BiGGAR Economics

Economic Impact Assessment of Owenreagh/Craignagapple Wind Farm

September 2023

BiGGAR Economics

Contents

1.	Executive Summary	1
2.	Introduction	3
3.	Socio-Economic Baseline	5
4.	Economic Impact Analysis	13
5.	Fiscal Impacts	21
6.	Impact on Bills	24
7.	Appendix 1: Method Statement	30

1. Executive Summary

Owenreagh/Craignagapple Wind Farm could generate up to £8.3 million Gross Value Added (GVA) and support 130 years of employment across Derry City and Strabane.

Owenreagh/Craignagapple Wind Farm is a proposed onshore wind development located in the local government district of Derry City and Strabane. The development comprises the repowering of Owenreagh I and Owenreagh II Wind Farms, and the replacement of the consented (but not constructed) Craignagapple Wind Farm with a total of 14 wind turbines and associated infrastructure.

Based on a maximum generating capacity of 67.2 MW, it was estimated that the expenditure on the construction and development of Owenreagh/Craignagapple Wind Farm could generate up to:

- £8.3 million GVA and support 130 years of employment in Derry City and Strabane;
- £27.4 million GVA and support 500 years of employment in Northern Ireland; and
- £64.1 million GVA and 1,140 years of employment across the UK.

Similarly, annual spend on operations and maintenance could generate up to:

- £0.3 million GVA and support less than 10 jobs in Derry City and Strabane;
- £1.4 million GVA and 20 jobs across Northern Ireland; and
- £2.7 million GVA and 40 jobs across the UK.

In 2025, at the peak of construction and development activity, Owenreagh/ Craignagapple Wind Farm is expected to support a total 90 jobs across Derry City and Strabane. This includes both activities directly associated with the project and occurring across supply chains.

The investment associated with Owenreagh/Craignagapple Wind Farm will also support public services by generating a total £8.6 million in tax revenue during its construction, and £0.8 million during each year of its operations. This revenue will support the provision of public services across Northern Ireland.

Recent turmoil in the gas market has shown the risks to energy security from relying on energy imports. Increases in gas prices have contributed to a rise in prices and have resulted in the cost-of-living crisis. Increasing the generation of renewable energy and, especially, of onshore wind energy will contribute towards increasing energy security and facilitating the transition of the UK economy towards net zero.

As onshore wind is a cost competitive energy source, increasing its role in the energy mix will also contribute towards lowering consumer bills. By 2030, the impact from more widespread adoption of onshore wind could deliver energy savings of up to 7%.

2. Introduction

BiGGAR Economics was commissioned to consider the economic impacts from the development, construction, and operations of Owenreagh/Craignagapple Wind Farm.

2.1 Study Scope

Ørsted is seeking to develop Owenreagh/Craignagapple Wind Farm, a proposed onshore wind farm in the local government district of Derry City and Strabane. The development is set to comprise the decommissioning of the existing Owenreagh I and II Wind Farms and their repowering, incorporating the consented Craignagapple Wind Farm. The wind farm will feature 14 turbines and have a total generating capacity of up to 67.2 MW. The site boundary is illustrated in Figure 1.1 of the Environmental Statement.

In early 2022, BiGGAR Economics was commissioned to carry out an economic impact assessment of Owenreagh/Craignagapple Wind Farm. The analysis considers:

- direct & indirect impact on GVA and employment from the wind farm on a local, regional, and national level;
- the tax revenue generated;
- a breakdown of labour market conditions; and
- the relationship between onshore wind and consumer energy prices.

2.2 The Role of Repowering

When wind farms such as Owenreagh I and Owenreagh II reach the end of their operational lifetime, there is the risk of losing their generating capacity. With the development of new turbine technology, the repowering of existing sites offers an opportunity for generating more energy, more efficiently and with less turbines.

The importance of repowering existing sites was highlighted in a 2019 RenewableUK[1] report considering the role repowering and extending the lifetime of existing sites has in filling the demand for renewable energy. The report set out three scenarios (optimal, intermediate, and low), which assessed potential surplus or shortfalls in the contribution of onshore wind to the UK's energy mix. The scenarios were based on a series of assumptions, including on:

- the likelihood of applying for an extension or repowering;

[1] RenewableUK (2019), Onshore Wind: the UK's Next Generation.

- success rates of planning applications;
- changes in turbine sizes;
- number of turbines; and
- the load factor.

The only scenario compatible with the UK's commitments towards decarbonisation was the optimal scenario, where a 100% success rate in planning applications for existing sites was assumed. Under this scenario around 36.2 TWh (terawatt-hour) could be generated within the UK by 2040.

2.3 Report Structure

The remainder of this report is structured as follows:

- Chapter 3 provides a socio-economic baseline setting the development within the local, regional, and national economic context;
- Chapter 4 estimates the economic impact of Owenreagh/Craignagapple Wind Farm during the initial decommissioning and construction phase, and its operation;
- Chapter 5 sets out the fiscal impacts associated with the development;
- Chapter 6 explains the impact that the expansion of onshore wind may have on electricity bills; and
- Appendix 1 includes a method statement.

3. Socio-Economic Baseline

This section sets Owenreagh/Craignagapple Wind Farm within its socio-economic context, with a particular focus on labour market structure.

The socio-economic baseline sets Owenreagh/Craignagapple Wind Farm within the context of the following study areas:

- Derry City & Strabane local government district;
- Northern Ireland; and
- the UK.

3.1 Population

In 2021, Derry City and Strabane had a population of 150,834 (Table 3-1), accounting for 7.9% of the population of Northern Ireland.

The population of Derry City and Strabane is younger than the wider population of Northern Ireland. Derry City and Strabane had a working age population of 94,602 or 62.7% of its total population. The share of the population of working age was slightly larger in Derry City and Strabane than across Northern Ireland. The proportion of Derry City and Strabane residents aged 65 and over (16.1%) was lower than across Northern Ireland (17.3%) and the UK (18.7%). Table 3-1 summarises Population by Age in 2021 within Derry City and Strabane, Northern Ireland, and the UK.

Table 3-1 Population by Age, 2021

		Derry City & Strabane	Northern Ireland	UK*
Total		**150,834**	**1,904,563**	**67,026,292**
	0-15	21.2%	20.4%	18.4%
	16-64	62.7%	62.3%	62.9%
	65+	16.1%	17.3%	18.7%

Source: ONS (2022), Mid-Year Population Estimates, UK, June 2021.

3.1.1 Population Projections

As shown in Table 3-2, over the period between 2021 and 2043 the population of Derry City and Strabane is expected to fall by 4.5%. During the same period the population of Northern Ireland is expected to increase by 4.4% to 1,989,195.

Table 3-2 Population Projections, 2020-2043

	2021	2043	Change
Derry City & Strabane	150,834	144,116	-4.5%
Northern Ireland	1,904,563	1,989,195	4.4%
UK*	67,026,292	71,102,852	6.1%

Source: ONS (2022), Mid-Year Population Estimates, UK, June 2021. *ONS (2021), Population Projections 2018-2043, National Records of Scotland (2021), Population Projections 2018-2043.

As shown in Table 3-3, the proportion of those living in Derry City and Strabane aged 16-64 years old is projected to decrease over time. By 2043, the number of working age people in Derry City and Strabane is projected to fall by 11,900. The share of the population of working age in Derry City and Strabane is projected to decrease from 62.7% to 57.4%, lower than the share of the working age population across Northern Ireland as a whole (58.2%) and the UK (59.0%). The share of the population aged 65+ is projected to increase from 16.1% in 2021 to 23.8% in 2043.

