Onshore Wind

Direct & Wider Economic Impacts

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This report has been produced by BiGGAR Economics for DECC and RenewableUK.

Contents

1 Introduction

This report presents research undertaken by BiGGAR Economics on behalf of RenewableUK and the Department of Energy and Climate Change (DECC) to assess the direct and indirect economic impacts of the commercial onshore wind sector in the UK in the decade to 2020.

1.1 Background

The onshore wind sector in the UK has grown significantly over the last decade and in particular over the last five years. Further increases are expected in onshore wind energy deployment over the course of the decade in order to meet the UK's 2020 renewable energy commitments and longer-term energy security and low carbon goals.

While renewable energy has been identified as a key sector for the future prosperity of the UK economy by the UK Government[1], the focus has often been on offshore renewables and on the next generation of technologies (such as wave and tidal devices). The assumption that has often been made is that a significant proportion of the economic impact associated with onshore wind will occur overseas, for example, in countries with well-developed onshore wind turbine manufacturing sectors such as Denmark and Germany. The experience of many local economies over the last few years however, demonstrates that the economic impact of onshore wind deployment can be significant in terms of direct, supply chain and wider economic effects.

This report considers the scale of these effects in the UK to date and the potential contribution of the onshore wind sector to future economic growth in the period to 2020. The focus of the study is on the economic impacts of the commercial onshore wind sector i.e. gross value added (GVA) and jobs[2].

1.2 Study Objectives

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.

In order to achieve this, the aims of the research were to:

- identify the range of direct and indirect economic impacts that flow from onshore wind developments at the local, regional and national level for each stage of onshore wind farm development;
- identify the factors that influence the magnitude of economic impacts at the local, regional and national levels;
- project the potential impacts to 2020;
- identify factors that influence investment decisions;
- provide an overview of key companies in the UK supply chain; and

[1] See, for example, Department of Energy and Climate Change, UK Renewable Energy Roadmap, 2011
[2] The study does not consider either environmental impacts or the impacts associated with domestic micro generation.

- inform discussions around onshore wind specifically and energy policy more generally.

1.3 Structure

This report is structured as follows:

- chapter 2 provides a summary of the report findings;
- chapter 3 discusses the economic linkages associated with the UK onshore wind sector;
- chapter 4 describes the baseline direct and supply chain economic impact of the UK onshore wind sector;
- chapter 5 presents a scenario analysis, which considers the potential direct and supply chain economic impact of the onshore wind sector in the UK to 2020;
- chapter 6 discusses, and where possible quantifies, wider impacts of the onshore wind sector on the UK economy and on local and regional economies;
- chapter 7 summarises the current and potential future contribution of the sector in local and national taxation;
- chapter 8 summarises the quantifiable direct, supply chain and wider economic impacts in employment terms;
- Appendix A provides a methodology, including a description of the research undertaken and the analysis of data gathered from the research programme;
- Appendix B summarises a review of existing relevant literature on the economic contribution of the onshore wind sector;
- Appendix C lists the organisations consulted during this research;
- Appendix D contains details of the information requests made to developers and operators included in the case studies;
- Appendix E contains details of the topics discussed during the consultation programme;
- Appendix F contains details of the project case studies used in this study.

2 Summary of Report

2.1 Background

The onshore wind sector in the UK has grown significantly over the last decade and further significant increases are expected over the course of the coming decade in order to meet the UK's 2020 renewable energy commitments and longer-term energy security and low carbon goals. While renewable energy has been identified as a priority by the UK Government[3], it is often assumed that a significant proportion 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. This assumption does not however reflect the experience of many local economies throughout the UK over the last few years, which have experienced significant direct, supply chain and wider economic benefits from onshore deployment.

Although a variety of research has been undertaken into the actual and potential economic impact of the renewable energy sector, to date there has been no comprehensive study that quantifies the impacts of onshore wind deployment in the UK. In early 2012, RenewableUK and the Department for Energy and Climate Change (DECC) appointed BiGGAR Economics to address this knowledge gap.

2.2 Methodology

The key research tools used to inform the study were:

- 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 18 existing wind farm projects across the UK;
- 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 the onshore wind sector in the UK as well as regionally and nationally between 2011 and 2020.

The development of the study methods was also informed by BiGGAR Economics' 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. This experience includes providing expert witness to several onshore wind farm public inquiries and hearings and to parliamentary inquiries.

2.2.1 Literature Review

The first step in this study was to review existing published research about the economic contribution of the wind energy sector in the UK in order to identify any relevant evidence and information. While many reports on the sector have been

[3] See, for example, Department of Energy and Climate Change, UK Renewable Energy Roadmap, 2011

published in 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 in the UK and of the scenarios for future deployment. In particular, the deployment scenarios considered in this study were taken from the UK Renewable Energy Roadmap 2011 and the 2010 National Renewable Energy Action Plan. 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.

2.2.2 Current Deployment of Wind Energy in the UK

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 the UK 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, in January 2012, onshore wind farms contributed 4.5GW of operational installed capacity in the UK[4]. There was a further 1.4GW under construction, 4.0GW that had been approved but not yet built and connected, and a further 7.7GW of onshore projects in the planning process.

The analysis also revealed that 61% of installed and proposed developments are based in Scotland, 21% are in England, and Wales and Northern Ireland both have 9%. The largest contributor to the installed capacity figures is expected to come from large wind farms over 50MW in capacity and there are currently 17 operational sites of this size and 39 in the planning process[5]. The most numerous sites however are in the 5-20MW range and there are currently 107 sites of this size across the UK and a further 222 at different stages of the project pipeline.

2.2.3 Case Studies

In order to estimate the economic impact of the onshore wind sector in the UK, it was necessary to gather information about the nature and level of investment required to develop and operate wind farm projects around the UK. 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 150 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.

Initial approaches were made to 27 wind farm projects across the UK. These projects were selected to provide a sample of projects that was 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

[4] There are several estimates available of current deployment with variations at any given time, largely as a result of the frequency with which information is updated. For example, in January 2012, DECC estimated that there was 4.7GW of installed onshore wind capacity.
[5] As of January 2012

estimate of the proportion of activity undertaken under each contract in the local area, the wider region / nation or elsewhere in the UK.

Information was received from 18 wind farms across the UK, three of which are in Wales, five of which are in England, one of which is in Northern Ireland and nine of which are in Scotland. The projects chosen range in size from a single turbine to projects with more than 150 turbines.

2.2.4 Development of Economic Model

The direct and supply chain economic impact of onshore wind deployed in the UK has been estimated using data gathered from case studies of 18 existing wind farm projects around the UK. To ensure that the results are as robust as possible, the data gathered from the case studies was weighted to reflect the profile of all operational projects in the UK.

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 it was necessary to estimate how much of this expenditure occurs within the UK, how much occurs within the regions and nations that make up the UK in which individual wind farms are located (i.e. Scotland, Northern Ireland, Wales and the English regions) and how much occurs at the local level (i.e. within the local authority boundaries where individual wind farms are located).

The employment and GVA impacts were then 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, in operation and in decommissioning.

The baseline direct and supply chain impacts were calculated by applying these multipliers to the MW in development, construction and operation in 2011. The potential future economic impacts were based on scenarios for projected installed capacity in 2020.

In addition to these direct and supply chain impacts, the case studies also provided information on wider impacts, which were quantified where possible. These included income effects associated with spending of employees, calculated based on the wages paid to employees in sectors relevant to onshore wind, and business tourism effects, estimated based on examples from case studies of the extent to which employees used tourism accommodation in the locality of wind farm sites.

2.3 Economic Linkages

The lifecycle of a wind farm involves four main stages:

- development – including project design, environmental studies, legal agreements, project funding and planning permissions;
- construction – including preparing the site, manufacturing and installing the wind turbines and connecting to the grid;
- operations and maintenance – maintaining and operating the site and the turbines, typically over a 25 year period; and
- decommissioning and repowering – removing the turbines and restoring the site, at the end of the operation and maintenance period or

replacement of turbines at the end of their operational period with new turbines.

