NIRIG
NORTHERN IRELAND
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IWEA
Irish Wind Energy Association

renewableUK
The voice of wind & marine energy

ONSHORE WIND: ECONOMIC BENEFITS IN NORTHERN IRELAND

CONTENTS

1 ONSHORE WIND ECONOMICS IN NUMBERS[1]

49%
Percentage of NI content

26%
Percentage of local content

73%
Percentage of UK content

35%
Percentage of Development spend in Northern Ireland

31%
Percentage of Construction spend in Northern Ireland

67%
Percentage of O&M spend in Northern Ireland

£31.7m
GVA to the NI economy by onshore wind

532
NI jobs from wind energy

614MW
NI Onshore Wind Capacity

40%
NI target for electricity from renewables by 2020

19.9%
Percentage of Northern Ireland's electricity needs met by renewables (of which 91.6% from onshore wind)

35%
Executive target for reduction in greenhouse gas emissions on 1990 levels by 2025

[1] Figures as of December 2014

2 EXECUTIVE SUMMARY

Onshore wind is a Northern Ireland success story, with wind energy now an increasingly important part of our electricity mix and our economy. Almost 20% of Northern Ireland's electricity comes from onshore wind energy, and the growth of onshore wind has brought significant economic benefits too. Part of the reason for this growth is that onshore wind is the cheapest means of delivering our low carbon objectives. Already cheaper than other renewable sources and new nuclear; by 2020 adoption of best practice, use of innovation and development of new technology will make it cheaper than new gas generation.[2]

In 2011 RenewableUK and DECC jointly commissioned BIGGAR Economics to evaluate the level of UK and local content of our onshore wind industry. The 2012 report of this analysis set out the percentage of onshore wind investment across the UK at the development, construction and operation phases of UK projects, and calculated the investment value of this work. That report catalogued the experience of the many local economies over the last few years that have benefited from significant direct, supply chain and wider economic benefits of onshore wind. It showed that despite being reliant on imported turbines for larger projects companies were working hard to maximise UK content and to ensure that economic benefit was focused around local sites.

Wind companies know that onshore wind energy is supported by a clear majority of people. They also know, however, that when proposing a local scheme they must demonstrate that the impacts are manageable, and that there are local benefits. Today it is clear that wind farms contribute to the local area via rates payments, community benefits, electricity bill reductions, and also local employment and investment.

This 2015 report, again commissioned from BIGGAR Economics, updates that earlier work and for the first time provides Northern Ireland specific data. Our new analysis shows that happens around local projects.

The fact that onshore wind investment has grown, and that for each £1 spent a higher proportion is now flowing into the NI economy can only be good news. Today more than ever, you can stand at the base of a NI turbine and be confident that the majority of investment flows into the local area and across Northern Ireland.

How is investment spread across a wind farm's lifetime?

While it is useful to know how much investment is coming into Northern Ireland because of onshore wind, it's also helpful to look at what stages of the project life this investment is realised. We have analysed figures across the development, construction and operation and maintenance (O&M) phases of projects.

The development stage is when wind farm proposals are being developed and environmental assessments are being undertaken. The construction phase will include the cost of the turbine and associated equipment as well as related civil engineering work. This is the most intensive phase of a project's life. For a large project this work will take approximately two years. Finally, the O&M element includes ongoing running and maintenance work over a project's 25 year lifetime.

We calculate that for each 1 MW of installed capacity:

- 35% of development expenditure is within NI, and 96% across the UK as a whole
- 31% of construction expenditure is within NI, and 40% across the UK as a whole
- 67% of O&M expenditure is within NI, and 100% within the UK as a whole
- 49% of total expenditure is within NI, and 73% across the UK as a whole

[2] The 2015 report of the Onshore Wind Cost Reduction Taskforce sets out the steps needed to bring onshore wind costs below those of equivalent new gas generation, and show that on a levelised cost of energy comparison, onshore wind can get below the costs of gas.

	Jobs/MW	£ NI investment	GVA/MW (£)	% of NI spending
Development	0.20	£51,737 per MW	£14,196	35%
Construction	1.27	£339,275 per MW	£82,955	31%
Operation & Maintenance	0.32	£31,705 per MW per year	£13,144	67%

Given that Northern Ireland developers have little option except to import the main turbine components, the fact that almost half of lifetime spend is within Northern Ireland and over two-thirds within the UK as a whole demonstrates the effort made by industry to maximise both Northern Irish and wider UK content where possible. Given that the costs of supporting onshore wind are socialised across UK consumers this shows that as costs are shared, so are the economic benefits.

How much investment is spent locally or regionally?

A typical Northern Ireland wind farm will invest £1.18m per MW[3] into Northern Ireland over its development, construction and O&M stages, out of £1.75m per MW invested across the whole UK. When measured across the whole of UK, we can see that NI wind farms have overall UK content of 73%.

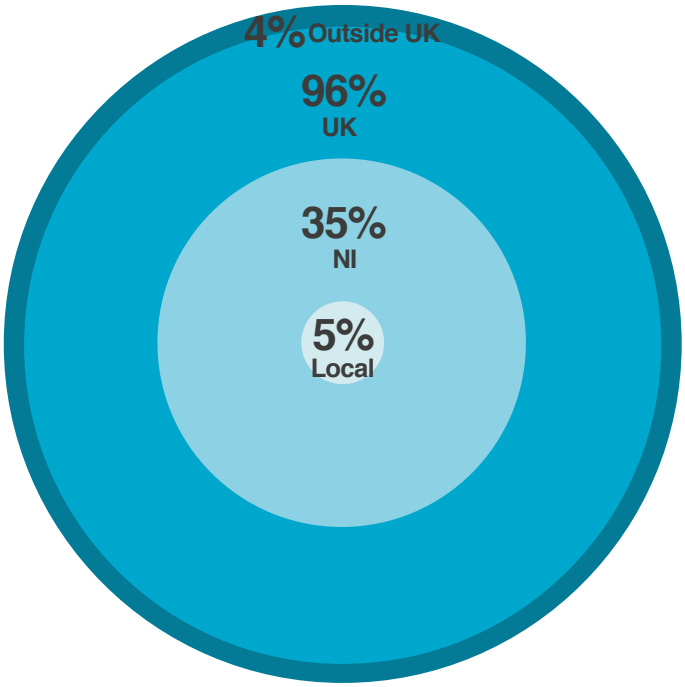
We also know that of the 27% of lifetime spend going out of the UK, some of it ultimately returns to the UK because there are many companies based here which supply components and services to turbine manufacturers based outside the UK. For example, Banbridge's GWA Supplies provides wind turbine spares globally and Lisburn's Mar-Train Haulage specialises in the haulage of wind farm components across Europe. Lisnaskea's Access Rescue Consulting at Height (ARCH) also delivers training and contract work for turbine blades across Europe.

