



Offshore Wind Power Limited

# West of Orkney Offshore EIA Report

## Volume 2, Supporting Study 21: Methodology used to Quantify GVA and Employment Effects

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# West of Orkney Offshore Windfarm: Methodology used to Quantify GVA and Employment Effects

FINAL REPORT

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## Acronyms Used in the Report

Acronym	Definition
CAPEX	Capital expenditure (stage)
DEVEX	Development expenditure (stage)
EIA	Environmental Impact Assessment
GVA	Gross Value Added
ONS	Office for National Statistics
OPEX	Operational expenditure (stage)
OWPL	Offshore Wind Power Limited
SIC	Standard Industrial Classification (codes, used by ONS)
WTGs	Wind Turbine Generator(s)

# 1: Methodology statement

## Introduction

- 1.1 This report provides an explanation of the approach and methodology used to assess the potential economic impacts – and specifically, the potential employment and Gross Value Added (GVA)<sup>1</sup> consequences – of the proposed West of Orkney Offshore Windfarm, hereafter termed ‘the Project’).
- 1.2 The report has been prepared by Development Economics Limited on behalf of OWPL, the developer of the Project.
- 1.3 The report focuses on:
  - A description of the various scenarios developed to assess impacts for a variety of geographic areas;
  - A description of the method used to quantify potential impacts on employment and GVA; and
  - A description of the principal assumptions used in the estimation of these impacts.
- 1.4 The quantification of employment and GVA estimates in the assessment is undertaken for the following spatial areas, which in this report are termed ‘impact areas’:
  - Caithness and Sutherland;
  - Highland;
  - Orkney;
  - Scotland; and
  - The United Kingdom.
- 1.5 The quantification of impacts is undertaken for the following stages of the Project:
  - Development (from post-consent to construction);
  - Construction (fabrication and installation); and
  - Operations and maintenance.

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<sup>1</sup> Gross Value Added (GVA) measures the contribution to the economy of each individual producer, industry, or sector. Essentially, GVA is the final value of the amount of goods and services that have been produced, less the cost of all inputs and raw materials that are directly attributable to that production.

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- 1.6 OWPL have provided outline estimates of the expenditure likely to be required to decommission the Project following the conclusion of the 30-year operational period. However, estimates of GVA and employment effects likely to be created during the decommissioning stage have not been quantified by Development Economics.
- 1.7 This is because the considerable potential for future technological innovation and progress relating to decommissioning activities over the next 30 or so years means that it is not currently possible to predict the likely duration of expenditure that would be required to decommission the Project. Nor is it possible to estimate the potential capabilities of the supply chain relating to decommissioning activities in the impact areas, especially those in local areas such as Orkney, or Caithness and Sutherland.
- 1.8 The intended approach to the socio-economics assessment was discussed at the initial meeting of the Socio-economics Working Group (SEWG) for the Project in June 2022. Further presentations and discussions regarding the approach to quantification of impacts and feedback on the initial set of results occurred at subsequent meetings of the SEWG, with feedback from members resulting in modifications or adjustments to the outputs of the model. Apart from the Project team, membership of SEWG was drawn from the following organisations:
- Caithness Chamber of Commerce;
  - Dounreay Site Restoration Limited;
  - Focus North;
  - The Highland Council;
  - Highlands and Islands Enterprise;
  - Orkney Islands Council; and
  - Visit Scotland.

## Introduction to Scenarios

- 1.9 The quantification of potential GVA and employment effects associated with the Project utilizes several types of information provided by OWPL, in particular:
- Estimates of expenditure expected to be incurred during each stage of the Project.
  - The proportion of expenditure in each stage that could occur within each of the impact areas (UK, Scotland, Highland, etc.) used in the assessment.
- 1.10 Starting with scale of overall expenditure, the information provided by OWPL was disaggregated into the categories listed in **Table 1** below.

**Table 1: Categories used to estimate lifetime costs associated with the Project**

<b>CATEGORY</b>	
<b>Development</b>	Project management
	Surveys and EIA
	Engineering
	Professional services
<b>CAPEX</b>	
<b>Manufacturing</b>	Nacelles and hubs
	WTG blades
	WTG towers
	Management and engineering for the WTGs
	Foundations (jackets and piles)
	Inter array cables and interconnector cables
	Offshore export cables
	Onshore export cables
	Offshore substation
	Onshore substation
	Contingencies
	<b>Installation</b>
WTGs	
Foundations	
Inter array cables	
Offshore export cables	
Onshore export cables	
Offshore substation	
Onshore substation	
Insurance and others	
<b>OPEX</b>	
<b>Operations and maintenance</b>	Insurance and others
	WTG maintenance
	Balance of plant maintenance
	Operational support