Each of these stages can be broken down in to a series of different tasks and activities, which may be undertaken by several different companies. In order to estimate the economic impact of onshore wind 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. This was achieved through a series of consultations with companies engaged in the onshore supply chain.

These consultations revealed that the supply chain for the onshore wind sector is a complex one involving a wide variety of companies from professional services and civil engineering to manufacturing and electrical engineering. The consultations also highlight various impacts generated by the sector such as those associated with transporting turbines, towers and other supplies to wind farm sites or those generated by construction workers who require accommodation and catering close to new wind farms during the construction phase. Evidence from these consultations suggests that UK companies secure the vast majority of expenditure that occurs during the development and operations and maintenance phases. The consultations also confirm that the expertise that UK companies have developed as a result of their involvement in the onshore wind sector is helping them to take advantage of new opportunities in the emerging offshore renewable energy sector.

The construction phase, which includes turbine manufacture, also provides significant opportunities for UK companies. Although it is certainly the case that the main turbine manufacturers are all based on continental Europe, many of the 8,000 components required to manufacture a turbine are or could be produced in the UK. Consultations undertaken with UK companies that are already producing such components also confirm that a significant proportion of output is exported.

2.4 Current Direct and Supply Chain Economic Impact

This study suggests that 98% of development expenditure, 45% of construction expenditure and 90% of operation and maintenance expenditure currently 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 based companies supply components to turbine manufacturers based outside the UK).

The study estimates 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).

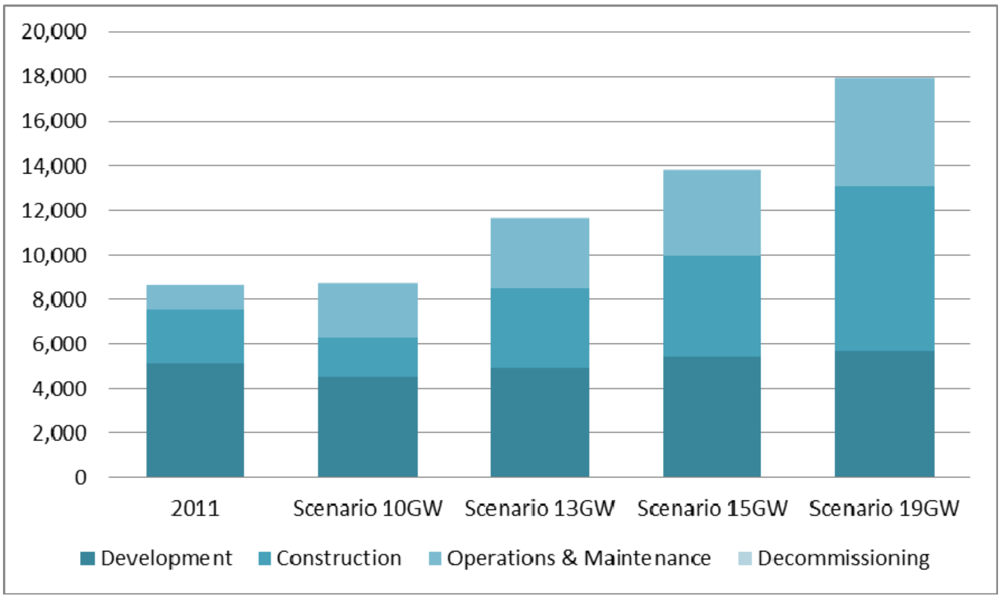
2.5 Potential Direct and Supply Chain Impacts to 2020

We do not know the exact trajectory of growth in deployment of onshore renewables between now and 2020. For this reason, four future scenarios are used to consider the future impacts of the sector. The scenarios were based on 10GW, 13GW, 15GW or 19GW installed onshore wind by 2020, based on scenarios considered in the UK Renewable Energy Roadmap published by DECC in 2011 and the National Renewable Energy Action Plan 2010.

By applying the estimate of the current direct and supply chain economic impact of the sector to these alternative scenarios it can be estimated that in 2020, the total direct and supply chain impact of the onshore wind sector in the UK could be:

- 8,700 jobs and £580 million GVA under scenario 10GW;
- 11,600 jobs and £780 million GVA under scenario 13GW;
- 13,800 jobs and £913 million GVA under scenario 15GW; or
- 17,900 jobs and £1,183 million GVA under scenario 19GW.

Figure 2-5: Total Direct & Supply Chain Jobs 2020 by Scenario, UK



2.6 Wider Economic Impacts

In addition to providing employment and generating GVA directly and in the supply chain, the onshore wind sector also supports a range of wider economic impacts. Where possible these have been quantified, including:

- local and regional supply chain development – the onshore wind sector has and continues to create opportunities for a wide range of businesses across the UK that are engaged at Tier 2 and further down the supply chain;

- income effects – spending by employees in the onshore wind sector currently contributes around £85 million in GVA to the UK economy and supports around 2,400 jobs in businesses where employees spend their wages. By 2020, this could increase to:
  - £90 million, supporting 2,500 jobs (scenario 10GW);
  - £122 million, supporting 3,500 jobs (scenario 13GW);
  - £145 million, supporting 4,100 jobs (scenario 15GW);
  - £192 million, supporting 5,400 jobs (scenario 19GW);
- impacts on land owners – wind farms have been used by farmers and other land owners to generate additional revenue and diversify income streams in order to support the continued viability of their businesses;
- community ownership – the development of community owned wind farms generates income for community shareholders and can help to improve community cohesion and invest in further community economic and social development;
- community benefit funds – these support community projects close to wind farms. The size of these funds varies from project to project;
- business and tourism effects – spending by employees in local businesses, for example on food and accommodation, during the construction phase currently contributes an estimated £11 million to the UK economy, supporting around 300 jobs. By 2020, this could be:
  - £8 million, supporting 200 jobs (scenario 10GW);
  - £14 million, supporting 400 jobs (scenario 13GW);
  - £18 million, supporting 500 jobs (scenario 15GW);
  - £27 million, supporting 800 jobs (scenario 19GW);
- other tourism economy effects including the provision of visitor facilities and the role of wind farms in improving access to the countryside;
- wildlife and habitat management – wind farm developers often contribute to ecological projects which can help to enhance the local area and support further employment; and
- investment in local infrastructure – wind farm developers often develop or improve local infrastructure such as access roads, which brings wider benefits to the local economy and community, in terms of short-term construction jobs and longer-term benefits as a result of the improvements to infrastructure.

2.7 Exchequer Impacts

The onshore wind sector currently contributes around £198 million tax each year to the UK exchequer (excluding taxes associated with the distribution and sale of electricity produced) including £59 million in non-domestic rates. By 2020, the sector could increase to:

- £279 million, including £130 million in non-domestic rates (scenario 10GW);
- £373 million, including £169 million in non-domestic rates (scenario 13GW);
- £438 million, including £194 million in non-domestic rates (scenario 15GW);
- £572 million, including £247 million in non-domestic rates (scenario 19GW).

In England, the estimated non-domestic rates paid in 2011 was £12 million and this could rise to between £27 million and £52 million by 2020, depending on the deployment scenario. This income will be available to local authorities if the Local Government Finance Bill is approved by Parliament.

2.8 Total Quantifiable Impacts

Taking the direct and supply chain economic impacts and the quantifiable wider economic impacts together, gives a total quantifiable employment impact of 11,400 in 2011. By 2020 the total quantifiable employment impact could be:

- 11,400 (scenario 10GW);
- 15,500 (scenario 13GW), an increase of 36% on 2011;
- 18,400 (scenario 15GW), an increase of 62% on 2011;
- 24,100 (scenario 19GW), an increase of 112% on 2011.

3 Economic Linkages

This chapter considers the wind farm lifecycle from development to operations and maintenance and highlights the main areas where economic impact occurs in the UK.

