table 8.6 Stronelaig Wind Farm: Total Expenditure – Economic Impact, GVA (£m)

	Great Glen	Highland	Scotland	UK
CAPEX	22.1	37.0	141.3	221.9
OPEX	141.9	188.7	372.0	550.9
Total	164.0	225.6	513.3	772.8

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



8.2 Glendoe CAPEX

8.2.1 Glendoe Original

The CAPEX associated with the Glendoe Original was estimated to support:

- £26.3 million GVA and 333 job years in the Great Glen;
- £40.5 million GVA and 530 job years in Highland;
- £109.5 million GVA and 1,523 job years in Scotland; and
- £161.3 million GVA and 2,473 job years in the UK.

Table 8.7 Economic Impact of Glendoe Original Expenditure, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	22.6	28.6	59.1	62.1
Indirect impact	1.1	6.0	31.9	57.8
Induced impact	2.5	5.9	18.4	41.3
Total	26.3	40.5	109.5	161.3

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

Table 8.8 Economic Impact of Glendoe Original Expenditure, Employment (years of employment)

	Great Glen	Highland	Scotland	UK
Direct impact	286	374	835	880
Indirect impact	17	87	465	952
Induced impact	30	69	222	640
Total	333	530	1,523	2,473

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



8.2.2 Glendoe Repair

The CAPEX associated with the Glendoe Repair was estimated to support:

- £20.0 million GVA and 291 job years in the Great Glen;
- £29.0 million GVA and 415 job years in Highland;
- £87.0 million GVA and 1,232 job years in Scotland; and
- £136.7 million GVA and 2,183 job years in the UK.

Table 8.9 Economic Impact of Glendoe Repair Expenditure, GVA (£m)

	Great Glen	Highland	Scotland	UK
Direct impact	16.7	19.5	44.5	50.1
Indirect impact	1.0	4.7	27.0	52.0
Induced impact	2.3	4.7	15.4	34.6
Total	20.0	29.0	87.0	136.7

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

Table 8.10 Economic Impact of Glendoe Repair Expenditure, Employment (years of employment)

	Great Glen	Highland	Scotland	UK
Direct impact	250	293	668	751
Indirect impact	14	68	386	879
Induced impact	27	55	178	553
Total	291	415	1,232	2,183

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

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