Lifetime Share of Investment, 2014

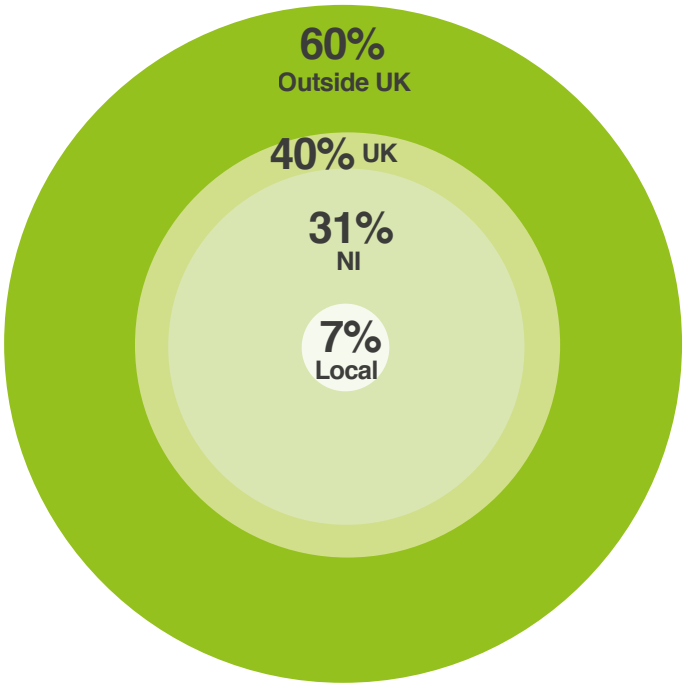
	Local	NI	UK
Overall (all Stages)	26%	49%	73%

[3] The figures for spend per MW are based on total spending and so are turnover rather than GVA figures.

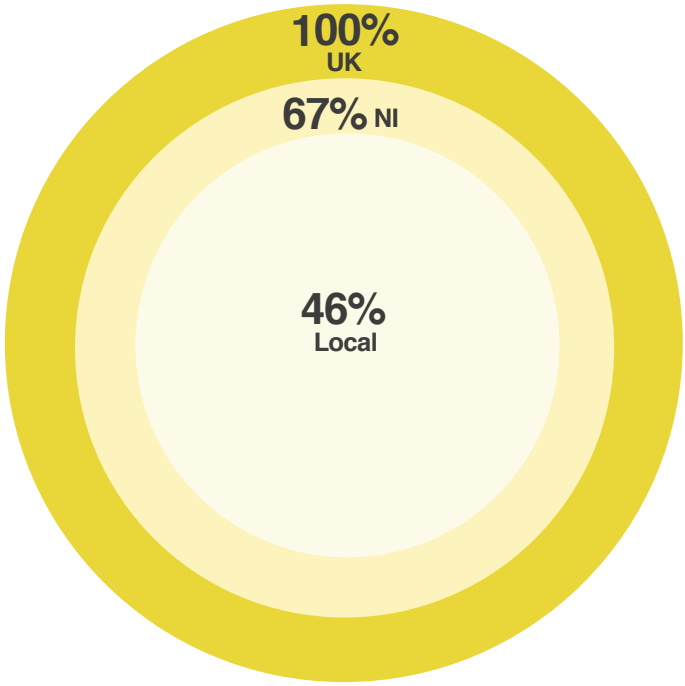
Share of Development Costs

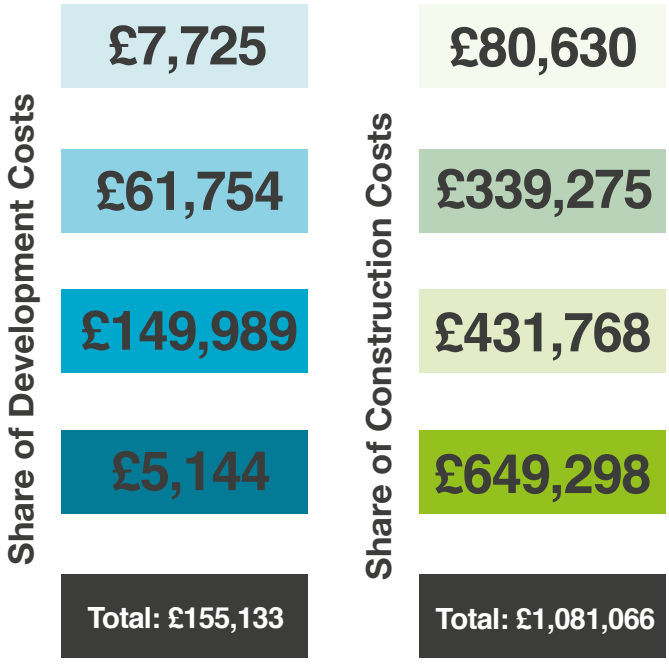


Share of Construction Costs



Share of O&M Costs





Share of O&M Costs

Proportion of costs at each project stage per MW

£146,304	£1,081,066	£1,178,025
Development	Construction	Operation & Maintenance

Lifetime Share of Investment, 2014

	Local	NI	UK
Overall (all Stages)	26%	49%	73%

The study data shows that when comparing NI data with the rest of the UK, the two markets are comparable. Experience elsewhere in the UK to maximise UK content is being similarly applied in Northern Ireland, with positive results.

As well as looking at percentage of spend, these figures can also be used to look at numbers of jobs and gross value added which accrues to Northern Ireland, as well as locally around each wind farm or across the UK as a whole.

There are 532 jobs and £31.7 million in gross value added (GVA) in the NI economy as a whole thanks to onshore wind. Over one-quarter of this – 191 jobs and £9.5 million GVA – is being felt within the local authority areas where developments are located. Overall , the results of this analysis highlight the ability of onshore wind to contribute strongly to economic development in Northern Ireland. These impacts will only grow as we continue to move towards our 2020 targets and beyond.

The increase in onshore wind as a proportion of our electricity mix shows a clear path towards cleaner energy while ensuring jobs and investment across NI. Importantly, we see that over a quarter of all spending on a typical onshore wind farm goes into the local authority in which it is built. And this is without taking into account the wider benefits of onshore wind for local communities: school education visits, scholarships, lower electricity bills and greater energy efficiency in community halls are some of the other ways in which communities benefit from wind farms in their area.

This local, national and UK investment demonstrates how onshore wind is helping to build a low carbon economy at the same time as minimising costs to the consumer. Onshore wind is an investment success story which deserves greater exposure and celebration.

3 BACKGROUND

The onshore wind sector in Northern Ireland has grown significantly over the last decade and further increases are expected in order to meet Northern Ireland's 2020 Strategic Energy Framework targets, as well as the UK and Northern Ireland's 2020 renewable energy commitments and longer-term energy security and low carbon goals. The experience of many local economies throughout the UK over the last few years is that of significant direct, supply chain and wider economic benefits from onshore wind deployment. This is despite the regular assumption that a much of the economic impact associated with onshore wind will occur in countries with well-developed onshore wind turbine manufacturing sectors such as Denmark and Germany.