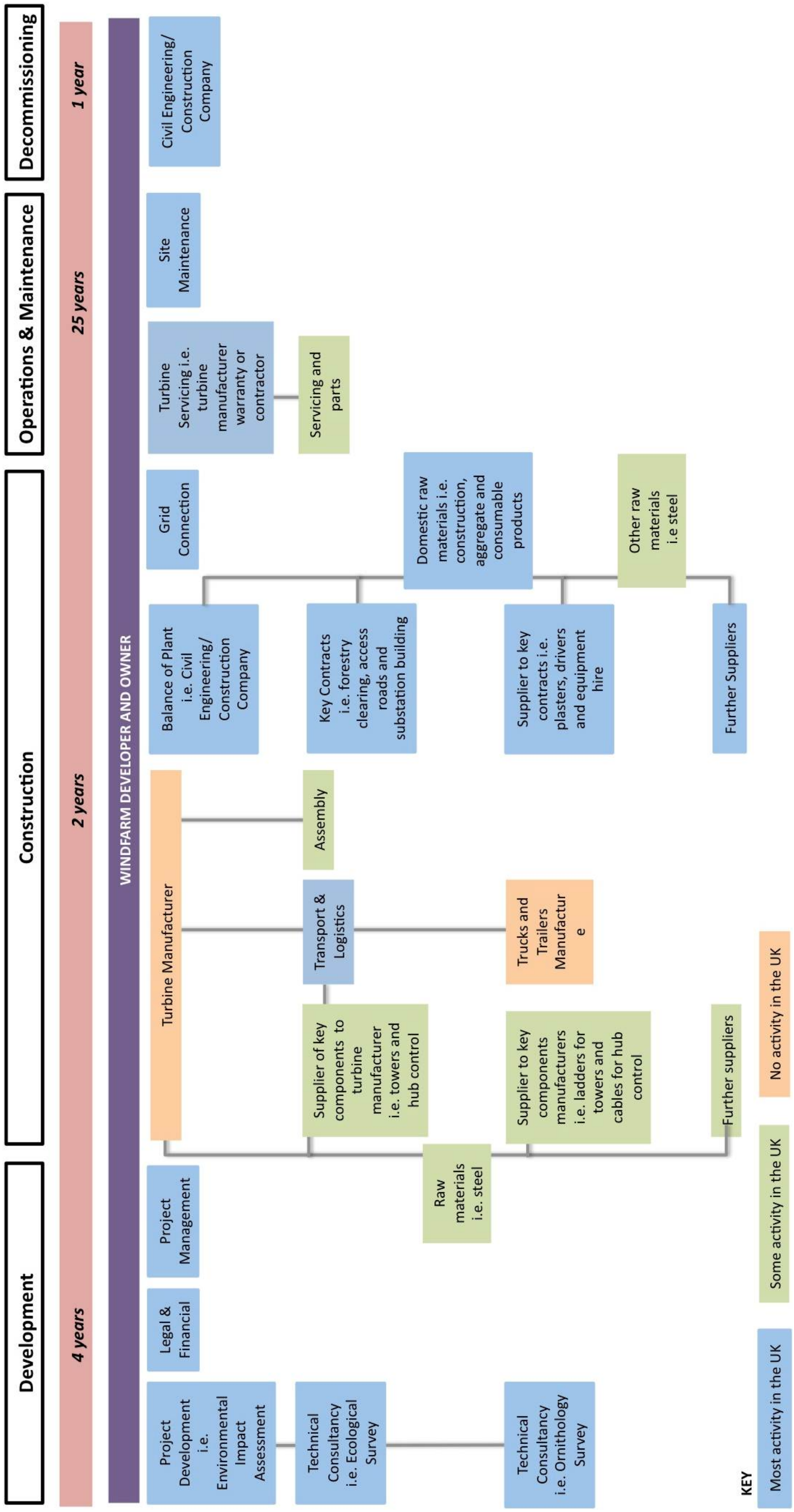
3.1 Wind Farm Life Cycle

The lifecycle of a wind farm involves four main stages:

- development;
- construction;
- operations and maintenance; and
- decommissioning and repowering

Each of the four stages and the main types of activities that occur within each one are overviewed in Figure 3-1, which also shows the likelihood of the activity occurring in the UK. There are a wide variety of jobs involved in each of these activities and examples of these are given in the rest of the chapter along with further discussion of what activity occurs in the UK.

Figure 3-1: Key activities during wind farm life cycle



3.2 Development

The development phase involves three main types of activity:

- project development, which includes technical consultancy and technical testing and analysis;
- legal and financial, which includes legal and accounting activities; and
- project management, which includes management consultancy activities and civil engineering.

There are a wide variety of jobs involved at the development stage including those related to:

- site identification and investigation;
- finance;
- legal;
- planning policy and submission;
- environmental impact assessment;
- community liaison;
- ornithological surveys;
- ecological surveys;
- transport consultants;
- archaeologists;
- heritage consultants;
- landscape architects;
- telecoms engineer;
- acoustic consultants; and
- business plan development.

These specialist and highly skilled jobs can be done by the wind farm developer itself or contracted out to specialist consultancies. For example a utility firm may have the expertise to develop an onshore wind project while a community wishing to develop their own project may have to buy in expertise. In either situation this activity is usually undertaken in the UK due to the need to have local knowledge such as local planning laws and an understanding of processes such as community consultation and scoping studies. There are opportunities in these areas for small and medium sized businesses as well as larger companies.

The consultation programme undertaken as part of this study suggests that the development phase expertise developed in the UK are considered one of the most developed in the world. There may therefore be opportunities to apply these skills and knowledge to other sectors where specialist skills are required in the development phase and also to export these skills and knowledge.

3.3 Construction

The construction phase involves three main types of activity:

- turbine manufacture – including the tower, blades and internal components;
- balance of plant – activity and supplies required to install completed turbines; and
- grid connection – to connect installed turbines to the electricity grid.

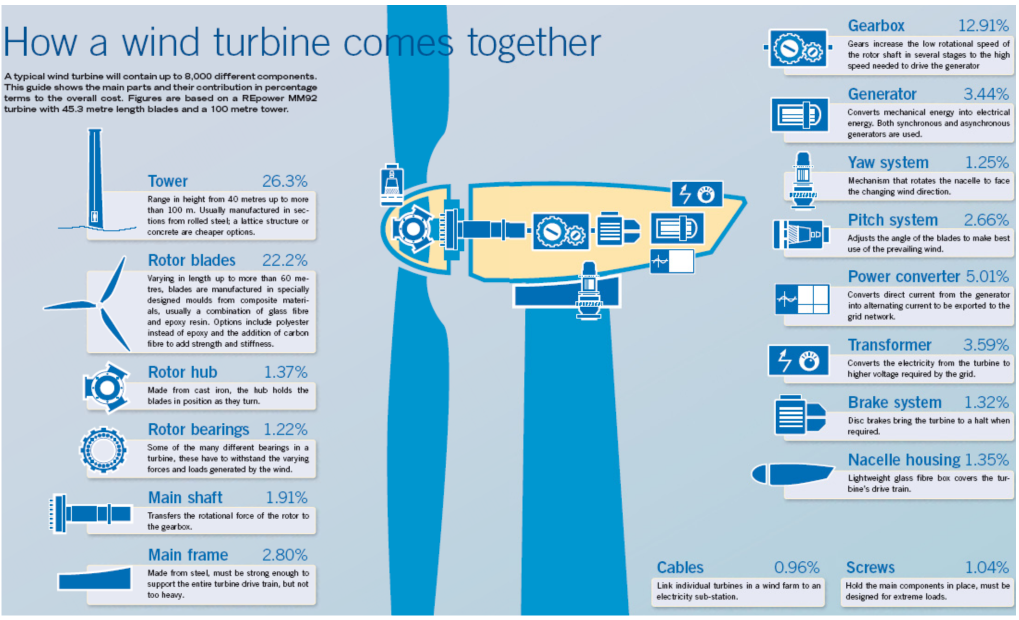
3.3.1 Turbine

Turbine manufacture includes:

- the manufacture of the turbine, the tower, blades and other electrical and mechanical components such as motors, generators transformers, wiring, cooling and ventilation equipment;
- assembly, which includes installation of industrial machinery and equipment, electrical installation, other construction installation and technical testing and analysis; and
- transport and logistics.