While a relative younger population currently lives in Derry City and Strabane compared to Northern Ireland and the UK, its demographic structure is set to age at a faster rate. This makes it important for the local area to generate economic activity that attracts and retains a younger population.

Table 3-3 Population Projections by Age, 2021-2043

	Derry City & Strabane		Northern Ireland		UK*	
	2021	2043	2021	2043	2021	2043
Total	150,834	144,116	1,904,563	1,989,195	67,026,292	71,102,852
0-15	21.2%	18.8%	20.4%	17.6%	18.4%	16.9%
16 - 64	62.7%	57.4%	62.3%	58.2%	62.9%	59.0%
65+	16.1%	23.8%	17.3%	24.2%	18.7%	24.0%

Source: ONS (2022), Mid-Year Population Estimates, UK, June 2021.* ONS (2021), Population Projections 2018-2043, National Records of Scotland (2021), Population Projections 2018-2043.

3.1.2 Household Projections and Trends

Between 2016 and 2041 the total number of households in Northern Ireland is projected to increase 12.2% from 726,100 to 813,800 (Table 3-4). Similarly, the number of households in Derry City and Strabane is also projected to increase, though at a slower rate of 4.7%.

During this period the proportion of one person households is also projected to increase across both areas. By 2041 the proportion of one person households is projected to rise from 28.7% to 33.4% in Derry City and Strabane and from 27.8% to

29.4% across Northern Ireland. For Derry City and Strabane this represents an increase of 3,500 single person households. Similarly, the proportion of two person households is projected to increase by 1.8% in Derry City and Strabane and by 3.0% across Northern Ireland.

Across both study areas a decrease in the proportion of three persons, four persons and 5+ persons households are projected, with this trend being more pronounced for Derry City and Strabane compared to Northern Ireland.

Changes in the size of households and in the number of people living within an area determine future demand for housing and this impacts house prices. Based on the projected increase in the number of households across both Derry City and Strabane, and Northern Ireland by 2041, it is anticipated that housing demand will increase and result in higher housing prices.

Table 3-4 Projected Change in Household Size, 2016-2041

	Derry City & Strabane		Northern Ireland	
	2016	2041	2016	2041
Total	57,500	60,200	726,100	813,800
1 person	28.7%	33.4%	27.8%	29.4%
2 persons	28.1%	29.9%	30.7%	33.7%
3 persons	16.9%	14.8%	16.5%	14.9%
4 persons	14.8%	12.6%	14.5%	13.0%
5+ persons	11.6%	9.3%	10.4%	9.0%

Source: Northern Ireland Statistics and Research Agency (2018), Household projections 2016 based.

3.2 Labour Market Structure & Economic Activity

The industrial structure of Derry City and Strabane is similar to the wider economy of Northern Ireland, but with a greater proportion of people working in health and social care.

As shown in Table 3-5, the highest proportion of employment in Derry City and Strabane in 2022 was in human health and social work sectors, which accounted for 21% of employment in the area. Employment in this sector was higher than in Northern Ireland (17%) and the UK (14%).

Those working in Derry City and Strabane were also more likely to be employed in education (11%), compared to workers across Northern Ireland (9%) and the UK (9%).

The construction sector is the most likely employment area that will benefit from the decommissioning and construction phases of the Owenreagh/Craignagapple Wind Farm. This sector accounts for 5% of employment in Derry City and Strabane, which

is similar to relative share of employment in the sector across Northern Ireland and the UK (5.0%).

Table 3-5 Employment by Industry, 2022

	Derry City & Strabane	Northern Ireland	UK
Human health and social work activities	21%	17%	14%
Wholesale and retail trade; repair of motor vehicles and motor cycles	16%	17%	15%
Education	11%	9%	9%
Manufacturing	10%	11%	8%
Administrative and support service activities	7%	7%	9%
Accommodation and food service activities	6%	6%	7%
Public administration and defence: compulsory social security	6%	7%	5%
Construction	5%	5%	5%
Information and communication	4%	3%	4%
Transport and storage	3%	4%	5%
Financial and insurance activities	3%	3%	3%
Professional, scientific and technical activities	3%	5%	9%
Arts, entertainment and recreation	2%	2%	2%
Water supply, sewerage, waste management and remediation activities	1%	1%	2%
Electricity, gas, steam and air conditioning supply	0%	0%	1%
Mining and quarrying	0%	0%	0%
Agriculture, forestry and fishing	0%	0%	0%
Total	**59,000**	**822,000**	**31,368,000**

Source: Northern Ireland Statistics and Research Agency (2022), Labour Force Survey Annual Tables 2021

In 2022 the unemployment rate in Derry City and Strabane (3.8%) was the same as the average across Northern Ireland, and lower than the UK average of 4.5% (Table 3-6).

Despite this, the level of economic activity was lower in Derry City and Strabane (68.0%) than across Northern Ireland (73.0%) and the UK (78.3%). Similarly, in 2022 the median annual gross wage for full-time workers living in Derry City and Strabane was estimated as £21,402, lower than for Northern Ireland were lower (£30,000) and for the UK (£33,000).

Expected demographic trends alongside relatively low economic activity in Derry City and Strabane risk creating future socio-economic pressures in the local area.

Table 3-6 Economic Activity Rates, 2022

	Derry City & Strabane*	Northern Ireland	UK
Economically Active (%)	68.0%	73.0%	78.3%
Unemployment Rate (%)	3.8%	3.8%	4.5%
Median Annual Gross Wage Full Time Workers (resident analysis)	£21,402	£30,000	£33,000

ONS (2022), Annual Population Survey 2021. *NISRA (2022), Labour Market Structure by district council area 2021. NISRA (2022), Employee Earnings in NI 2022,

3.3 Deprivation

The Northern Ireland Multiple Deprivation Measure is a relative measure of deprivation which ranks small areas of Northern Ireland in terms of deprivation across the domains of income, employment, health and disability, education skills and training, access to services, living environment, and crime and disorder. These areas can be ranked by quintiles (one fifth shares), with a small area in the first quintile being among the 20% most deprived areas in Northern Ireland.

Based on this measure, Derry City and Strabane features above average levels of deprivation. There are 57 small areas in Derry City and Strabane, with 40% of these small areas identified in the most deprived quintile, 19% ranked in the second most deprived quintile, and 9% ranked in the least deprived quintile (Table 3-7).

Table 3-7 Northern Ireland Multiple Deprivation Measure by Quintile, 2017

	Derry City & Strabane
1 (most deprived quintile)	40%
2	19%
3	16%
4	16%
5 (least deprived quintile)	9%

Source: Northern Ireland Statistics and Research Agency (2017), Northern Ireland Multiple Deprivation Measure 2017

3.4 Education

Derry City and Strabane has a lower share of the population with a degree level qualification (29.8%) compared to Northern Ireland (38.4%) and the UK (43.0%). The local area has also a higher share of the population with no qualifications (19.2%) compared to Northern Ireland (12.7%) and the UK (6.6%). This is summarised on Table 3-8 below.

Table 3-8 Qualification Levels, 2020

	Derry City & Strabane	Northern Ireland	UK*
Degree Level and Above	29.8%	38.4%	43.0%
Below Degree Level	51.0%	48.9%	50.4%
No Qualifications	19.2%	12.7%	6.6%

Source: Northern Ireland Statistics and Research Agency (2021), Labour Force Survey Annual Qualifications 2020. *ONS (2021), Annual Population Survey 2020.