3.1 Onshore Wind in Northern Ireland

By the end of 2014 almost 20% of Northern Ireland's electricity needs came from renewable sources, the majority of which was from large-scale onshore wind.[4] The Northern Ireland Executive has a target of 40% electricity from renewables by 2020. The majority of this generation is expected to come from onshore wind.

There were five years of steady growth in large-scale renewable electricity to 2014, with a marked increase in small scale and micro-generation last year. Over 8,000 local homes and businesses have installed renewable electricity technologies and interest in single turbines, particularly for farms, continued to develop.

Renewable energy exists in a fast moving policy environment. The key framework for sustainable energy in Northern Ireland, the Strategic Energy Framework[5], is currently being reviewed and will shortly be out to consultation. In Great Britain the new support system for renewable electricity, the Contract for Difference (CfD), will bed in, although recent announcements have created uncertainty around the role of onshore wind within the CfD scheme. The CfD scheme will run for 10 years from April 2015, with a budget of £15 billion. Selected individual projects will be able to receive support for up to 15 years. Northern Ireland was expected to enter the CfD two years later than the rest of the UK i.e. in 2017, but again, recent government announcements have cast this into doubt. As it currently stands, therefore, the NIRO is the only support scheme available to generation in NI for the foreseeable future, and this itself may close earlier than expected.

On the island of Ireland, key decisions will be made on the detailed structures of the new Integrated Single Electricity Market (I-SEM) for Northern Ireland and Ireland from 2016[6]. The second North-South interconnector is still planned to facilitate increased security of supply and more effective markets, although the timeframe for this infrastructure has now been delayed and is not expected for at least four more years. Finally, Northern Ireland Electricity Networks (NIE) continues to implement new renewable connections to the grid and develop new policies for connection.

614MW of large-scale wind is currently connected to the network in Northern Ireland (January 2015), with a further 115MW of small-scale renewables generation. Between April 2014 and March 2015, 19.9% of total electricity consumption in Northern Ireland was generated from renewable sources. This represents a total of 1,581GWh, 91.6% of which was generated from wind[7].

3.2 Previous Economic Impact Studies

Research undertaken in 2012 by BiGGAR Economics on behalf of RenewableUK and the Department of Energy and Climate Change (DECC) assessed the direct and indirect economic impacts of the commercial onshore wind sector in the UK in the decade to 2020.

The overall objective of the research was to provide stakeholders with an evidence base detailing the scale and range of impacts that flow from onshore wind developments at the local, regional and national level and the influencing factors on this impact up to 2020.

The key research tools used to inform the study included: a literature review on the economic impact of the onshore wind sector; a review of information about current and planned deployment of onshore wind capacity; case studies of 18 existing wind farm

[4] For details see https://www.detini.gov.uk/articles/electricity-consumption-and-renewable-generation-statistics
[5] Strategic Energy Framework 2010-2020, Review and Refresh http://www.detini.gov.uk/energy-newpage-14
For details see http://www.uregni.gov.uk/uploads/publications/SEM-14-045_I-SEM_HLD_Draft_Decision.pdf
[6] Electricity consumption and renewable generation in Northern Ireland: Year ending March 2015, NI Statistics and
[7] Research Agency and DETI https://www.detini.gov.uk/articles/electricity-consumption-and-renewable-generation-statistics

projects across the UK; a programme of consultations with key companies; and the development of an economic model.

This study suggested that in 2011 98% of development expenditure, 45% of construction expenditure and 90% of operation and maintenance expenditure occurs in the UK. Even when initial expenditure does occur overseas, some of it ultimately returns to the UK when UK companies are involved in the supply chain (e.g. some UK companies, including NI-based companies, supply components to turbine manufacturers based outside the UK).

The study estimated that the total direct and supply chain impact of the onshore wind sector in 2011 was:
• 8,600 jobs and £548 million in GVA across the UK;
• of the total UK impacts, 4,500 jobs and £314 million GVA arose at the regional/national level to individual wind farms (i.e. Scotland, Northern Ireland, Wales or English region); and
• of the regional/national impacts, 1,100 jobs and £84 million GVA arose at the local level for individual wind farms (i.e. local authority area).

In 2015, Renewable UK commissioned an updated study from BiGGAR Economics. It demonstrated that since 2011, the UK onshore wind industry has grown in size. This has led to increased UK investment and increased numbers of people working in the industry. But most significantly, the new analysis shows that the UK's onshore wind sector has also succeeded in increasing the level of UK content derived from onshore wind farms and also increased the proportion of spending which happens around local projects.

Between 2011 and 2014, the economic contribution of the onshore wind sector to the UK increased:

• from 8,600 jobs to 13,600 jobs, an increase of 58%; and
• from £548 million to £906 million GVA, an increase of 65%.

The percentage of spend coming into the UK has increased for development and construction phases, though not for operations and maintenance (O&M). The percentage of spending within the English region / devolved nation level increased for the development and construction phases, though not for O&M where there has been a shift of spend to UK level.

This trend towards increased spending at the level of the region/nation and at the local level during the development and construction phases is possibly the result of site operators working hard to optimise onshore wind costs by (a) establishing local support teams cited at individual sites or clusters, and (b) focusing asset management and monitoring in single UK locations.

3.3 Current Deployment in Northern Ireland

In order to estimate the economic impact of onshore wind deployment, it was first necessary to understand how much installed capacity there currently is across Northern Ireland and how much is under construction or being planned. This was achieved through an analysis of the wind energy database maintained by RenewableUK[8], which showed that, at the end of December 2014, onshore wind farms in Northern Ireland contributed 614MW of operational connected capacity. There was a further 82MW under construction and 1,182MW of onshore projects either in the planning process or approved but not yet under construction.

3.4 Direct and Supply Chain Economic Impact at Stages of Project Lifecycle

The direct and supply chain economic impact associated with the onshore wind sector is different in nature and scale for projects at different stages of development. Those stages are:

• development – including project design, environmental studies, legal agreements, project funding and planning permissions;
• construction – including preparing the site, manufacturing and installing the wind turbines, balance of plan and connecting to the grid; and
• operations and maintenance – maintaining and operating the site and the turbines, typically over a 25 year period.

There will also be further economic impacts at the decommissioning stage, typically after 25 years operation. The direct and supply chain economic impacts associated with each stage are discussed below.

Each of these stages can be broken down into a series of different tasks and activities, which may be undertaken by several different companies. In order to estimate the economic impact of onshore deployment in the UK, it is necessary to understand the type of activity that occurs within each stage and the extent to which this is, or could be, undertaken by UK companies.

[8] RenewableUK, Wind Energy Database, 2015

4 STUDY METHOD

The development of the study method was informed by BiGGAR Economics' 2012 and 2014 research for RenewableUK, as well as our experience of undertaking economic impact studies of a wide range of sectors, investments and public sector interventions including particular experience of undertaking socio-economic impact assessments of onshore wind energy projects for both developers and public sector agencies. The experience includes providing expert witness to several onshore wind farm public inquiries and hearings and to parliamentary inquiries.