The main components of a turbine and the contribution of each to turbine costs are summarised in the Figure 3-2.

Figure 3-2: Wind Turbine Components and Corresponding Percentage of Total Cost



Source: European Wind Energy Association and International Economic Development Council

Turbine manufacturers are the companies that deliver the completed turbine to the wind farm developer. As well as completing the turbine, this stage also includes the transport of the turbine to site and the assembly of the turbine on site as these are usually done or contracted by the turbine manufacturer.

Although the turbine suppliers manufacture some of these components, others are made by specialist third party suppliers. These companies that manufacture the components also purchase supplies, including specialised parts and general parts such as bolts or raw materials such as steel. There is some activity relating to the production of components in the UK, particularly wind turbine towers, hub controls and convertors, and this activity has increased markedly in recent years. However, many of the components are currently sourced in continental Europe.

The degree of outsourcing among turbine manufacturers ranges from companies who tend to produce the majority of components in-house, to those that prefer to outsource components as much as possible.

The onshore wind turbine sector is a mature sector with an established supply chain in terms of manufacturing. Given the importance of reliability in terms of component quality and supply, turbine manufacturers and their key suppliers tend to be risk adverse, preferring to use established relationships. It can therefore be difficult for new entrants to enter the supply chain.

This section highlights some of the activity that takes place in the UK.

3.3.1.1 Wind Turbine Towers

With heights ranging from around 25 to 80 meters, the single largest component of these turbines is the tower. The majority of turbine towers already installed in the UK were manufactured in continental Europe; however, there are now two large scale tower manufacturers in the UK so the number of UK towers manufactured is expected to increase in the future. This is an area where wind turbine manufacturers are keen to use UK suppliers as the size and weight of a wind turbine tower means that it is expensive to transport. Any reduction in the distance over which wind turbine towers have to be transported can result in significant savings.

Based on consultations, it is estimated that between them, these two UK plants manufactured around 220 wind turbine towers in 2011 and provided these towers to turbine manufacturers. This represents around one third of the 618 turbines[6] currently being installed in 31 sites across the UK. The total number of towers constructed in the UK is expected to increase to around 400 over the next two to three years.

In January 2012, one of the UK's tower manufacturers, Mabey Bridge, announced that it had secured a multi-million-pound order with Nordex to manufacture and supply 35 towers. This was followed in March by a further announcement that the company has secured an order from Siemens to manufacture towers for 15, 2.3 MW turbines bound for the Mynydd y Betws wind farm in Carmarthenshire. As a result of the new orders, the company has created 50 new jobs. In total the company has currently 175 employees, which will increase this year to 200 and in the future it is envisaged that the employee numbers could be 240.

A similar story can be told about Wind Towers Limited, the other UK based tower manufacturer, which is based in a remote area of the Scottish Highlands. In early 2011 the future of the Campbeltown facility was in doubt after its Danish parent company, Skykon went into administration. The future of the factory and its 100 employees was secured in May 2011 when it was purchased by Wind Towers

[6] RenewableUK Wind Energy Database

Limited, a joint venture between Scottish & Southern Energy and Marsh Wind Technology.

3.3.1.2 Internal Tower Components

Approximately 20% of the cost of a wind turbine tower is accounted for by internal components such as ladders, lifts, lighting, cabling, plates and electrics. Based on current manufacturing activity, it can be estimated that the market for these components in the UK is therefore currently worth £4-5 million and will grow to around £8 million over the next two to three years as the number of towers manufactured in the UK increases.

The internal components of a wind turbine tower are relatively non-specialised and as such can often be sourced from existing UK suppliers. Whether or not this occurs depends on the procurement policy of the wind turbine manufacturer with some procuring components internally and others leaving the decision to the tower manufacturer. Consultations suggest that the proportion of internal components sourced from UK suppliers has increased significantly over the past two to three years and that around half of the towers being manufactured in the UK in 2012 will utilise internal components from UK suppliers.

3.3.1.3 Hub Control

There are various systems and parts used for hub control including the pitch system which adjusts the angle of the blades to make use of the prevailing wind and the slip ring which transmits power and data to the pitch system. There are approximately ten to twelve companies involved in these areas including some UK based companies and subsidiaries. As these UK companies supply turbine manufacturers, their products are used not just in the UK but also globally.

For example, one UK company, BGB Innovations, specialising in slip ring systems (which are used in electric motors as well as generators) obtains 90% of its turnover through exports. Turnover and employment in this company has grown significantly in recent years and growth is expected in the future. The main factor driving this growth is the wind sector. The company currently has 100 employees. It aims to source material from the UK where possible and therefore most of its suppliers are from the UK; however, the majority of expenditure on supplies is for a specialised product, which is sourced from Sweden for cost reasons.

Another UK subsidiary of a global company, Moog Inc, provides pitch solutions including pitch systems and slip rings for 5,000 to 6,000 turbines per year. This product is used in both onshore and offshore wind turbines. This company has reported that future growth in supplying to the wind sector is expected to be between 10% and 20% per year as a result of growth in market opportunities. The UK subsidiary spends about £1 million on wind related supplies, with most supplies sourced from companies with a presence in the UK.

3.3.1.4 Convertors

All wind turbines incorporate a convertor to turn the mechanical energy produced by the turning blades into electrical energy. Convertors can cost between £20,000 and £100,000 depending on the power rating of the turbine. Some turbine manufacturers make all of their own power chain components while others purchase them externally from companies. One of the companies that manufactures convertors for turbine manufacturers is GE Power Conversion (formerly Converteam).

GE Power Conversion is a French company with worldwide operations. Most of the convertors produced by GE Power Conversion are manufactured in two factories in the UK, one in Kidsgrove in Staffordshire and the other near Glasgow; the company employs around 1,500 staff in the UK. All of the output from these factories is exported and used in the manufacture of turbines outside the UK, some of which will ultimately be imported back into the UK. It is not known how many of the turbines currently installed in the UK incorporate converters manufactured in the UK; however, GE Power Conversion's global fleet of convertors is currently around 10GW, which is more than twice the total installed onshore wind capacity across the UK.

This illustrates how UK based manufacturers are benefitting from wind farm projects even where the majority of expenditure at the construction phase appears to occur outside the UK. It also illustrates the potential for UK based companies to export products as part of the global wind supply chain.

Electronic components are the main type of supplies used in the production of convertors, however consultation with industry suggests that it is currently difficult for manufacturers to source these components in the UK. Although there are some suppliers within the UK, consultations undertaken as part of this study suggest that many are not large enough to supply the required volume of components to meet demand. Others are too expensive and some cannot meet required quality standards or delivery requirements.

In order for UK based businesses to fully exploit these opportunities in the future, it will be necessary to develop this supply chain. Businesses engaged in this part of the supply chain pointed to the Automotive Council UK as a potential model for achieving this. The Automotive Council UK is chaired jointly by industry and the Secretary of State for Business, Innovation and Skills. It was established in 2009 on the recommendation of the industry led New Automotive Innovation and Growth Team with objectives that include to develop a stronger and more competitive automotive supply chain.

3.3.1.5 Transport and Logistics

Transport and logistics includes the transportation of turbines by sea and road, port handling and storage of components and logistics supply services. This activity is sometimes included in the turbine contract so companies in this sector are often contracted directly by turbine manufacturers.

Figure 3-3: Wind Turbine Transport, Collett Heavy Transport

The presence of tower manufacturers in the UK means that a further opportunity has been developed in the delivery of turbine towers to site. There are 30 to 40 of these transport and logistics companies across Europe, five of which are UK based.

One of the UK based companies currently generates turnover of around £10 million and supports 80 jobs, of which 30% is supported by the onshore wind sector. This company spends approximately 60% of its turnover on supplies, which mostly comprises items such as trucks and trailers manufactured in Germany and the Netherlands. Working in the onshore sector has enabled the business to grow, while also providing added value and financial support for business development in other sectors, due to the additional investment in facilities and equipment provided by the onshore wind sector.