3.5 House Prices

As shown in Table 3-9, the average price of a property in Derry City and Strabane in 2022 was £143,000, which is lower than the average price across Northern Ireland (£159,100). The average price of a property across the UK was £260,400 , which is 82% and 64% more expensive than those in Derry and Strabane and in Northern Ireland, respectively.

In 2022 the average gross annual earnings for full-time workers in the UK was £38,100, 14% higher than Northern Ireland (£33,500). In turn, average gross annual earnings in Derry City and Strabane (£30,400) were 9% lower than the Northern Irish average.

The house value to earnings ratio gives a relative measure of housing affordability. Based on this measure, the average housing price is around 4.7 times the average gross income across both Derry City and Strabane, and Northern Ireland. For the UK this ratio is 6.8, suggesting that housing is relatively less affordable across the UK than in Derry City and Strabane, and Northern Ireland (Table 3-9).

Table 3-9 House Prices and Affordability 2022

	Derry City & Strabane	Northern Ireland	UK
Average House Price	£143,000	£159,100	£260,400
Average Annual Gross Income	£30,400	£33,500	£38,100
House Value to Earnings Ratio	4.7	4.7	6.8

Source: ONS (2022), UK House price Index. Northern Ireland Statistics and Research Agency (2022), Annual Survey of hours and earnings – by Local Government District (by place of work). ONS (2022), Annual Survey of Hours and Earnings – Workplace Analysis 2021.

The presence or lack of onshore wind developments is not one of the main determinants of house prices. While a series of studies have been carried out on the subject, the evidence provided is not conclusive. Using similar methodologies Gibbons[2] and ClimateXChange[3] argue intrinsic preferences play an important role in determining the nature of the relationship.

Changing attitudes towards renewables are likely to shape the relationship between house prices and onshore wind developments in the future. As onshore windfarms are increasingly seen as part of the necessary infrastructure to reduce carbon emissions, this is expected to have an impact on the relationship between wind farms and the prices of properties located in their proximity.

3.6 Summary of Socio-Economic Baseline

Between 2020 and 2043, the population of Derry City and Strabane is expected to fall, while the populations of both Northern Ireland and the UK are expected to rise. These trends are largely based on the area's limited economic opportunities, as indicated by the higher levels of deprivation experienced in Derry and Strabane compared to Northern Ireland as a whole. This is also reflected in relatively smaller shares of the population with degree level qualifications and lower levels of economic activity.

Owenreagh/Craignagapple Wind Farm and the development of the onshore wind sector in Derry City and Strabane provides the area with an opportunity for economic

[2] Gibbons, S. (2015). Gone with the wind: valuing the visual impacts of wind turbines through house prices.
[3] ClimateXChange (2016). Impact of wind turbines on house prices in Scotland.

growth. This will be important if demographic projections are to be reversed and a skilled workforce is to be attracted to the area.

While employment in Derry City and Strabane is largely concentrated in public sector roles in public administration, education and health, the construction sector accounts for 5% of employment. This sector will play a role in the construction of the wind farm and could benefit from non-specialised construction activity as part of balance of plants works.

House prices in Derry City and Strabane are relatively lower than those across Northern Ireland and the UK. The future expansion in the number of households living in the area, despite a fall in population, is set to increase demand for housing and could potentially increase housing prices.

4. Economic Impact Analysis

This section estimates the economic impact associated with the decommissioning and construction phase, and operation of Owenreagh/Craignagapple Wind Farm.

4.1 Decommissioning and Construction Phase

4.1.1 Total Economic Impact

Based on a total generating capacity of up to 67.2 MW from 14 turbines, it was estimated that the development and construction of Owenreagh/Craignagapple Wind Farm could cost up to £96.1 million. To consider the economic impact of the wind farm, it was first necessary to split spending across the following contract categories:

- development and planning;
- turbines;
- balance of plant (including decommissioning); and
- grid connection.

Turbine contracts are expected to be the largest contract category, resulting in spending of around £54.4 million, equivalent to 57% of capital expenditure (Capex). Balance of plant contracts could be worth up to £18.6 million, or 19% of Capex. Spending on grid connection (15%), and development and planning (9%) will account for relatively smaller shares of capital expenditure. This is summarised on Table 4-1 below.

Table 4-1 Development and Construction by Contract Type

	% Capex	Value (£m)
Development and Planning	9%	8.7
Turbines	57%	54.4
Balance of Plant (including Decommissioning)	19%	18.6
Grid Connection	15%	14.4
Total	**100%**	**96.1**

Source: BiGGAR Economics Analysis

The next step in the economic impact analysis was to consider the ability of businesses across Derry City and Strabane, Northern Ireland and the UK to carry out the contracts required to develop and construct Owenreagh/Craignagapple Wind

Farm. This was based on an analysis of industries within each of the study areas and the availability of required contractors across Derry City and Strabane, Northern Ireland, and the UK. The assessment has drawn on evidence from other studies carried out by BiGGAR Economics across the UK and Northern Ireland, and on a report on the economic impact of onshore wind in Northern Ireland commissioned by RenewableNI[4]. The assumptions on local content draw on evidence from Ballykeel Wind Farm, an onshore wind farm under construction in County Antrim. The evidence from Ballykeel Wind Farm highlights opportunities for local contractors in the sourcing of construction materials as well as in site management services.

On this basis, it was assumed that during the construction period Derry City and Strabane could benefit from total spending of £12.4 million or 13% of capital expenditure. As shown in Table 4-2, balance of plant contracts, including decommissioning (£4.7 million), will be associated with the greatest level of local benefits, primarily linked with construction and civil engineering activities. Derry City and Strabane are also expected to benefit from around a quarter of the spending associated with project development and grid connection.

Similarly, balance of plant contracts will constitute the largest opportunity for businesses across Northern Ireland and the UK, with Northern Irish contractors expected to receive up to £12.0 million and UK businesses £18.6 million. There will also be opportunities for businesses in Northern Ireland and the UK to carry out most of the grid connection works and development contracts. As turbines will be manufactured outside the UK, local, regional, and national spending on this contract category will be more limited.

The extent to which higher levels of local content could be realised is dependent on the developer's commitment towards maximising local economic impacts and the capacity of companies in Derry City and Strabane to deliver these contracts. Ørsted will require successful tenderers to attend "meet the buyer" events to increase awareness among local contractors of the opportunities available through this onshore wind development. The initiative is in line with best practice, as set out in RenewableUK Good Practice Guide to supply chain opportunities[5].

[4] RenewableNI (2021), Powering a Green Economy.
[5] RenewableUK (2014), Local Supply Chain Opportunities in Onshore Wind: Good Practice Guide.

Table 4-2 Development and Construction Expenditure by Study Area

	Derry City & Strabane		Northern Ireland		UK	
	% of Spend	£m	% of Spend	£m	% of Spend	£m
Development and Planning	33%	2.8	35%	3.1	99%	8.6
Turbines	2%	1.2	7%	4.0	12%	6.4
Balance of Plant (including Decommissioning)	25%	4.7	65%	12.0	100%	18.6
Grid Connection	26%	3.7	83%	11.9	91%	13.2
Total	**13%**	**12.4**	**32%**	**31.0**	**49%**	**46.7**

Source: BiGGAR Economics Analysis. Note: totals may not match due to rounding.