- 1.11 Estimates of the proportion of Project expenditure expected to be expended were provided by the OWPL Project engineering team for four impact areas: Scotland; rest of the UK; Europe; and the rest of the world. However, only the estimates for the UK and Scotland have been used in the Offshore EIA Report (chapter: 19 Socioeconomics) for the Project.
- 1.12 These estimates were based on project design considerations and knowledge of supply chain capabilities located in each area. Further consideration included ongoing dialogue and engagement with potential supply chain companies in Scotland and the UK, as part of the developer's ambition to maximise the economic development potential of the Project. These considerations included targets and commitments for the sourcing of Project content established through dialogue with Crown Estates Scotland.
- 1.13 The targets also reflect ongoing dialogue and negotiations with other stakeholders, including Scottish Government, local authorities, and local training providers.
- 1.14 Given the potential for uncertainty with respect to future supply chain capabilities, capacity, and ability to win contracts through a competitive procurement process, three scenarios for out-turn of project shares benefiting each spatial area were developed by the OWPL engineering team:
- **Low Case scenario:** based on a minimum realistic level of expenditure for each category of Project expenditure in each spatial area based on current supply chain capabilities.
  - **Moderate Case scenario:** based on what the team considered was the most likely out-turn for Project expenditure in each area given current capacities and an assessment of the likelihood of future supply chain capacity augmentation.
  - **High Case scenario:** based on a maximum realistic level of out-turn Project expenditure in each area. The High Case scenario takes into account existing supply chain capacity within each area, plus any known proposals for augmentation of existing capacity (such as inward investment by suppliers, additional investment in infrastructure, etc.).
- 1.15 Only the Low Case and High Case scenarios are used in the Offshore EIA Report (chapter: 19 Socioeconomics). The Moderate Case scenario was used to identify the most likely level of outputs that could be expected to be generated by the Project, with this information then available to be shared with Project collaborators and stakeholders (via SEWG) to help inform resource planning and other decisions.
- 1.16 Based on the shares of project expenditure associated with each of the three scenarios, Development Economics developed further breakdowns of the estimated proportion of spend for Scotland into the following sub-national areas: (1) Highland; (2) Caithness and Sutherland; and (3) Orkney. Initial proposals for these breakdowns were developed by Development Economics based on experience with other projects in the north of Scotland, with these assumptions subsequently adjusted in some cases following feedback from OWPL and other members of the Project team.
- 1.17 **Table 2** presents the assumed levels of spend for the impact areas within the UK, including Scotland and local areas, for the Low Case scenario.
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**Table 2: Assumed share of Project spend for UK impact areas: Low Case scenario**

Category	UK	Scotland	Highland	Caithness and Sutherland	Orkney
<b>Development</b>					
Development	73%	53%	8%	0%	5%
<b>Fabrication</b>					
Nacelles and hubs	6%	0%	0%	0%	0%
WTG blades	23%	8%	0%	0%	0%
WTG towers	30%	10%	0%	0%	0%
WTG engineering	10%	5%	0%	0%	0%
Foundations	28%	19%	3%	1%	2%
Inter array cables	63%	13%	0%	0%	0%
Offshore export cables	80%	0%	0%	0%	0%
Onshore export cables	80%	0%	0%	0%	0%
Offshore substation	52%	15%	8%	3%	5%
Onshore substation	45%	20%	10%	4%	7%
Contingencies	30%	15%	8%	3%	5%
<b>Installation</b>					
Project management	50%	50%	8%	0%	5%
WTGs	25%	9%	0%	0%	0%
Foundations	28%	11%	6%	2%	4%
Inter array cables	25%	9%	5%	2%	3%
Offshore export cables	25%	9%	5%	2%	3%
Onshore export cables	60%	20%	10%	4%	7%
Offshore substation	60%	20%	10%	4%	7%
Onshore substation	60%	20%	10%	4%	7%
Insurance	60%	20%	0%	0%	0%
<b>Operations</b>					
Insurance and others	100%	0%	0%	0%	0%
WTG maintenance	71%	55%	47%	40%	4%
Other maintenance	47%	47%	41%	34%	4%
Operational support	83%	83%	71%	61%	8%

1.18 It should be noted that the percentage share assumptions for Caithness and Sutherland are a sub-set of those assumed for the Highland area. For some aspects of Project expenditure Orkney may be in competition for expenditure with the Highland area, so the percentages for these areas cannot be added together.