The key research tools used to inform this study were drawn from

- a review of existing published literature about the economic impact of the onshore wind sector;
- a review of available information about current and planned deployment of onshore wind capacity;
- case studies of nine existing wind farm projects across Northern Ireland;
- a programme of consultations with key companies involved in the UK onshore supply chain; and
- the development of an economic model to estimate the economic impacts of Northern Ireland's onshore wind sector in the UK as well as in Northern Ireland and in local council areas.

4.1 Literature Review

The first step in this study was to review existing published research about the economic contribution of the wind energy sector in Northern Ireland in order to identify any relevant evidence and information. While many reports on the sector have been published in Northern Ireland, the UK and elsewhere, there are few with robust assessments of economic impacts. However, some reports were identified that were relevant to this study.

These studies informed the development of the model used to estimate the economic impact of onshore deployment. Job creation estimates were calculated in the economic impact model and cross-referenced against RenewableUK's Working for a Green Britain report. The analysis of the wider economic impacts also considered available evidence on the impact of onshore wind on the tourism sector.

4.2 Current Deployment of Wind Energy in the Northern Ireland

In order to estimate the economic impact of onshore wind deployment, it was necessary to understand how much installed capacity there currently is in Northern Ireland and how much is under construction or being planned. This was achieved through an analysis of a the wind energy database maintained by RenewableUK, which showed that, at the end of December 2014, onshore wind farms in Northern Ireland contributed 614MW of operational connected capacity. There was a further 82MW under construction and 1,182MW of onshore projects either in the planning process or approved but not yet under construction.

4.3 Case Studies

We used a case study approach to gather information about the nature and level of investment required to develop and operate wind farm projects in Northern Ireland. The information gathered for the case studies was also used to develop an understanding of the wider economic opportunities generated by each of the projects. The scale of onshore wind projects varies considerably, from small, single turbine projects to large-scale farms of over 30 turbines so average costs vary significantly from project to project. For this reason, a case study approach was adopted that would reflect the diversity of activity in the sector.

Nine projects were selected to provide a sample that is representative in terms of both size and location. Each project was invited to provide information about the total investment costs for each of the four main stages of an onshore wind farm project (development, construction, operation and maintenance and decommissioning). Each project was also asked to provide a breakdown of these costs into contract types (e.g. turbine and balance of plant contracts) and an estimate of the proportion of activity undertaken under each contract in the local area, in Northern Ireland or elsewhere in the UK.

4.3.1 List of Case Studies

Developers were approached to supply data on individual wind farm projects. In total nine case studies were analysed, with a combined installed capacity of 253MW. These were:

- Crockagarran;
- Screggagh;
- Hunters Hill;
- Curryfree;
- Dunbeg;
- Crighshane;
- Church Hill;
- Carnhill; and
- Slieve Kirk.

The data from those case studies was then used to apply to the onshore wind sector in 2014, that is, the total MW capacity in development, construction and operation in 2014. The case study data was also weighted according to project size (so that data for large projects was not used to estimate the impacts of smaller projects, or vice versa).

4.4 Development of Economic Model

The direct and supply chain economic impact of onshore renewables deployed in the Northern Ireland has been estimated using the data gathered our case studies. To ensure that the results are as robust as possible, the data was weighted to reflect the profile of all operational projects in the Northern Ireland.

The first step in calculating the economic impact of onshore deployment was to calculate total expenditure during each of the four main stages in the project life cycle. Next we estimated how much of this expenditure occurs within the UK, how much occurs within Northern Ireland and how much occurs in the local council area.

The employment and GVA impacts were calculated by applying ratios of turnover to GVA and turnover per employee from contractors' sectors. It was then possible to derive multipliers for GVA and employment per MW of onshore wind in development, under construction and in operation.

The baseline direct and supply chain impacts were calculated by applying these multipliers to the MW in development, construction and operation in 2014.

5 DEVELOPMENT AND CONSTRUCTION ECONOMIC IMPACT

5.1 Development Impacts

The total cost of development per MW installed ranged considerably between the different case studies. The weighted average cost was £146,304 per MW installed.

Over a third of the development costs (35%) were spent in Northern Ireland. This includes 5% of development costs spent in the local council area (i.e. within the local area in which the wind farm was located).

The contract data from the case studies (i.e. turnover data) has been combined with turnover per employee data and ratio of GVA to turnover for relevant industries (Table 5 2) from National Statistics. This table also shows the breakdown of development costs into each of the main components of work, based on the case study data.

This provides a basis for estimating the employment and GVA impacts, based on the contract values (which are in turnover terms).

Table 5 1 Development Costs per MW

	Unweighted spend per MW	Weighted spend per MW	% of spend
Local Council Area	£7,725	£7,979	5%
Northern Ireland	£61,754	£51,737	35%
UK	£149,989	£140,309	96%
Total	£155,133	£146,304	100%

Source: BiGGAR Economics Case Studies

Table 5 2: GVA and Employment Ratios (Development Phase)

	Turnover per employee (£)	GVA/Turnover
Project development	120,965	0.569
Legal and financial	87,041	0.777
Environmental Impact Assessment	101,102	0.653
Other (Average)	103,036	0.666
Development Total	111,424	0.643

Source: ONS, Annual Business Survey 2013, 2014

As of the end of December 2014 there were 1,182MW either in the planning system or approved but not yet under construction[9]. In addition, developers will undertake feasibility studies for projects that do not proceed to the planning stage.

Applying the data from the case studies to the current level of development provides an estimate of the 2014 turnover in the UK associated with wind farms in the development stage: £69.5 million. Of this, £4.0 million is in the area local to the developments and £25.6 million in Northern Ireland.

Applying the assumptions set out in Table 5 2 gives the level of employment[10] in the UK for wind farms developed in Northern Ireland as 624, contributing £44.7 million in GVA to the UK economy. Of these impacts, £16.8 million GVA and 232 jobs are in Northern Ireland.

Table 5 3: Economic Impact of Development, 2014

	Jobs	GVA (£m)	Turnover (£m)
Local Council Area	29	2.5	4.0
Northern Ireland	232	16.8	25.6
UK	624	44.7	69.5

[9] RenewableUK, Wind Energy Database, 2015
[10] Employment figures given here and throughout the report are full-time equivalent jobs.

5.2 Construction Impacts

Based on the case studies, the weighted average construction cost per MW was £1.1 million. The developers provided further information on the three main areas of construction spend:

- Turbine;
- Balance of Plant; and
- Grid Connection.

On average, 31% of the construction costs were spent in Northern Ireland including 7% in the local council area.

As discussed above there are three main components to the construction process (balance of plant, turbines and grid connection), and these can each be split further into smaller components.