The spending on each of these contracts was then split across smaller contract areas, with each one of these being allocated to a sector based on the codes from the Standard Industrial Classification (SIC)[6]. Sectoral spending was divided by the relevant turnover per GVA ratio, as sourced from the UK Annual Business Survey (ABS)[7]. In this way, it was estimated that the construction and development of Owenreagh/Craignagapple Wind Farm could generate £6.0 million direct GVA in Derry City and Strabane, £15.1 million direct GVA in Northern Ireland and £22.6 million direct GVA across the UK (Table 4-3).

[6] Office for National Statistics (2009), UK Standard Industrial Classification of Economic Activities 2007 (SIC 2007).

[7] Office for National Statistics (2018), Non-financial business economy, UK (Annual Business Survey) Statistical bulletins.

Table 4-3 Development and Construction, Direct GVA (£m)

	Derry City & Strabane	Northern Ireland	UK
Development (£m)	1.4	1.5	4.3
Turbines (£m)	0.6	1.9	2.9
Balance of Plant - including Decommissioning (£m)	2.2	5.6	8.8
Grid Connection (£m)	1.8	6.0	6.6
Total (£m)	**6.0**	**15.1**	**22.6**

Source: BiGGAR Economics Analysis. Note: totals may not match due to rounding.

The turnover generated by each of the contracts associated with the construction and development of Owenreagh/Craignagapple Wind Farm will also support employment across Derry City and Strabane, Northern Ireland and the UK. The direct employment supported by the wind farm was estimated by dividing the spending under each contract by the relevant turnover per job ratio. In this way it was estimated that the construction and development of Owenreagh/Craignagapple Wind Farm could support 90 direct years of employment in Derry City and Strabane, 260 direct years of employment in Northern Ireland, and 390 direct years of employment across the UK (Table 4-4).

Table 4-4 Development and Construction, Direct Employment (Years of Employment)

	Derry City & Strabane	Northern Ireland	UK
Development and Planning	10	10	50
Turbines	10	50	70
Balance of Plant (including Decommissioning)	30	90	130
Grid Connection	30	120	130
Total Years of Employment	**90**	**260**	**390**

Source: BiGGAR Economics Analysis. Note: totals may not match due to rounding.

The spending on primary contractors will then have knock on effects across their supply chains. To estimate indirect impacts, Northern Irish Type 1 GVA and

employment multipliers[8] were applied to the direct GVA and employment supported by the construction and development of the wind farm. This is summarised in Table 4-5 below.

Table 4-5 Development and Construction, Indirect Impacts

	Derry City & Strabane	Northern Ireland	UK
Indirect Employment (years of employment)	20	160	430
Indirect GVA (£m)	1.1	7.7	22.8

Source: BiGGAR Economics Analysis

In a similar way, those working on the construction and development of Owenreagh/Craignagapple Wind Farm will have an impact on economic activity by spending their salaries and wages (induced economic impact). To estimate this impact, Type 2 Northern Irish GVA and employment multipliers were estimated and applied to the direct GVA, and employment associated with the construction and development of Owenreagh/Craignagapple Wind Farm. As Northern Irish multipliers reflect activity at the regional level, adjustments were made to account for local supply chain activity and household spend within Derry City and Strabane (Table 4-6).

Table 4-6 Development and Construction, Induced Impacts

	Derry City & Strabane	Northern Ireland	UK
Induced Employment (years of employment)	20	70	330
Induced GVA (£m)	1.3	4.7	18.7

Source: BiGGAR Economics Analysis

Adding together direct, indirect, and induced impacts it was estimated that Owenreagh/Craignagapple Wind Farm during its construction and development could generate up to:

- £8.3 million GVA and support 130 years of employment in Derry City and Strabane;
- £27.4 million GVA and support 500 years of employment in Northern Ireland; and

[8] Northern Ireland Statistics and Research Agency (NISRA) (2022), NI Economic Accounts Project - 2017 and 2018 Experimental Results.

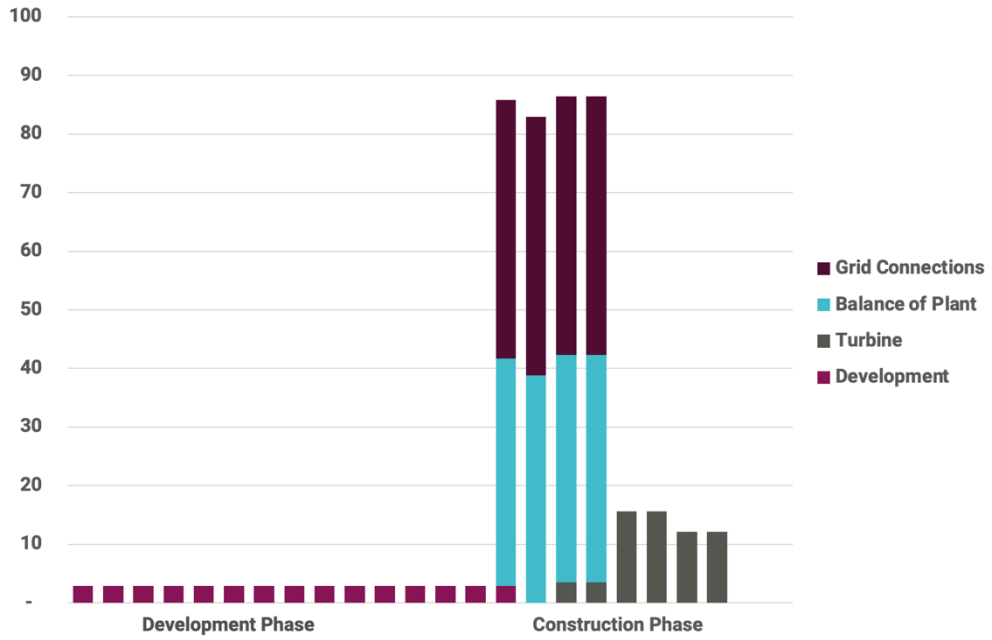
- £64.1 million GVA and 1,140 years of employment across the UK.

4.1.2 Economic Impact Over Time

Since the development and construction of an onshore wind farm occurs over several years it is helpful to consider impacts over time. At the earliest, construction of Owenreagh/Craignagapple Wind Farm is expected to start in 2026. This section provides an overview of the distribution of activity across the development and construction phases.

As shown in Figure 4-1, most of the initial activity is linked to the project's development, which is assumed to support a limited number of jobs in Derry City and Strabane. Most of the employment supported by the development (direct and indirect) takes place during construction. In particular, it was estimated that at its peak during Owenreagh/Craignagapple Wind Farm will support 90 jobs.

Figure 4-1 Development and Construction Employment Over Time (By Quarter)



Source: BiGGAR Economics Analysis

4.2 Operations and Maintenance

Following its construction, Owenreagh/Craignagapple Wind Farm is also expected to generate economic benefits during its operational phase expected to last 40 years. It was estimated that each year of operations will result in spending of around £2.0 million. Based on the ability of Derry City and Strabane, Northern Irish and UK contractors to deliver the required contracts, it was estimated that £0.5 million would be spent on operations and maintenance contracts in Derry City and Strabane, £1.5 million in Northern Ireland and £1.8 million across the UK (Table 4-7).