1.19 **Table 3** similarly presents the assumed levels of spend for the impact areas within the UK, including Scotland and local areas, for the High Case scenario.

**Table 3: Assumed share of Project spend for UK impact areas: High Case scenario**

Category	UK	Scotland	Highland	Caithness and Sutherland	Orkney
<b>Development</b>					
Development	100%	80%	13%	4%	9%
<b>Fabrication</b>					
Nacelles and hubs	19%	0%	0%	0%	0%
WTG blades	72%	23%	11%	5%	8%

WTG towers	68%	41%	20%	8%	14%
WTG engineering	15%	10%	0%	0%	0%
Foundations	90%	53%	8%	2%	3%
Inter array cables	81%	31%	1%	0%	1%
Offshore export cables	80%	40%	20%	8%	14%
Onshore export cables	80%	40%	20%	8%	14%
Offshore substation	80%	48%	24%	10%	17%
Onshore substation	75%	40%	20%	8%	0%
Contingencies	30%	15%	8%	3%	5%
<b>Installation</b>					
Project management	100%	100%	20%	10%	10%
WTGs	32%	11%	5%	2%	4%
Foundations	32%	12%	6%	2%	4%
Inter array cables	32%	12%	5%	2%	4%
Offshore export cables	32%	12%	5%	2%	4%
Onshore export cables	100%	100%	50%	20%	0%
Offshore substation	100%	100%	50%	20%	35%
Onshore substation	100%	100%	50%	20%	0%
Insurance	100%	100%	0%	0%	0%
<b>Operations</b>					
Insurance and others	100%	25%	0%	0%	0%
WTG maintenance	83%	64%	55%	51%	8%
Other maintenance	56%	56%	47%	44%	6%
Operational support	100%	100%	80%	75%	10%

## Impact Assessment Methodology

- 1.20 All modelling and estimation of Project impacts was undertaken by Development Economics Limited. The assessment work started in October 2022 and was updated over the October 2022 to March 2023 period reflecting updated Project expenditure and other updated information supplied by OWPL.
- 1.21 Detailed guidance on socio-economic impact assessment for marine and offshore developments has not yet been published by Marine Directorate (but is understood to be currently in preparation). The approach taken in this assessment is considered to be consistent with interim advice and guidance on aspects of the approach to assessment of offshore renewables projects issued at various times by the Marine Analytical Unit of Marine Directorate.

### *Information Provided by OWPL*

- 1.22 The assessment of employment and GVA impacts are based on Project expenditure information supplied by OWPL. These costs span five broad stages:
- The development stage (DEVEX);
  - The construction stage (CAPEX), which is further sub-divided into the (1) fabrication stage and (2) installation stage;
  - The operation and maintenance stage (OPEX); and
  - The decommissioning stage.

- 1.23 These stages of expenditure are derived from the categories of Project expenditure listed in the tables provided in Chapter 2 of this report. The costings were provided by OWPL and are based on 2022 prices.
- 1.24 Based on information provided by OWPL, the construction stage is assumed to occur over 5 years, including one year of pre-construction preliminary activity.
- 1.25 The operation and maintenance stage is assumed to occur over 30 years once the Project is commissioned. The modelling of operational stage impacts is based on estimated annual average expenditure over the 30 year period and includes expenditure on items such as replacement of parts, and surveys and monitoring.
- 1.26 Project impacts are estimated for the year when expenditure is assumed to take place. Impacts are estimated and summarised for the UK, Scotland, Highland, Caithness and Sutherland, and Orkney in terms of:
- Employee jobs – which essentially is the proportion of the Project workforce who are employees and whose normal workplace is located in each of the impact areas.
  - Net outputs, which exclude the proportion of equipment, supplies, and services that are procured from supply chains located outside supply chain expenditure for each area under consideration.
  - Related Gross Value Added (GVA) generated in the impact areas. The GVA for a business or sub-national area is its contribution to Gross Domestic Product (GDP), which is essentially measured by its operational profit over a year plus remuneration of employees.
- 1.27 It is useful to distinguish between three types of effects generated by major infrastructure developments such as the Project.
- Direct effects: Employment and gross value added which is associated with the first round of capital expenditure (e.g., Project expenditure undertaken by OWPL and/or prime contractors) within each impact area used in the assessment.
  - Indirect effects: Employment and gross value added associated with the supply of goods and services to main contractors by other companies located within each impact area of the assessment.
  - Induced effects: Further economic activity (beyond direct and indirect effects) that occur with each impact area, which are associated with additional local income effects and local supplier purchases.
- 1.28 In the case of developments such as the Project, in practice it can be difficult to distinguish between direct and indirect effects. For this reason it is common practice for this type of assessment to assess and quantify direct and indirect effects in combination, and this is the approach taken here.