The contract data from the case studies has been combined with turnover per employee data and GVA to turnover ratios for relevant industries (Table 5 5). This table also shows the breakdown of construction costs into each of the main components of work. Where the data for the breakdown was not given the average was taken across the represented sectors.

Table 5 4: Weighted Construction Costs/MW

	Unweighted spend per MW	Weighted spend per MW	% of spend
Local Council Area	£85,223	£80,630	7%
Northern Ireland	£361,158	£339,275	31%
UK	£459,545	£431,768	40%
Total	£1,147,502	£1,081,066	100%

Source: BiGGAR Economics Case Studies

Table 5 5: GVA and Employment Ratios (Construction Phase)

	Turnover per employee (£)	GVA/Turnover	% spend
Balance of Plant			
Civil & Project Management	120,965	0.569	30%
Roads	198,610	0.365	19%
Substation buildings	198,610	0.365	6%
Turbine foundations & Hard standings	198,610	0.365	28%
Landscaping / Forestry / Fencing	71,144	0.398	2%
Mechanical & Electrical Installation	169,748	0.418	12%
Other (average)	159,615	0.413	2%
Turbine			
Tower Manufacture	107,145	0.432	14%
Other Manufacture	151,241	0.410	7%
Assembly	143,675	0.421	47%
Transport	134,929	0.418	32%
Other (average)	134,248	0.420	0%
Grid Connection			
Engineering services	121,646	0.531	8%
Construction	198,610	0.365	26%
Electrical components	154,916	0.359	30%
Industrial equipment & machinery	169,260	0.442	0%
Other (average)	161,108	0.424	36%

Source: ONS, Annual Business Survey 2013, 2014

Table 5 6: GVA and Employment Ratios (Construction Phase, Summary)

	Turnover per employee (£)	GVA/Turnover	% spend
Balance of Plant Contract	157,462	0.435	20.0%
Turbine Contract	136,889	0.421	64.6%
Grid Connections Contract	162,733	0.398	15.3%
Total Construction	143,681	0.420	

The turbine contracts account for the majority of the value of the construction contracts: 64.6%. The balance of plant contracts account for 20.0% and the grid connections account for 15.3%. Therefore the weighted average for construction shows there is one employee per £143,681 in turnover and a GVA/Turnover rate of 0.420 (Table 5 6).

As of the end of December 2014 there were 82MW in construction in Northern Ireland[11]. This figure is broadly similar to the levels of construction in previous years.

The time period covered during the construction phase of an onshore wind farm development will vary depending on a number of factors, including the size and location of the project. Analysis of the RenewableUK Wind Energy Database found that the average time that a development was in the construction phase was 20.4 months.

Applying the data from the case studies to the 2014 level of construction provides an estimate of the turnover in the UK associated with wind farms in Northern Ireland in the construction stage. This method found the turnover in the UK to be £20.9 million. Of this, £3.9 million is in the area local to the projects and £16.4 million in Northern Ireland.

Applying the assumptions set out in Table 5 5 and Table 5 6 gives the level of employment in the UK for wind farm construction in Northern Ireland in 2014 as 136, contributing £8.7 million in GVA to the UK economy. Of these impacts, £6.8 million GVA and 104 jobs are in Northern Ireland.

Table 5 7: Economic Impact of Construction, 2014

	Jobs	GVA (£m)	Turnover (£m)
Local Council Area	23	1.5	3.9
Northern Ireland	104	6.8	16.4
UK	136	8.7	20.9

[11] RenewableUK, Wind Energy Database, 2015

6 OPERATION AND MAINTENANCE IMPACTS

Based on the case studies, the annual cost of operations and maintenance per MW installed ranged from £35,000 to £62,000 per annum. The operations and maintenance costs were affected by the size of development, land contracts and whether the turbines were still under warranty. The weighted average cost was £47,121 per MW installed per annum.

67%, of the operation and maintenance spend was in Northern Ireland, including 46% spent in the local council area.

The contract data from the case studies has been combined with turnover per employee data and GVA to turnover ratios for relevant industries (Table 6 2).

Table 6 1: Operations and Maintenance Costs/MW per annum

	Unweighted spend per MW	Weighted spend per MW	% of spend
Local Council Area	£22,662	£21,701	46%
Northern Ireland	£33,341	£31,705	67%
UK	£47,926	£46,966	100%
Total	£48,654	£47,121	100%

Source: BiGGAR Economics Case Studies

Table 6 2: GVA and Employment Ratios (Operations and Maintenance Phase)

	Turnover per employee (£)	GVA/Turnover	% spend
Turbine Maintenance	154,923	0.364	28%
Site Maintenance	109,844	0.440	10%
Operational Management	122,500	0.584	11%
Land Agreements	49,744	0.360	16%
Habitat Management costs	83,600	0.337	0%
Non-domestic rates (business rates)	n/a	0.500	15%
Community Benefit	47,967	0.342	6%
Other (Average)	94,763	0.418	14%
Operations & Maintenance Total	103,805	0.420	100%

Source: ONS, Annual Business Inquiry 2010

As of the end of December 2014 there were 614MW connected in Northern Ireland[12]. Applying the data from the case studies to the current level of operational capacity provides an estimate of the 2014 turnover in the UK associated with Northern Ireland wind farms in the operations and maintenance stage of £28.5 million. Of this, £13.3 million is in the area local to the projects and £19.3 million in Northern Ireland.

The Non-domestic rates paid by wind farm owners to the local authorities accounts for 15% of the operational expenditure. The level of rates paid is determined by the installed capacity on each site. In April 2015 the rates value per MW increased from £4,000 to approximately £17,000: more in certain cases. This will result in the income to local authorities increasing significantly in the future.

Applying the assumptions set out in Table 6 2 gives levels of employment in the UK for Northern Ireland wind farm operations and maintenance in 2014 as 278 jobs and contributing £12.1 million in GVA to the UK economy. Of these impacts, £8.1 million GVA and 196 jobs are in Northern Ireland.

Table 6 3: Economic Impact of Operations and Maintenance, 2014, per annum

	Jobs	GVA (£m)	Turnover (£m)
Local Council Area	139	5.5	13.3
Northern Ireland	196	8.1	19.5
UK	278	12.1	28.8

[12] RenewableUK, Wind Energy Database, 2015

7 SUMMARY OF DIRECT AND SUPPLY CHAIN ECONOMIC IMPACT IN 2014

As shown in Table 7 1, taking all of the stages together gives a total 2014 direct and supply chain economic impact of the onshore wind sector of **532 jobs and GVA of £31.7 million in Northern Ireland.**

The total local direct and supply chain economic impact of the sector is estimated at 191 jobs and £9.5 million GVA (Table 7 2) and the UK economic impact is estimated at just over 1,000 jobs and £65.6 million GVA (Table 7 3).