Table 4-7 Operations and Maintenance Spending by Study Area

	Derry City & Strabane		Northern Ireland		UK	
	% of Spend	£m	% of Spend	£m	% of Spend	£m
Operations and Maintenance	25%	0.5	77%	1.5	77%	1.8

Source: BiGGAR Economics Analysis

Similar to the construction and development contracts, spending was split across the different contracts performed during operations and maintenance. Sectoral spending was then divided by the relevant turnover per GVA and turnover per job ratios to estimate the direct GVA and employment associated with the operations and maintenance of Owenreagh/Craignagapple Wind Farm. In this way, it was estimated that the wind farm's operations could support £0.2 million direct GVA and less than 10 direct jobs in Derry City and Strabane, £0.7 million direct GVA and 10 direct jobs in Northern Ireland, and £0.9 million direct GVA and 10 direct jobs across the UK (Table 4-8).

Table 4-8 Operations and Maintenance, Direct Impact

	Derry City & Strabane	Northern Ireland	UK
Direct Employment	<10	10	10
Direct GVA (£m)	0.2	0.7	0.9

Source: BiGGAR Economics Analysis

The direct GVA and employment supported by operational spending were then multiplied by the relevant Type 1 and Type 2 GVA and employment multipliers to estimate indirect and induced impacts. Adding together direct, indirect and induced impacts, it was estimated that the operations and maintenance of Owenreagh/Craignagapple Wind Farm could generate the following each year:

- £0.3 million GVA and support less than 10 jobs in Derry City and Strabane;
- £1.4 million GVA and 20 jobs across Northern Ireland; and
- £2.7 million GVA and 40 jobs across the UK.

4.3 Community Benefits

Throughout the operation of Owenreagh/Craignagapple Wind Farm, Ørsted has committed to providing community benefits worth £5,000 per MW of installed

capacity[9]. Based on a maximum generating capacity of 67.2MW, up to £340,000 would be available each year to those communities living in proximity of the wind farm.

The existing wind farm has already supported a series of projects across the community, including the installation of a defibrillator at Tristan Road, Evish and funding to Owen Roes' GAA Club, Clann na nGael GAA Club, Artigarvan Hall, and the Drummond Centre. Similarly, funds from the proposed wind farm development will be managed by an independent organisation and allocated to activities supporting local aspirations.

[9] Orsted. Owenreagh/Craignagapple Wind Farm, Leaflet 3.

5. Fiscal Impacts

This section considers support mechanisms for renewable energy and the tax revenue that Owenreagh/Craignagapple Wind Farm is expected to deliver.

5.1 Taxes Generated

The primary sources of taxes that would be directly supported by the Owenreagh/Craignagapple Wind Farm are:

- non – domestic rates; and
- employment taxes.

The developer would also pay corporation taxes on any profits made as a result of developing the wind farm, however, at this stage it is not possible to estimate what these values will be and therefore this has been excluded from the analysis.

5.1.1 Non-Domestic Rates

In Northern Ireland properties and developments subject to non-domestic use are assessed based on their rental value, known as their Net Annual Value (NAV). Since the support mechanisms for future onshore wind developments will be different compared to those for wind farms currently in operation, it was not possible to establish what the non-domestic rates paid by Owenreagh/Craignagapple Wind Farm could be.

Based on discussions with developers elsewhere in the UK and the latest revision to Net Annual Values (NAVs), it was assumed that the revenue from the non-domestic rates associated with the development could amount to £7,000 per MW of generating capacity. This reflects a conservative assumption, which is appropriate in the context of the planning application. On this basis, it was estimated that during each year of operations Owenreagh/Craignagapple Wind Farm could generate £470,400 in non-domestic rates. This revenue will support the spending of local government, including the provision of public services.

5.1.2 Employment Taxes

The direct and indirect employment supported by Owenreagh/Craignagapple Wind Farm is also expected to generate benefits to the Exchequer through the payment of employment taxes. These include Income Tax and National Insurance contributions (both Employee National Insurance and Employer National Insurance).

The starting point in estimating these taxes was to consider the number of jobs (direct and indirect) supported by activity at Owenreagh/Craignagapple Wind Farm.

Jobs were then split by sector and data from the Annual Survey of Hours and Earnings (ASHE)[10] on median incomes by industry were used to estimate the earnings associated with each job supported. Once total earnings per job had been estimated, it was possible to apply Income Tax[11] and National Insurance[12] rates to estimate the amount of tax associated with each job.

The total sectoral taxes per job were then multiplied by the number of jobs (direct and indirect) supported by Owenreagh/Craignagapple Wind Farm to estimate the total employment taxes generated by the development with respects to the UK economy.

Employment Taxes During Construction and Development

On this basis, it was estimated that the construction and development of Owenreagh/Craignagapple Wind Farm could generate up to £8.6 million in employment taxes, including:

- £3.4 million in Income Tax;
- £2.4 million in Employee National Insurance; and
- £2.8 million in Employer National Insurance.

Employment Taxes During Operations and Maintenance

Similarly, throughout each year of its operations Owenreagh/Craignagapple Wind Farm is expected to support a total £0.3 million in employment tax revenue, including:

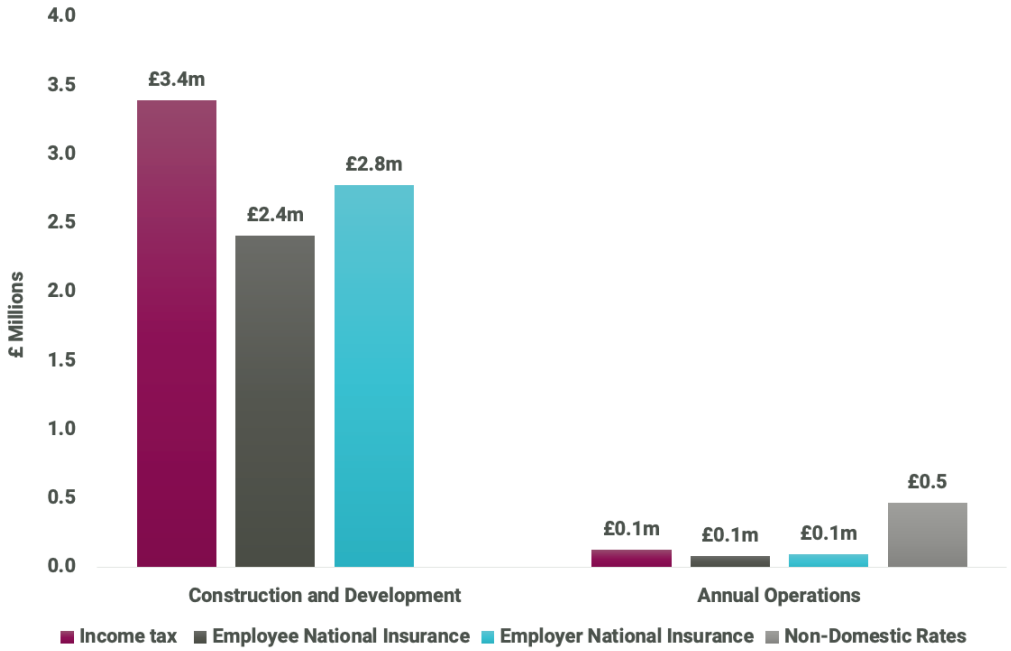
- £0.1 million in Income Tax;
- £0.1 million in Employee National Insurance; and
- £0.1 million in Employer National Insurance.

5.2 Summary of Tax Contribution

It was estimated that during its construction and development Owenreagh/Craignagapple Wind Farm could generate tax contributions worth a total £8.6 million, while during each year of its operations it could result in up to £0.8 million in tax revenue. Refer to Figure 5-1 below.