- 1.29 Employee jobs generated during the CAPEX stage will include a proportion of workers who are not usually resident in local impact areas (use as Caithness and Sutherland or Orkney) but who reside temporarily in the impact area for some or all of the construction stage.

### *Assumptions Used in the Modelling of Impacts*

- 1.30 The approach and assumptions used to convert information on expected Project expenditure in each impact area into estimates for GVA and employee jobs is described below.
- 1.31 Project expenditure was supplied by OWPL using a 2022 price base. In order to produce estimates for employment associated with anticipated Project expenditure, it was necessary to convert 2022 construction prices into 2018 equivalent prices to enable matching with relevant Office for National Statistics data sets. Prices were converted using the ONS Construction Output price data series.<sup>2</sup>
- 1.32 Project expenditure is the various stages was allocated to various Standard Industrial Classification (SIC) codes used by the ONS to organise various sector-based statistical datasets, including for business turnover, GVA, and employment. The specific categories used in the assessment are summarised in **Table 4**.

**Table 4: SIC categories used in the assessment of impacts**

SIC code (category)	Description
23	Manufacture of non-metallic mineral products
25	Fabricated metal products
27	Electrical equipment
28	Manufacture of machinery & equipment n.e.c.
33	Repair & maintenance, installation
42	Civil Engineering
49	Land transport
50	Water transport
65	Insurance activities
70	Head office & consulting services
71	Engineering & Architectural services
74	Other professional, scientific, & technical activities

- 1.33 ONS data from the following datasets was used to develop impact coefficients and ratios used in the estimation of Project effects:
- Annual Business Survey regional reference tables<sup>3</sup>
  - Business Register and Employment Survey.<sup>4</sup>

<sup>2</sup> [Construction output price indices - Office for National Statistics](#)

<sup>3</sup> [Non-financial business economy, UK regional results: Sections A to S - Office for National Statistics](#)

<sup>4</sup> [Dataset Selection - Query - Nomis - Official Census and Labour Market Statistics \(nomisweb.co.uk\)](#)

- 1.34 These data sets were used to estimate the potential direct and indirect employment and GVA effects likely to occur in each impact area for every £1 million of Project expenditure considered likely to occur in that area for each of the three scenarios (i.e., the Low, Moderate, and High Case scenarios respectively). The specific assumptions used to convert project expenditure into estimates for employment and GVA for each industry destination of spending within Scotland are summarised in **Table 5**.

*Table 5: Assumptions for direct + indirect effects and ratios for industrial sectors - Scotland*

SIC	Direct/indirect jobs supported per £1 million expenditure	GVA to turnover ratio
23	5.63	0.385
25	6.29	0.461
27	4.76	0.558
28	4.57	0.350
33	3.09	0.409
42	6.06	0.365
49	9.25	0.447
50	3.45	0.569
65	5.28	0.751
70	6.93	0.568
71	5.88	0.470
74	9.20	0.547

- 1.35 Induced employment and GVA impacts for Scotland are estimated using the respective Type II and Type I multiplier coefficients obtained from Input Output tables published by Scottish Government for each type of industrial activity (i.e., the SIC categories) listed in Table 5 above. The values used in the modelling are summarised in **Table 6** below.<sup>5</sup>

*Table 6: Induced jobs and GVA ratios - Scotland*

SIC	Employment effect ratios	GVA effect ratios
23	0.174	0.202
25	0.191	0.226
27	0.157	0.250
28	0.245	0.234
33	0.288	0.205
42	0.129	0.176
49	0.148	0.228
50	0.287	0.252
65	0.176	0.118
70	0.222	0.242
71	0.157	0.206
74	0.147	0.220

<sup>5</sup> [Supply\\_Use\\_and\\_Input-Output\\_Tables - gov.scot \(www.gov.scot\)](http://www.gov.scot/Supply_Use_and_Input-Output_Tables)

1.36 Equivalent values for direct/indirect and induced multipliers are no longer published for the UK. They are also not available for local authority areas of Scotland. The approach taken is to upscale or downscale based on Scotland ratios and the judgement of Development Economics. The specific assumptions used for each industrial activity category relative to the sector-specific assumptions for Scotland are as follows:

- UK: 20% increase in ratio compared to Scotland.
- Highland and Orkney: 10% reduction in ratio compared to Scotland.
- Caithness and Sutherland: 20% reduction in ratio compared to Scotland.