The transport of turbines also has a positive impact on ports. For example the construction of Arecleoch wind farm resulted in 500 turbine components arriving at the Port of Ayr, supporting jobs in the port. This is also the case at ports across the UK.

3.3.1.6 Raw Materials

It is estimated that the average wind turbine incorporates around 140 tonnes of steel. The vast majority of this is in the tower but specialised steel is also required for mechanical and electrical components and for the anchor plate in the foundation. The steel used in UK manufactured wind turbine towers is sourced from Tata Steel, a major global steel manufacturer (formerly Corus and British Steel). Tata Steel supplies three main types of product to the wind sector:

- plate steel used to construct turbine towers;
- engineering steel used in drive shafts and gear-boxes; and
- electrical steel used inside generator cores.

Tata Steel manufactures plate steel for the wind industry at the company's dedicated Wind Tower Hub in Scunthorpe, which was established in 2010. The

£1.3 million facility handles up to 200,000 tonnes of steel plate per year and employs 38 people. In January 2012, the facility secured its largest order to date to supply 25,000 tonnes of steel plate to Siemens Wind Power. The steel will be used to build about 150 onshore wind turbine towers.

In addition to the plate steel used for turbine towers, Tata Steel also manufactures engineering steel at Stocksbridge in Rotherham and electrical steel at two specialist sites in Norway and Wales. Electrical steel is manufactured using steel supplied by two strip sites in South Wales and the Netherlands.

Most of the material Tata Steel will supply for wind turbine towers will be delivered to customers in the UK and mainland Europe. However, completed towers may be shipped around the world. It is anticipated that the contract with Siemens will lead to further opportunities for Tata Steel to supply other steel products used in wind turbines.

3.3.2 Balance of Plant

Balance of plant activities cover everything else that needs to be done to construct the wind farm other than the turbine activity. These activities include:

- civil and project management;
- roads and access;
- substation buildings;
- turbine foundations and hard standings;
- forestry, logging and landscape service activities; and
- electrical installation and installation of industrial machinery and equipment.

This can involve a wide variety of trades from plasterers, bricklayers, electricians, crane operators, HGV drivers, stone crushing machine operators, timber harvester operators, chainsaw operators and fibre optic networking technicians.

3.3.2.1 Companies Involved

Responsibility for delivering balance of plant activity usually rests with a lead contractor, which is usually an engineering or construction company that specialises in wind farm construction. There are currently about ten to twelve such operators who are based in the UK and Ireland.

The level of subsequent contracting varies by company and by project. Arecleoch provides a case study of the supply chain in the balance of plant contract. The main contractor then had four main subcontracts, electrical infrastructure, two earthworks contracts and a forestry/site clearing contractor. These contractors in turn can sub-contract part of their contract. For the Arecleoch project there were five or six tiers of contractors. These contractors are also usually based in the UK.

The activity undertaken during this phase of a wind farm project is generally quite labour intensive so staff costs are usually one of the main costs for balance of plant contractors. Contractors generally use a mixture of existing employees and local recruits with existing employees often undertaking management roles such as site foreman. Consultation with balance of plant contractors suggest that it is common for local recruits to remain with the company after the project has finished, providing sustained employment opportunities for residents of what are often very remote, rural areas.

3.3.2.2 Raw Materials

The main supplies for balance of plant contractors are construction products, aggregate products and consumable materials such as lubricants and fuel. One balance of plant contractor typically spent 80% of their contract on buying supplies. Most supplies were purchased in the UK from suppliers who supply to the construction industry as a whole. The one significant product that has had to be imported was steel reinforcements. Another contractor spent a third of the contract value on supplies and a third on equipment. Again supplies consist of mainly concrete, bricks and steel and are purchased as locally as possible.

3.3.2.3 Local Opportunity

Due to the wide variety of supplies and services required during balance of plant works and the nature of the supplies and services required there is significant opportunity for local companies to gain contracts. For example during the construction of An Suidhe wind farm, contracts with local companies included concrete supply, plant hire, two tree-felling companies and a contract for switchgear building.

Marr provides another illustration of the local opportunity. The amount spent on contractors from the surrounding area was £120,500 and included the following contracts: site security (£50,000), traffic management (£6,000), scaffolders (£2,500), local labour agency (£5,000), white liners (£1,500), fencing (£20,000), roofers (£2,500), earthworks testing (£3,000) and surfacing contractors (£23,000).

A further £320,700 was spent on local material suppliers including purchases from two aggregate companies, two haulage companies, a steel company, a stone suppliers, a pump hire company, a timber merchant and a waste disposal company.

3.3.3 Grid Connections Contracts

The type of activities usually involved in grid connections contracts include:

- engineering services, which includes engineering activities and related technical consultancy and technical testing and analysis;
- construction services including civil engineering; and
- electrical components, which includes manufacture of electric motors, generators transformers etc., manufacture of wiring and wiring devices and the manufacture of electronic components and boards.

These are significant contracts as many wind farms underground the lower voltage connections to the grid, which creates additional expenditure and economic impact when compared with using overhead lines.

3.4 Operations and Maintenance

During the operations and maintenance phase there are two main areas of activity: turbine maintenance and site maintenance. Turbines can be operated and maintained by the turbine manufacturer for a warranty period or they can be maintained by contract or by technicians working for the owner of the wind farm.

3.4.1 Turbine Maintenance

Given that technicians, both those working for turbine manufacturers and those working for maintenance providers, tend to live locally, this is an important source of economic impact at the local level. Not only in terms of generating local jobs, but also in terms of spending their wages in the local economy.

Figure 3-4: Wind Turbine Maintenance at Minsca Wind Farm

One of the main providers of operations and maintenance for post warranty wind farms is Global Wind Alliance, providing a complete operations and maintenance service from servicing to products and transport. The group has 14 member companies and organisations with a combined £45 million turnover and 1,500 employees, of which 90% are working on onshore wind and 60% are based in the UK. Their main suppliers are equipment manufacturers for turbine parts, mostly based in Demark, Germany and the Netherlands.

Other companies carry out part of the service. One example is David Brown established in Huddersfield in 1860 to manufacture patterns for cast gears. The company's current activity in the onshore wind sector is the repair and refurbishment of gearboxes. The expertise gained from this activity combined with its overall engineering excellence means the company is in a key position to carry out the research and development required to provide innovative solutions to the offshore sector. This is shown by its multi million investment in a Wind Turbine Gearbox Research and Innovation Centre and the award of £1.2 million grant from DECC and the Technology Strategy Board's Offshore Wind Component Technologies Innovation Scheme. This represents the first award from this scheme.

3.4.2 Site Maintenance

Site maintenance activity includes routine tasks such as maintaining site access tracks and bridges, maintaining drainage ditches and repairing gates and fences. From time to time, site maintenance may also involve tasks such as snow clearing or tree clearance. This will also include improvement and maintenance of the grid connection including cable jointers and overhead lines persons, building maintenance and habitat management.

Evidence from the case studies undertaken for this report suggests that the site maintenance for one large wind farm will support around 140 days of employment per year. Locally based companies usually undertake this activity because the work-flow is unpredictable and often requires the contractor to attend the site at short notice. Much of the site maintenance work also requires plant to be brought on site and the transportation costs of moving this plant are minimised if the contractor is based locally.

3.5 Decommissioning and Repowering

At the end of the operation phase, onshore wind sites will either be decommissioned or repowered. Given that the operation phase is typically twenty-five years, there are only a small number of examples of UK wind energy projects reaching the decommissioning stage and many of those sites have been repowered.

Where sites are repowered, there will be opportunities for companies in the development phase since repowered proposals will require feasibility studies and planning approvals. While the costs of new turbines account for a large proportion of investment costs, there will be opportunities for cost savings in repowered sites, compared with new sites, during the construction phase since there will be existing access to the site and an existing grid connection.

There will be work involved in decommissioning wind farm developments in the future. The exact nature of the work required will depend on the planning conditions attached to each wind farm and is therefore likely to vary from site to site. However, at a minimum, this phase will involve taking down and disposing of the wind turbines. Disposal may either involve scrapping the turbines or selling them second hand but either way, it will require civil engineering expertise to dismantle the towers and transportation services to remove them from the site. This work is likely to be undertaken by UK based businesses.