[10] Northern Ireland Statistics and Research Agency (NISRA) (2022), Annual Survey of Hours and Earnings.
[11] UK Government (2022), Income tax rates and allowances for current and past years, available at: https://www.gov.uk/government/publications/rates-and-allowances-income-tax/income-tax-rates-and-allowances-current-and-past
[12] UK Government (2022), National Insurance rates and categories, available at: https://www.gov.uk/national-insurance-rates-letters

Figure 5-1 Summary of Tax Contribution from Owenreagh/Craignagapple Wind Farm



Source: BiGGAR Economics Analysis

6. Impact on Bills

This section considers the role played by renewable energy in lowering the energy costs faced by end users.

6.1 Energy Prices & the Cost-of-Living Crisis

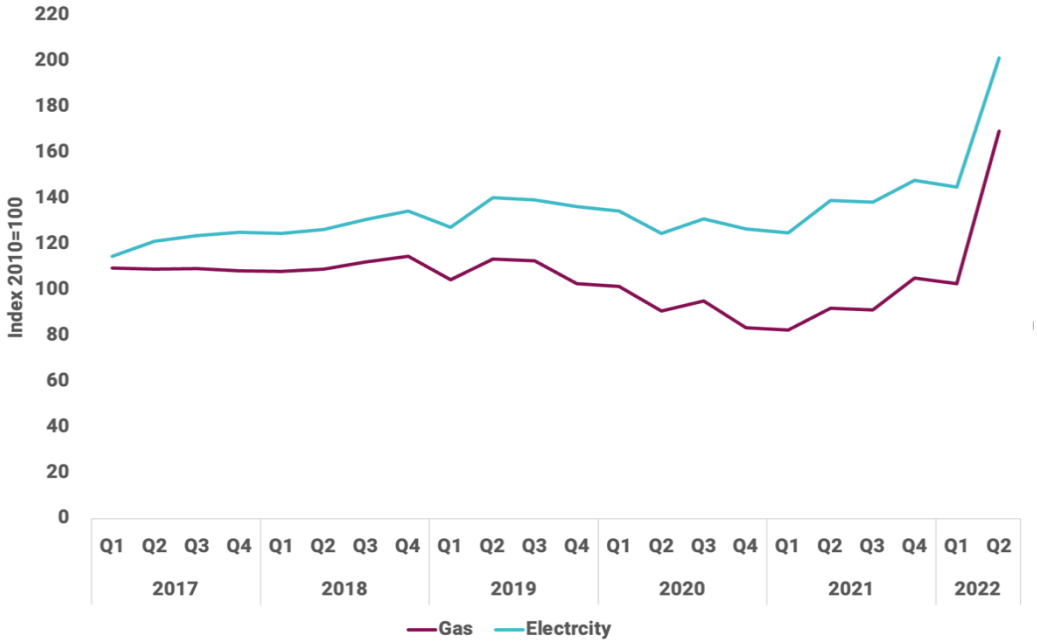
6.1.1 Impacts on Energy Prices from Lower Gas Supply

As economies worldwide restarted following Covid-induced lockdowns, there has been an increase in global demand for gas[13]. At the same time, in the lead-up to and following its invasion of Ukraine, Russia has limited its supply of natural gas towards Europe.

This increase in demand combined with lower energy supply has resulted in an increase in energy prices. As a net importer of gas, the UK has been particularly exposed to these fluctuations. This is shown in Figure 6-1, which displays real term changes in the domestic gas and electricity price indices over the period 2017-2022. Both gas and electricity prices have been increasing since Q1 2021, with the largest percentage increase taking place between Q1 and Q2 of 2022. The price of gas for a domestic consumer increased by 65% between Q1 and Q2, and by 39% for electricity.

[13] House of Commons Library (2022), The energy price crunch.

Figure 6-1 Domestic gas and electricity price indices in real terms 2017-2022



Source: Department for Business, Energy, and Industrial Strategy (2022) Consumer Prices Index UK: fuel components in the UK.

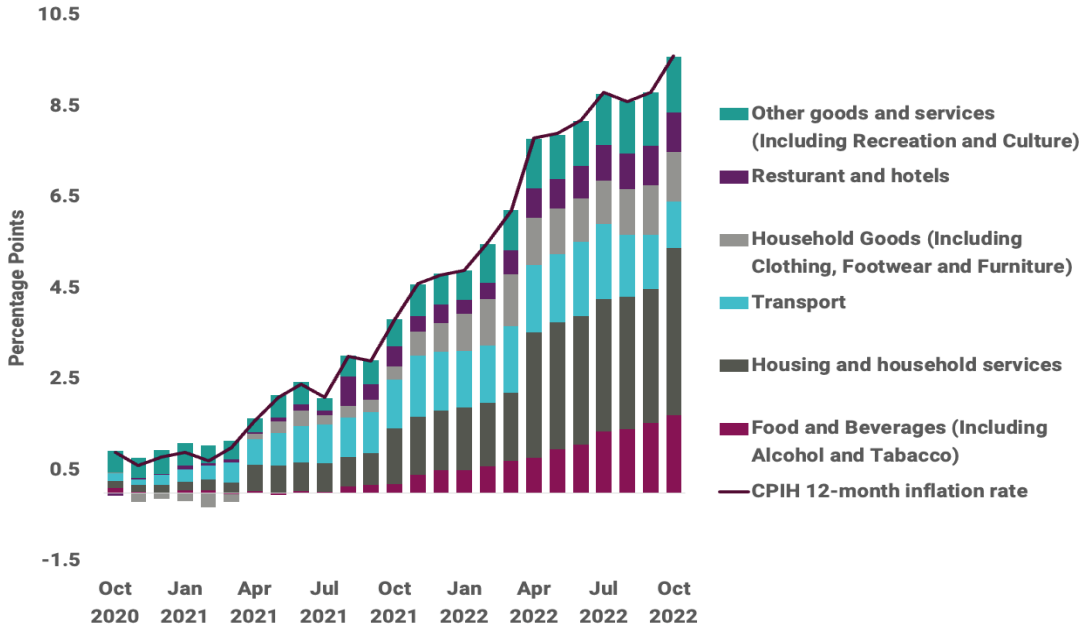
6.1.2 Energy and its Impact on Inflation

The substantial increase in energy prices is manifesting itself across the economy. It has impacted on household bills following changes to the price cap set by regulator Ofgem, which increased from £1,277 for the average gas and electricity bill in October 2021 to £3,549 in October 2022. This has had an impact on inflation and has contributed to the cost-of-living crisis.

The Consumer Price Index including owners' occupiers housing costs (CPIH) 12-month inflation rate rose to 9.6% in October 2022 compared to October 2021, up from 8.8% in September 2022, and up from 3.8% in October 2021[14]. As shown in Figure 6-2, housing and household services (including energy costs) has recently been the largest contributor to the headline CPIH rate. In October 2022, the same category increased its contribution to 3.68 percentage points towards the overall CPIH rate of 9.6%, which is equivalent to a 38% contribution to the headline index.