Table 7 1: Total Direct & Supply Chain Economic Impact (Northern Ireland), 2014

	Jobs	GVA (£m)	Turnover (£m)
Development	232	16.8	25.6
Construction	104	6.8	16.4
Operation & Maintenance	196	8.1	19.5
Total	532	31.7	61.5

Note: columns may not sum to totals, due to rounding

Table 7 2: Total Direct & Supply Chain Economic Impact (Local Council Areas), 2014

	Jobs	GVA (£m)	Turnover (£m)
Development	29	2.5	4.0
Construction	23	1.5	3.9
Operation & Maintenance	139	5.5	13.3
Total	191	9.5	21.2

Note: columns may not sum to totals, due to rounding

Table 7 3: Total Direct & Supply Chain Economic Impact (UK), 2014

	Jobs	GVA (£m)	Turnover (£m)
Development	624	44.7	69.5
Construction	136	8.7	20.9
Operation & Maintenance	278	12.1	28.8
Total	1,038	65.6	119.2

Note: columns may not sum to totals, due to rounding

It should be noted that some of the jobs included in the tables above are held by people who do not work in the sector all of the time. Examples include professional services, civil engineering and haulage. So the number of individuals employed because of the activities of the sector will be much greater than the number of jobs shown above.

Finally, the impacts shown above arise from wind farms developed and operated in Northern Ireland. In addition to these impacts, there are likely to be further economic benefits from the exports of goods and services of renewables companies that win contracts in the Republic of Ireland, Great Britain and abroad. Without the domestic wind farm market in Northern Ireland, there would be no opportunity for those companies to build their export portfolios.

8 IMPACT IN CONTEXT

8.1 Overall Share of Investment

The proportion of the investment and costs of the onshore wind sector that are retained within Northern Irish economy (and in the UK and local council areas) varies for the different stages of the project lifestyle. It is lowest during the construction stage; however, this typically lasts for less than two years. The proportion maintained in Northern Ireland is higher during the operation and maintenance stage, which is much longer lasting, typically 25 years.

As summarised in Table 8 1, taking the total investment and costs into account (over the development, construction and operations and maintenance stages) around half (49%) of the total spend is retained within Northern Irish economy. Almost three quarters (73%) of total spend is retained in the UK and more than a quarter (26%) is retained within the local authority area in which the individual wind farms are located.

Table 8 1: Share of Investment, 2014

	Local Council Area	Northern Ireland	UK
Development	5%	35%	96%
Construction	7%	31%	40%
Operation & Maintenance	46%	67%	100%
Overall (all Stages)	26%	49%	73%

The total spend per MW has been estimated as £146,304 per MW during the development stage (Table 5 1), £1,081,066 per MW during the construction stage (Table 5 4) and £47,121 per MW per year during the operations and maintenance stage (Table 6 1), which typically lasts 25 years and is therefore estimated at £1,178,013 per MW over this period. This gives a total spend over the project lifecycle of £2,405,383.

Of this, 35% of development stage spending (£51,737 see Table 5 1), 31% of construction spending (£339,275 see Table 5 4) and 67% of operations and maintenance spending (£31, 705 per year totaling £792,616 over 25 years, see Table 6 1) is retained in Northern Ireland. This gives a total spend in Northern Ireland over the project lifecycle of £1,183,628: 49% of all spend.

8.2 Impact per MW

The analysis summarised above calculates the economic contribution at each stage of the project lifestyle, during which the impacts vary, peaking during the construction stage.

At the end of December 2014, there were 614MW of installed onshore wind farms connected to the grid in Northern Ireland, with 82MW under construction and 1,182MW either in the planning process or approved but not yet under construction.

By dividing the total contribution to the UK economy of each phase by the total capacity of projects at each phase, it is possible to calculate the average jobs and GVA impacts per MW in development, under construction and in operation.

Table 8 2 provides those ratios for the Northern Ireland economy, showing, based on the experience of what has happened in previous projects that for each 1MW of installed, in any given year it would be reasonable to expect:

- 0.20 jobs and £14,196 GVA in the Northern Irish economy to be supported during the development stage;
- 1.27 jobs and £82,955 GVA in the Northern Irish economy to be supported during the construction stage; and
- 0.32 jobs and £13,144 GVA per year in the Northern Irish economy to be supported during the 25 year operations and maintenance stage.

Table 8 2: Economic Contribution per MW per Stage (Northern Ireland Economy)

	MW (end 2014)	Jobs per MW	GVA per MW (£)
Development	1,182	0.20	14,196
Construction	82	1.27	82,955
Operation & Maintenance	614	0.32	13,144

The economic contribution of the onshore wind sector varies over the lifecycle for individual projects. Figure 8 1 shows how jobs supported peaks during the construction period and that there are employment benefits that continue throughout the 25 year operations and maintenance stage.

Figure 8 2 illustrates the cumulative GVA contribution per MW, over a typical project lifecycle. The cumulative total GVA impact on the Northern Irish economy is in excess of £0.5 million per MW during the full project lifecycle.

This consists of:

- £14,196 per year over the development stage that typically lasts 4 years, a total for this stage of £56,783;
- £82,955 per year over the construction stage that typically lasts 2 years, a total for this stage of £165,909; and
- £13,144 per year over the 25-year operations and maintenance stage, a total for this stage of £328,608.

Figure 8 1: Northern Ireland Jobs Per MW during Development, Construction & Operations Phases