3.6 Maximising Future Opportunities

As highlighted in this chapter, many activities relating to the development of wind farms are already carried out by UK based businesses. As the sector develops, there are likely to be opportunities to increase this activity. This section considers how these opportunities can be maximised.

As Figure 3-1 shows, almost all the activity during the development stage occurs in the UK. The process of developing a wind farm in the UK can take several years and generally requires input from a wide variety of professional services companies. As a result, UK based firms have developed particular expertise in this area. Several UK firms have exported their expertise to other countries where onshore wind capacity is being developed and this could be an area of growth for UK suppliers as the international onshore wind sector grows.

UK businesses are also active during the construction stage. For example, much of the balance of plant and grid connections work is undertaken by UK businesses as well as the transport and logistical support required within the UK to deliver and erect wind turbines and towers. The main activity during the construction stage is turbine manufacturing and installation and even though all of the major wind turbine manufacturers are based overseas, UK businesses are active in manufacturers supply chains. As illustrated in sections 3.3.1.3, 3.3.1.4 and 3.3.1.6 for example, UK businesses already provide specialised electronic components to wind turbine manufacturers' and steel used in the construction of wind turbine towers.

Consultation with UK based businesses engaged in supplying components to wind turbine manufacturers suggests that it is difficult to source electrical components within the UK. Consultation also suggests that there may be future opportunities for UK based businesses to supply a greater proportion of non-specialist components, such as internal tower fittings. In order for UK based businesses to fully exploit these opportunities in the future, development of this supply chain is essential. Businesses engaged in this part of the supply chain pointed to the Automotive Council UK as a potential model for achieving this.

As described above, most of the operations and maintenance activity involved in the UK onshore wind sector is undertaken by UK based businesses. At present some of this activity is undertaken by local subsidiary companies established by turbine manufacturers to service turbines in the UK during the warranty period but in future there may be more opportunities for UK based servicing companies.

Consultation with businesses engaged in the onshore wind supply chain in the UK also highlight that this activity has helped businesses to develop expertise and experience that will help them to exploit future opportunities in the offshore wind sector, in the UK and internationally.

4 Direct and Supply Chain Economic Impact of UK Onshore Wind Sector in 2011

4.1 Direct and Supply Chain Economic Impact at Four 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;
- operations and maintenance – maintaining and operating the site and the turbines, typically over a 25 year period; and
- decommissioning – removing the turbines and restoring the site, at the end of the operation and maintenance period and, in some cases, repowering.

The direct and supply chain economic impacts associated with each stage are discussed below.

4.2 Development Impacts

Of the 18 case studies, 16 provided information on the costs associated with the development of their projects. The total cost of development per MW installed ranged from £10,000 to over £500,000. The weighted average cost was £108,759 per MW installed.

The majority of the development costs (98%) were spent in the UK. This includes 41% of development costs spent regionally (for the case studies in England) or in Scotland, Wales or Northern Ireland (for case studies based in these UK nations), which in turn includes 8% of development costs spent in the local area (i.e. within the local authority area in which the wind farm was located).

Table 4-1 Development Costs per MW

	Unweighted spend per MW	Weighted spend per MW	% of spend
Local	£15,482	£8,742	8.0%
Region/Nation	£45,483	£44,722	41.1%
UK	£132,844	£106,330	97.8%
Total	**£134,464**	**£108,759**	**100.0%**

Source: BiGGAR Economics Case Studies

As discussed in the previous chapter, the development process includes project development and design, legal and financial and project management.

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 4-2). This table also shows the breakdown of development costs into each of the main components of work, based on the case study data.

Table 4-2: GVA and Employment Ratios (Development Phase)

	Turnover per employee (£)	GVA/Turnover	% spend
Project development	103,000	0.592	25.0%
Legal and financial	74,000	0.751	42.0%
Project management	137,000	0.489	33.0%
Development Total	**102,000**	**0.625**	**100.0%**

Source: ONS, Annual Business Inquiry 2010

As of January 2012 there were 7.7GW in the planning system and 4.0MW approved but not yet under construction[7]. In addition, developers will undertake feasibility studies for projects that do not proceed to the planning stage.

Based on the information provided by the case studies, the development process typically takes place over four years, although this varies from project-to-project.

Applying the data from the case studies to the current level of development provides an estimate of the 2011 turnover in the UK associated with wind farms in the development stage, £525 million. Of this, £43 million is in the area local to the developments and £222 million in the region/nation.

Applying the assumptions set out in Table 4-2 gives the level of employment[8] in the UK for wind farm development as 5,139, contributing £316 million in GVA.

Table 4-3: Economic Impact of Development, 2011

	Jobs	GVA (£m)	Turnover (£m)
Local	403	27.0	43.2
Region/Nation	2,161	127.5	221.9
UK	5,139	316.5	525.1

4.3 Construction Impacts

All 18 case studies gave information regarding the costs associated with the construction. The average construction cost per MW was £1.23 million and 12 of the 18 sites spent within ±15% of this figure. The largest difference in the construction cost per MW came from the use of second hand turbines in one of the case studies.

On average, 45% of the construction costs were spent in the UK including 7% in the local area and 29% in the region or nation.

[7] RenewableUK, Wind Energy Database, 2012
[8] Employment figures given here and throughout the report are full-time equivalent jobs.

Table 4-4: Weighted Construction Costs/MW

	Unweighted spend per MW	Weighted spend per MW	% of spend
Local	£108,477	£77,240	6.5%
Region/Nation	£342,688	£343,606	29.1%
UK	£540,525	£529,383	44.8%
Total	**£1,234,540**	**£1,182,612**	**100.0%**

Source: BiGGAR Economics Case Studies

As discussed in the previous chapter 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 4-5). This table also shows the breakdown of construction costs into each of the main components of work.

Table 4-5: GVA and Employment Ratios (Construction Phase)

	Turnover per employee (£)	GVA/Turnover	% spend
Balance of Plant Contract	**136,000**[9]	**0.373**	
Civil & Project Management	103,000	0.592	10.0%
Roads	164,000	0.34	20.0%
Substation buildings	164,000	0.34	8.0%
Turbine foundations & Hard standings	164,000	0.34	49.0%
Landscaping / Forestry / Fencing	55,000	0.445	2.0%
Mechanical & Electrical Installation	147,000	0.382	11.0%
Turbine Contract	**163,000**	**0.393**	
Tower Manufacture	102,000	0.363	10.0%
Other Manufacture	180,000	0.384	75.0%
Assembly	121,000	0.452	12.5%
Transport	108,000	0.470	2.5%
Grid Connections Contract	**131,000**	**0.486**	
Engineering services	99,000	0.571	60.0%
Construction	164,000	0.342	20.0%
Electrical components	163,000	0.367	10.0%
Industrial equipment & machinery	226,000	0.389	10.0%

Source: ONS, Annual Business Inquiry 2010

The turbine contracts account for the majority of the value of the construction contracts, accounting for 65.1%. The balance of plant contracts account for 27.3% and the grid connections account for 7.6%. Therefore the weighted average for

[9] Figures given in bold refer to the average of the overall contracts

construction shows there is one employee per £148,290 in turnover and a GVA/Turnover rate of 0.391 (Table 4-6).

Table 4-6: GVA and Employment Ratios (Construction Phase, Summary)

	Turnover per employee (£)	GVA/Turnover	% spend
Balance of Plant Contract	121,000	0.363	27.3%
Turbine Contract	162,000	0.393	65.1%
Grid Connections Contract	131,000	0.486	7.6%
Construction Total	**148,290**	**0.391**	**100.0%**

As of January 2012 there were 1,430MW in construction[10]. While construction timescales will vary from project-to-project depending on factors such as location and scale, based on the case studies, the construction process typically takes place over two years.

Applying the data from the case studies to the current level of construction provides an estimate of the 2011 turnover in the UK associated with wind farms in the construction stage, £379 million. Of this, £55 million is in the area local to the projects and £246 million in the region/nation.