[14] ONS (2022) Consumer Price Inflation, UK: October 2022

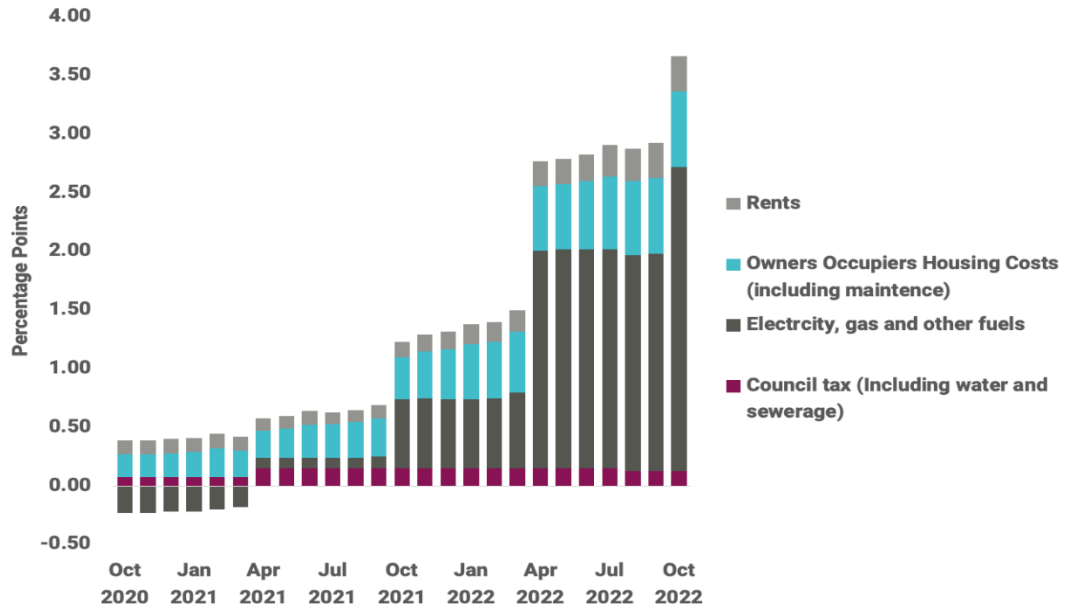
Figure 6-2 Contributions to The Annual CPIH Inflation Rate October 2020-2022



Source: ONS (2022), Consumer Price Inflation, UK: October 2022

The breakdown of the contribution made by the different elements included as part of housing and household services is provided in Figure 6-3. Electricity, gas and other fuel components have been the main contributors towards increases in housing and household services since April 2022. In October 2022, electricity, gas, and other fuels were responsible for 2.59 percentage points of the 9.6% rise. The largest increase recorded was between September and October 2022, where its contribution to the 12-month rate increased from 1.85 to 2.59%.

Figure 6-3 Contributions of housing components to the annual CPIH Inflation Rate, October 2020-2022



Source: ONS (2022), Consumer Price Inflation, UK: October 2022

The effect of increasing energy prices goes beyond its impact on household energy bills. It also contributes to inflation through the higher cost of energy affecting production costs across a range of sectors, including transport, manufacturing, and food production.

Government support to households through the Energy Bills Support Scheme[15] recognises the impact energy costs have on inflation by setting a cap on per unit costs and providing £400 to eligible households during winter 2022-2023.

6.2 The Role of Renewables

Within this context, an expansion of renewable energy generation fulfils two aims:

- reducing reliance on imported energy, increasing energy security; and
- supporting the future energy needs of the UK in the transition to Net Zero.

Both these elements reflect Government commitments as set out in departmental strategies and legislation.

6.2.1 Increasing Energy Security

The UK Government has recognised the importance of a secure energy supply, and identified both short, and long-term solutions to achieve this. The overriding objective of the 2022 British Energy Security Strategy[16] is to reduce the UK's dependency on oil and gas imports.

This means sourcing more energy domestically in clean, affordable, and sustainable ways. By diversifying the energy generation mix, and using domestic sources of energy, the UK will reduce vulnerability to energy shocks linked to other countries. This follows from trends in other sectors where attempts have been made to decouple the UK economy from countries seen as posing geo-political and strategic risks. This will make the UK economy more resilient, giving more certainty to business investment.

The British Energy Security Strategy aims to capitalise on the UK's inexhaustible resources (wind and sun) by expanding the proportion of electricity produced by renewables. Expanding the domestic capacity of renewables will reduce import dependency, while supporting the decarbonisation of the UK economy. Reducing the risk of energy shocks will have an impact on price stability and lower inflation.

6.2.2 Supporting the Transition to Net Zero

In addition to its role in diversifying the electricity generation mix and increasing energy security, onshore wind, by being a low-cost renewable source, will make an

[15] Department for Business Energy and Industrial Strategy (BEIS) (2022), Getting the Energy Bills Support Scheme.

[16] HM Government (2022), British Energy Security Strategy, secure, clean and affordable British energy for the long term.

important contribution towards the UK's and Northern Ireland's transition to Net Zero.

This will enable the UK and Northern Ireland to reach Net Zero by 2050 as mandated by their own legislation. The electrification of economic activity remains an important way to reach carbon neutrality. To make this change possible, the supply of electricity will need to increase to match demand.

In the Future Energy Scenarios[17], the National Grid outlines several ways in which the UK's energy system will require to change to be compliant with the Net Zero targets. Under all scenarios, an increase in electricity generation from onshore wind is required. The electricity generation capacity from installed onshore wind will have to increase by at least 9 GW by 2030 and 16 GW by 2050 across the UK.

In December 2021, the Department for the Economy published the 'Northern Ireland Energy Strategy - The Path to Net Zero'[18] which detailed Northern Ireland's (NI) energy future over the next ten years and set the renewable electricity targets for 2030- identifying that 70% of electrical energy needed to be sourced from renewables by 2030, with flexibility to increase this target. This strategy was further refined 'Climate Change Act (Northern Ireland) 2022[19] (the Climate Change Act), received Royal Assent on 6 June 2022. The Act aims to have Northern Ireland play its part in the global and UK effort to tackle climate change by creating a framework that will establish a pathway to achieving emission reduction targets. The Act includes a target for net-zero emissions by 2050 as well as a set of interim targets for 2030 and 2040 for reducing greenhouse gas emissions in Northern Ireland. Part 1, section 12 of the Climate Change Act specifies that "The Department for the Economy must ensure that at least 80% of electricity consumption is from renewable sources by 2030."

In this way, development of renewable energy and onshore wind will aid the transition to carbon neutrality by providing a basis for sustainable and clean energy expansion. As onshore wind is now cost competitive with other forms of energy generation, it presents a very efficient and clean way for increasing energy supply.

As set out in Chapter 2, the repowering of existing onshore wind sites provides a significant opportunity for delivering the future energy needs associated with the electrification of economic activity and the transition towards Net Zero in a cost-competitive way.

[17] National Grid (2022), 'Future Energy Scenarios', available at: https://www.nationalgrideso.com/document/263951/download
[18] Department of the Economy (2021) Northern Ireland Energy Strategy- The Path to Net Zero. Available at: https://www.economy-ni.gov.uk/publications/energy-strategy-path-net-zero-energy
[19] Northern Ireland Executive, 2022, The 'Climate Change Act (Northern Ireland) 2022, Available at: https://www.legislation.gov.uk/nia/2022/31/contents/enacted

6.3 Impact of Onshore Wind Deployment on Consumer Bills

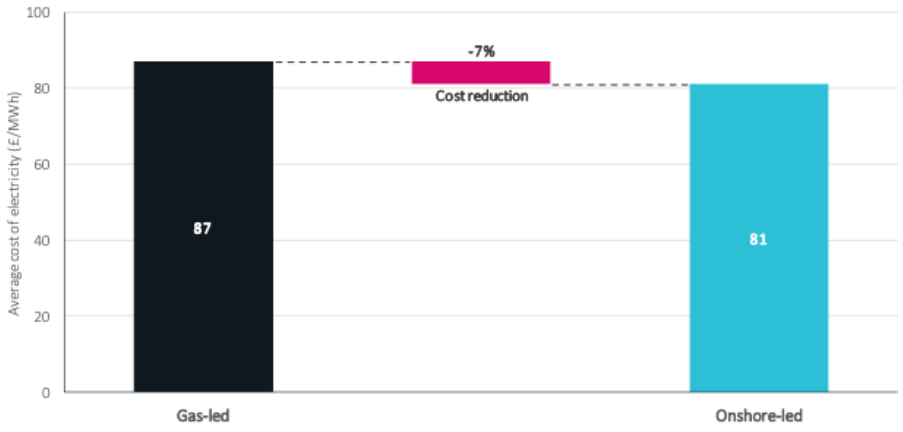
Within the context of the cost-of-living crisis, the cost competitiveness of onshore wind energy provides an opportunity for a more secure energy supply and lower prices for consumers.