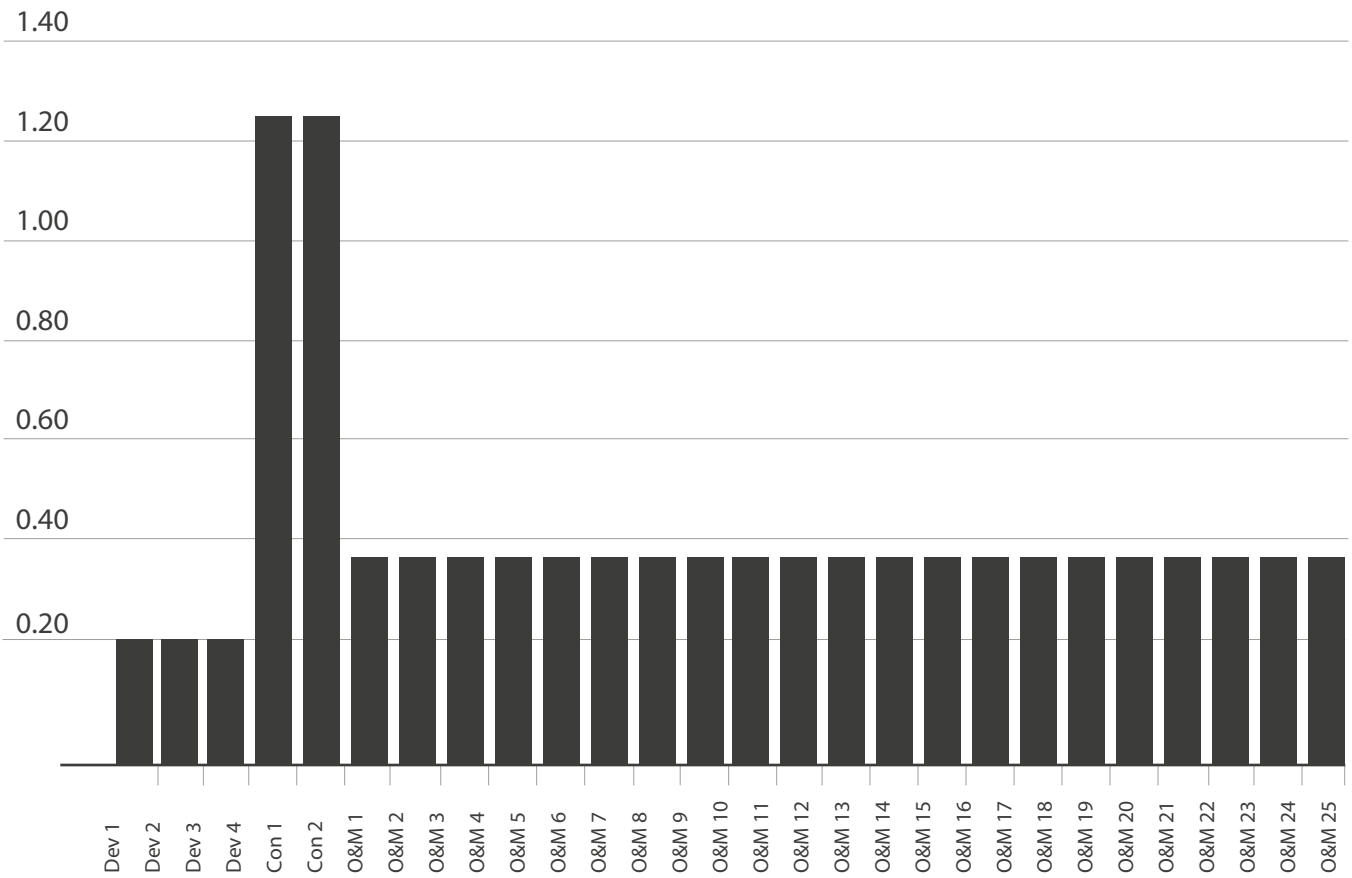
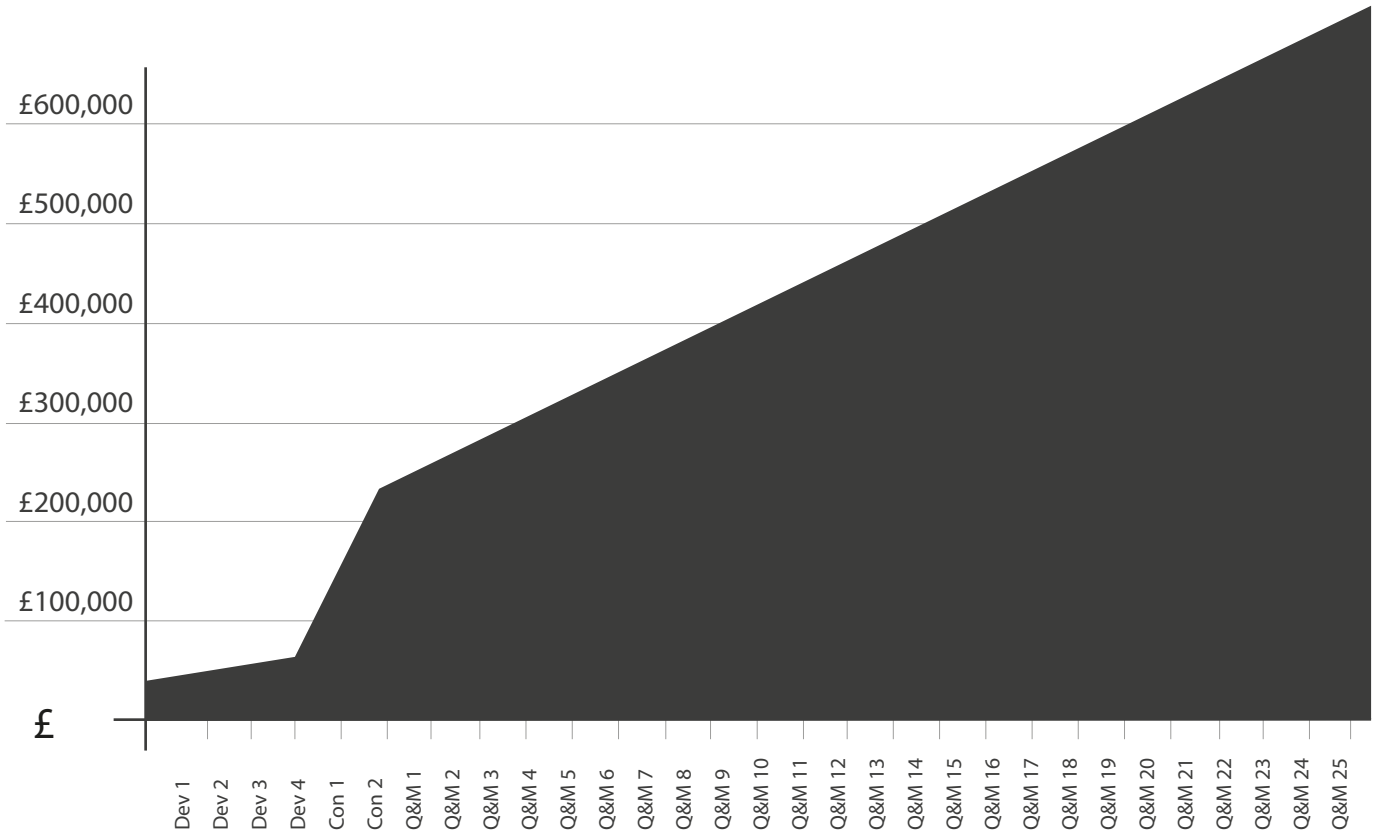


Figure 8 2: Northern Ireland GVA Per MW During Phases (Cumulative)