Applying the assumptions set out in Table 4-5 and Table 4-6 gives level of employment in the UK for wind farm construction in 2011 as 2,413, contributing £142 million in GVA.

Table 4-7: Economic Impact of Construction, 2011

	Jobs	GVA (£m)	Turnover (£m)
Local	357	22.0	55.2
Region/Nation	1,566	92.5	245.7
UK	2,413	141.9	378.5

4.4 Operation and Maintenance Impacts

Of the 18 case studies, 16 provided information on the costs associated with operations and maintenance. The annual cost of operations and maintenance per MW installed ranged from £12,000 to £110,000 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 £52,659 per MW installed per annum.

The vast majority, 90%, of the operation and maintenance spend was in the UK, including 29% spent in the local area and 65% which was spent regionally.

[10] RenewableUK, Wind Energy Database, 2012

Table 4-8: Operations and Maintenance Costs/MW per annum

	Unweighted spend per MW	Weighted spend MW	% of spend
Local	£18,511	£15,181	28.8%
Region/Nation	£29,070	£34,215	65.0%
UK	£47,678	£47,610	90.4%
Total	**£52,952**	**£52,659**	**100.0%**

Source: BiGGAR Economics Case Studies

The contract data from the case studies has been combined with turnover per employee data and GVA to turnover ratios for relevant industries (Table 4-9). On average the case studies spent 43% of this budget on maintenance and 57% on operational costs.

Table 4-9: GVA and Employment Ratios (Operations and Maintenance Phase)

	Turnover per employee (£)	GVA/Turnover	% spend
Maintenance	173,000	0.364	43.4%
Operations	217,000	0.618	56.6%
O&M Total	**198,000**	**0.508**	**100.0%**

Source: ONS, Annual Business Inquiry 2010

As of January 2012 there were 4,512MW in operation[11]. Applying the data from the case studies to the current level of operational capacity provides an estimate of the 2011 turnover in the UK associated with wind farms in the operations and maintenance stage, £173.2 million. Of this, £74.7 million is in the area local to the projects and £111.0 million in the region/nation.

Applying the assumptions set out in Table 4-9 gives level of employment in the UK for wind farm operations and maintenance in 2011 as 1,100, contributing £215 million in GVA.

Table 4-10: Economic Impact of Operations and Maintenance, 2011, per annum

	Jobs	GVA (£m)	Turnover (£m)
Local	318	35.3	68.5
Region/Nation	782	57.2	154.4
UK	1,088	89.3	214.8

4.5 Decommissioning and Repowering Impacts

Given that the operating period for most wind farms is 25 years there are few examples of sites being decommissioned. However, evidence from the case studies suggests that each turbine is anticipated to require work in the order of £60,000 in turnover when they come to be decommissioned.

Many of the sites that have come to the end of their operational period have been repowered. Given that these include some of the earliest deployment of onshore

[11] RenewableUK, Wind Energy Database, 2012

wind projects in the UK, this has allowed significant increases in capacity due to the higher capacity wind turbines that are now available.

4.6 Summary of Direct and Supply Chain Economic Impact in 2011

As shown in Table 4-11, taking all of the stages together gives a total 2011 direct and supply chain economic impact of the onshore wind sector of **8,600 jobs** and **GVA of £548 million**.

Table 4-11: Total Direct & Supply Chain Economic Impact (UK), 2011

	Jobs	GVA (£m)	Turnover (£m)
Development	5,139	316.5	525.1
Construction	2,413	141.9	378.5
Operation & Maintenance	1,088	89.3	214.8
Decommissioning	0	0	0
Total	**8,640**	**547.7**	**1,118.4**

The total local direct and supply chain economic impact of the sector is estimated at 1,100 jobs and £84 million GVA (Table 4-12) and the total regional/national economic impact is estimated at 4,500 jobs and £277 million GVA (Table 4-13).

Table 4-12: Total Direct & Supply Chain Economic Impact (Local), 2011

	Jobs	GVA (£m)	Turnover (£m)
Development	403	27.0	43.2
Construction	357	22.0	55.2
Operation & Maintenance	318	35.3	68.5
Decommissioning	0	0	0
Total	**1,078**	**84.5**	**166.9**

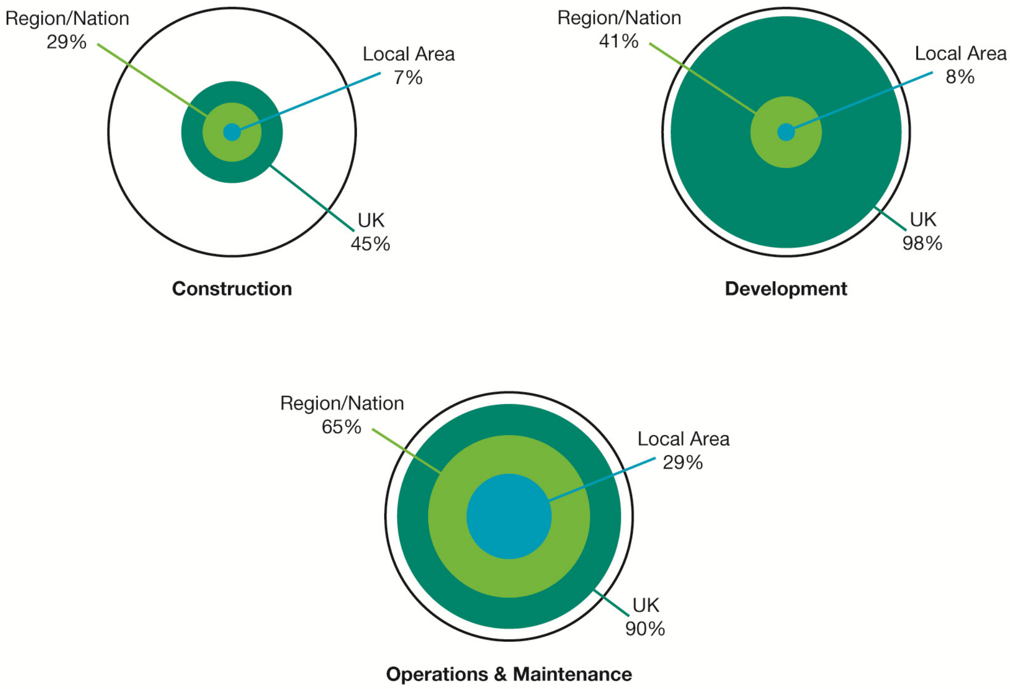
Table 4-13: Total Direct & Supply Chain Economic Impact (Region/Nation), 2011

	Jobs	GVA (£m)	Turnover (£m)
Development	2,161	127.5	220.8
Construction	1,566	92.5	245.7
Operation & Maintenance	782	57.2	154.4
Decommissioning	0	0	0
Total	**4,509**	**277.3**	**620.9**

4.7 Distribution of Direct & Supply Chain Economic Impacts

The analysis has found that the UK, regional and local impacts are highest in the development and operations and maintenance phases, with the vast majority of investment secured by UK companies. This is significant since the operations and maintenance phase is typically 25 years. The UK share of the construction investment is lower due to the fact that the majority of turbines are imported, although UK companies are capturing a significant minority of the investment at the construction stage. The local share of contracts is highest in the operation and maintenance phase.

Figure 4-1: UK, Regional and Local Economic Contracts (Direct & Supply Chain)



5 Potential Direct and Supply Chain Impacts to 2020

The direct and supply chain economic impacts for the 2011 baseline year summarised in the previous chapter provide a basis for considering the potential future contribution of the sector to the UK economy.

This analysis has been based on four scenarios for the future deployment of onshore wind energy capacity in the UK.

5.1 Future Development Scenarios

The starting point for the scenario analysis was the 1,430MW (1.4GW) of capacity that are currently under construction; it was therefore assumed that the scenarios would not diverge in terms of installed capacity in the sector until after 2013. At the start of 2012, there was an installed capacity of 4,512MW (4.5GW) of onshore wind energy with capacity under construction implying that this will increase to 6.4 GW in 2013.