In 2019, Vivid Economics[20] analysed the effect accelerating the deployment of onshore wind in the UK could have on the economy. Their report found that deploying 35 GW of onshore wind by 2035 could reduce average UK household electricity costs by 7%.

Given current turmoil in the gas market, gas generation is already more expensive than generating energy through onshore wind. Based on the Vivid Economics report, by 2035 gas is expected to be significantly more costly than onshore wind generation. By then, onshore wind generation costs will fall to £46/MWh, compared to £49/MWh in 2019. On the other hand, since gas generation generates CO_2 emissions, it will incur an additional carbon price. Carbon prices are expected to rise over time to around £118/tCO_2 by 2035. As a result, it is expected that gas generation costs will increase from around £56/MWh in 2019 to over £90/MWh in 2035.

As shown in Figure 6-4, it is estimated that under a gas-led scenario the average cost of electricity in the UK will be £87/MWh in 2035, whilst an onshore-wind led scenario would result in average costs of £81/MWh, delivering a cost saving of 7%. This reduction in average costs could save a typical UK household around £50 per year by 2035. These benefits may be an underestimate if current turmoil in the gas market was to persist into the future.

Figure 6-4 Electricity cost savings in 2035 through the deployment of onshore wind



Source: Vivid Economics (2019), Quantifying benefits of onshore wind to the UK.

[20] Vivid Economics (2019), Quantifying benefits of onshore wind to the UK

7. Appendix 1: Method Statement

This section sets out the methodology followed in estimating the economic impacts from Owenreagh/Craignagapple Wind Farm

7.1 Measures of Economic Impact and Study Areas

The analysis relied on the following measures of economic impact:

- Gross Value Added (GVA): a measure of economic output, which is the difference between an organisation's activity and its non-staff operational spending;
- Years of Employment: a measure of short-term employment, often used when considering the impact associated with the jobs supported during construction and development; and
- Jobs: a measure of jobs that are supported over longer time-periods.

Economic impacts were considered at the level of the following geographical aggregations:

- Northern Ireland; and
- United Kingdom.

7.2 Methodology

7.2.1 Economic Impact of Onshore Wind Farm Developments

The approach followed in estimating the economic impact from onshore wind developments is based on industry best-practice. In particular, it draws on evidence on the construction and operational costs associated with a range of onshore wind farm projects across the UK from a study conducted in 2015 by BiGGAR Economics on behalf of RenewableUK[21]. The analysis also relies on evidence from more recent case studies of actual construction and operational costs in the sector, and discussions with the developer to account for recent changes in costs, including as a result of higher energy costs.

This method has been used over time to estimate the economic impact associated with onshore wind developments. The modelling exercise involved the estimation of construction and development costs across four categories:

[21] RenewableUK (2015), Onshore Wind: Economic Impacts in 2014.

- development and planning;
- balance of plant;
- grid connection; and
- turbine.

To account for the different ability of businesses across the UK in fulfilling onshore wind contracts, assumptions were adjusted based on BiGGAR Economics' experience working with developers in Northern Ireland.

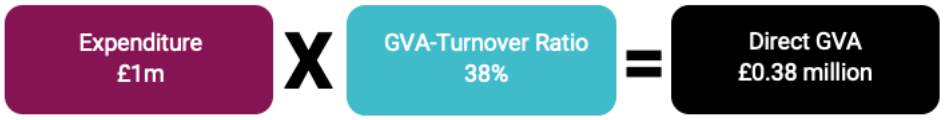
The assessment considered the following sources of economic impact:

- direct impacts: the economic value generated through the contracts associated with Owenreagh/Craignagapple Wind Farm;
- indirect impacts: the impact from the spending of contractors within their supply chains; and
- induced impacts: the impact from the spending of those workers carrying out contracts for Owenreagh/Craignagapple Wind Farm and on behalf of its contractors.

7.3 Economic Impact Modelling

The first step in carrying out the analysis involved making assumption on the ability of businesses to fulfil contracts. It was then possible to establish the direct GVA and years of employment supported by Owenreagh/Craignagapple Wind Farm. This was done by applying sectoral turnover per job and turnover per GVA ratios, as sourced from the UK Annual Business Survey[22], to the expenditure occurring in each study area, as shown in the figure below.

Figure 7-1 Direct GVA Calculation



The economic activity supported by Owenreagh/Craignagapple Wind Farm will not be limited to the direct contribution that contracts awarded make to the turnover of recipient companies. Contract-related spending has also an impact on the supply chain of those businesses involved in the construction and development of the wind farm (indirect impacts). In addition, those working at Owenreagh/Craignagapple Wind Farm have an impact through their spending in the economy (induced impacts).

Indirect impacts were estimated by applying Type 1 GVA and employment multipliers, as sourced from the Northern Ireland Supply Use Tables[23] and the UK

[22] ONS (2020), Annual Business Survey 2018 revised
[23] NISRA (2022), NI Supply Use Tables 2017 and 2018

Input Output Tables 2016[24] to the direct GVA and employment supported by construction and development contracts. Similarly, induced impacts were estimated by applying Type 1 and Type 2 GVA and employment multipliers to the direct GVA and employment support.

The calculations involved are shown in the figures below.

Figure 7-2 Indirect GVA Calculation

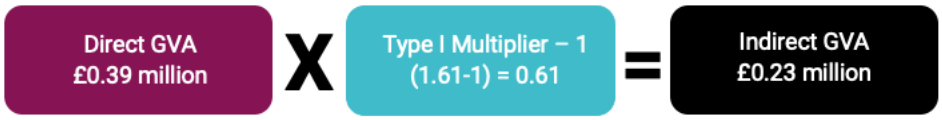
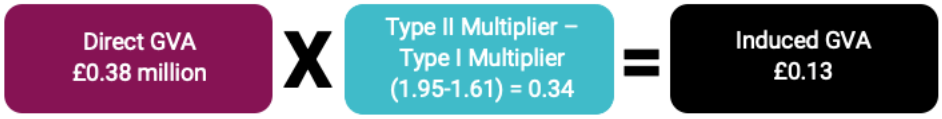


Figure 7-3 Induced GVA Calculation



The total construction and development impact associated with Owenreagh/Craignagapple Wind Farm is given by the sum of direct, indirect and induced impact, as shown below.

Figure 7-4 Total GVA Calculation

[24] ONS (2019), UK Economic Multipliers 2015

BiGGAR Economics, Pentlands Science Park,
Bush Loan Penicuik, Midlothian, Scotland EH26 0PZ

info@biggareconomics.co.uk

biggareconomics.co.uk