8.3 Potential

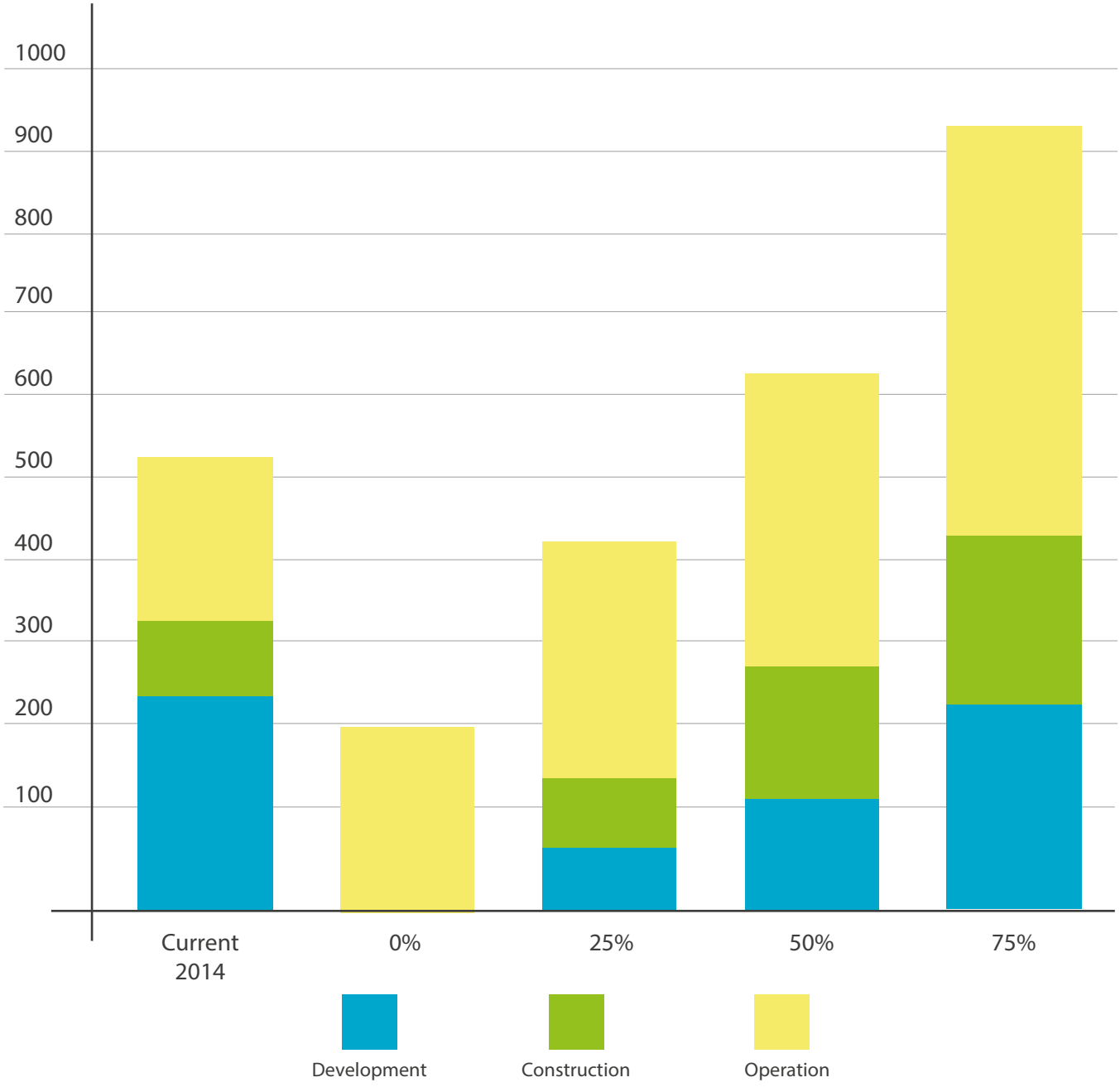
The capacity of the projects that are either approved or in the planning stages of the development process is far greater than is what is currently operational. The economic impacts are greater during the construction and operational stages of the development and therefore there is potential for the economic impact of the onshore wind energy sector to grow if new projects become operational. If 50% of the sites that are currently in planning or have been approved progress through to the construction and operational stages this would almost double the installed capacity in Northern Ireland by adding 591MW of capacity. Table 8 3 gives the additional capacity that would be added to the Northern Ireland portfolio if different proportions of projects currently in planning (or with approval) progress to the operational stage.

The sites that are currently either in planning or approved would be able to support jobs during their construction and operational stages. Figure 8 3 gives indicative employment levels in Northern Ireland in 2020 associated with the different rates of progression from the planning to construction stages of the development. It was assumed that the level of development activity was linked to current development activity, so if 25% of the sites currently approved or in planning were to become operational by 2020, the level of development activity in 2020 would be 25% of what it was in 2014. If no further developments are constructed, the only jobs in Northern Ireland will be those associated with the operations and maintenance of the wind energy projects currently operational. However, if some sites are developed by 2020 there is the potential for the employment to grow. For example, if 50% of those sites that are currently in planning (or are approved) are constructed by 2020 the total employment in the sector in Northern Ireland would increase by 23% to over 650 jobs.

Table 8 3: Potential of construction of projects currently approved or in planning

Proportion of approved and in planning projects that proceed	Capacity (MW)
0%	-
25%	295
50%	591
75%	886

Figure 8 3: Northern Ireland Employment in 2020 by scenario



8.4 Comparisons with Great Britain

The onshore wind energy sector in Northern Ireland operates within the wider UK energy market and is affected by the corporate and policy environment within the UK. The results of this study are directly comparable with those from the study undertaken by BiGGAR Economics for RenewableUK (as discussed in Section 3.2).

Data gathered for both studies implies that there are slightly different cost structures associated with constructing an onshore wind farm in Northern Ireland compared to the rest of the UK.

The weighted spend per MW in each stage of the development and construction of an onshore wind energy project is given in Table 8 4. This shows that projects developed in Northern Ireland have a lower CAPEX per MW (£1.2 million) than the average across the UK (£1.5 million). However, this is not uniform across all stages as the data provided from the case studies suggests that the level of expenditure associated with grid connection in Northern Ireland is significantly higher than for the rest of the UK.

Table 8 4: Development and Construction Spend per MW

	Northern Ireland	UK
Development	£146,304	£150,216
Turbine	£698,744	£849,177
Balance of Plant	£216,466	£376,585
Grid Connection	£165,856	£93,113
Total	£1,227,370	£1,469,091

The distribution of CAPEX between the stages of the development has an impact on the proportion of contracts that are secured both within the UK and Northern Ireland. The data provided in this study suggests that 73% of the total expenditure over the lifetime of an onshore wind farm development in Northern Ireland is retained in the UK. This is greater than the figure that given in the UK study, which found that 69% of this expenditure was retained. The proportion retained within the local and national/regional level was found to be similar in the two studies. The proportion of overall expenditure procured in each area for the UK and Northern Ireland is given in Table 8 5.

This analysis found that Northern Ireland's £31.7 million GVA represents 4% of the £906 million GVA that the sector contributes to the UK economy. However, this analysis does not include the work undertaken by Northern Irish firms on other onshore wind developments elsewhere in the UK and therefore this study will underestimate the true economic impact of the onshore wind sector in Northern Ireland, which is likely to be greater than 4%. Northern Ireland accounts for 3% of the population of the UK and therefore punches above its weight in the UK onshore wind sector.

Table 8 5: Proportion of overall expenditure procured in each area

	Northern Ireland	UK
Local Area	26%	26%
Region/Nation (Northern Ireland)	49%	49%
UK	73%	73%

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