The following scenarios for installed capacity by 2020 have been considered:

- Scenario 10GW: 10.0GW, an increase of 6.4GW on 2011 which implies an annual build rate after 2013 of 566MW;
- Scenario 13GW: 13.0GW, an increase of 8.5GW on 2011 which would require 950MW of capacity to be installed every year;
- Scenario 15GW: 14.89GW, an increase of 10.4GW on 2011 which would require 1,213MW of capacity to be installed every year; and
- Scenario 19GW: 19.0GW, an increase of 14.5GW on 2011 which would require 1,370 MW being installed ever year.

Three of the scenarios (10GW, 13GW and 19GW) are the same as those adopted in the Renewable Energy Roadmap published by DECC in 2011[12] and the other is from the National Renewable Energy Action Plan[13].

[12] Department of Energy and Climate Change, UK Renewable Energy Roadmap, 2011
[13] Department of Energy and Climate Change, National Renewable Energy Action Plan for the United Kingdom, 2010.

Table 5-1: Assumptions on Annual Installed Capacity by Scenario (MW)

Year	Scenario 10MW	Scenario 13GW	Scenario 15GW	Scenario 19GW
2011	4,512	4,512	4,512	4,512
2012	5,455	5,455	5,455	5,455
2013	6,398	6,398	6,398	6,398
2014	6,913	7,341	7,611	8,198
2015	7,427	8,284	8,824	9,999
2016	7,942	9,228	10,038	11,799
2017	8,456	10,171	11,251	13,599
2018	8,971	11,114	12,464	15,399
2019	9,485	12,057	13,677	17,200
2020	10,000	13,000	14,890	19,000

The assessment of economic impacts in the period to 2020 requires that the levels of deployment summarised above have been translated into the MW in each stage of a wind energy project's lifecycle for each of the scenarios. Based on the case studies, the following assumptions have been made:

- for the new capacity installed each year, it has been assumed that construction takes place over the two years before it becomes operational;
- for each MW constructed, it has been assumed that the development stage lasts, on average four-years prior to construction[14]; and
- half of the capacity that enters scoping subsequently enters the planning application stage and half of that is constructed.

Decommissioning of wind farms that became operational in the early 1990s will take place towards the end of the decade. By the end of the decade 151.2 MW will have been decommissioned (a small percentage of the installed capacity for all of the scenarios) and the decommissioning of each site is assumed to take place over one year.

In addition to the assumptions on deployment, the study considered the impact that would be associated with an increase in the UK market share, since the greater the installed capacity the greater the opportunity for UK companies to enter the sector or expand and the greater the likelihood that companies from other countries will increase their UK presence. The assumptions on increased market share for each of the scenarios are summarised in the table below. The scenario analysis was also undertaken on the basis of no increase in market share.

[14] The data gathered from the case studies was for the entire development period. This varied considerably from two years to ten years from initial feasibility to the start of the construction process; four years was typical and was the average for case studies. It was necessary to make an assumption on the development time period so that the impacts were appropriately distributed over the period 2011 to 2020 modelled; however, it should be noted that variations to this assumption do not impact on the results of the analysis since it is based on the average deployment per annum to reach a particular deployed capacity in 2020.

Table 5-2: Assumptions on Increases in Market Share by Scenario

	Current Market Share	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Development					
Local	8%	No change	+1%	+1%	+2.5%
Region/Nation	41%	No change	+2.5%	+2.5%	+5%
UK	98%	No change	No change	No change	No change
Construction					
Local	7%	No change	+1%	+1%	+2.5%
Region/Nation	29%	No change	+2.5%	+2.5%	+5%
UK	45%	No change	+5%	+5%	+10%
Operations					
Local	29%	No change	+1%	+1%	+2.5%
Region/Nation	65%	No change	+2.5%	+2.5%	+5%
UK	90%	No change	+5%	+5%	+5%

Source: BiGGAR Economics assumption

The potential jobs, turnover and GVA impacts in the period 2011 to 2020 for each of the scenarios is set out below.

5.2 Jobs

The analysis summarised in Chapter 4, found that there are currently approximately 8,600 individuals employed directly in the onshore wind sector and in the supply chain in the UK.

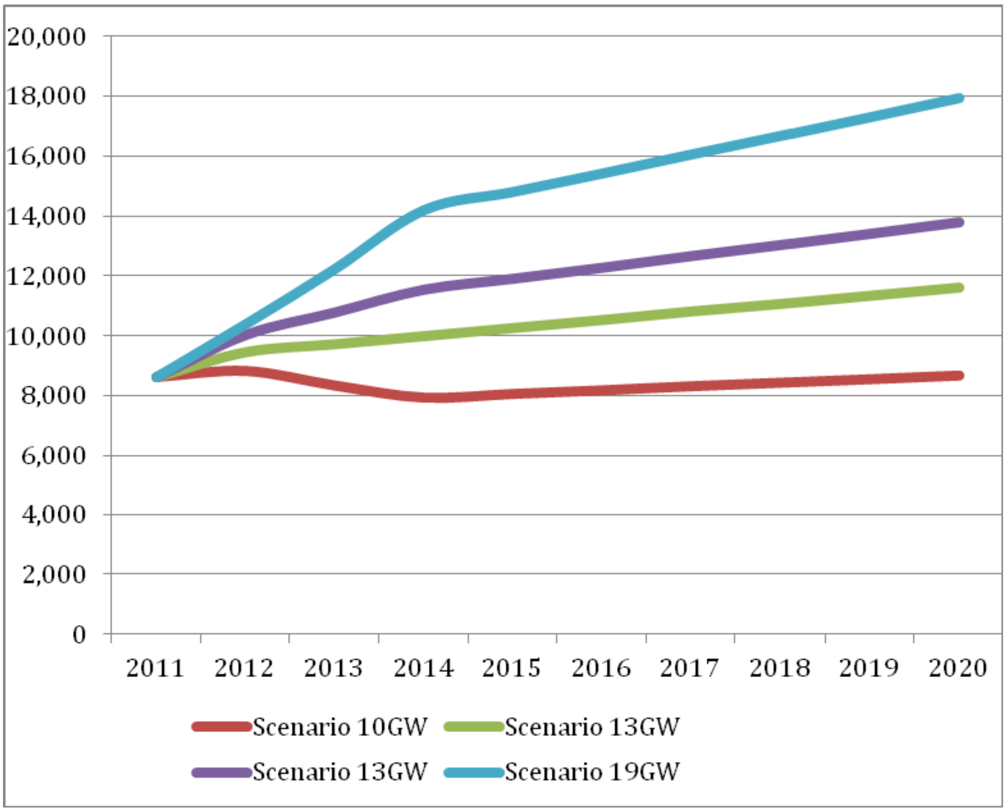
This could grow to as much as 17,900 by 2020 (Table 5-3 and Figure 5-1). As the table and figure shows the variation in potential future direct and supply chain economic impact is expected to be considerable. The 2020 direct and supply chain employment impacts associated with 19GW of installed capacity are more than double current levels and more than double those associated with 10GW of installed capacity.

In all four scenarios the number of jobs in operations and maintenance in particular would be expected to grow, as the installed capacity increases over time.

Table 5-3: Total Direct & Supply Chain Jobs 2020 by Scenario, UK

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Development	5,139	4,533	4,931	5,423	5,660
Construction	2,413	1,737	3,538	4,552	7,433
Operations & Maintenance	1,088	2,411	3,134	3,788	4,834
Decommissioning	0	9	9	9	9
Total	**8,640**	**8,689**	**11,612**	**13,771**	**17,935**

Figure 5-1: Total Direct & Supply Chain Jobs over Time by Scenario, UK



The employment in the different areas is shown for each of the scenarios for 2020 in Table 5-4. As with the UK impacts, the local and regional direct and supply chain employment impacts in 2020 are considerably greater under the higher deployment levels than the current employment impacts.

Table 5-4: Total Direct & Supply Chain Jobs 2020 by Locality

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Local	1,078	1,317	1,401	2,374	3,423
Region/Nation	4,509	4,766	6,696	7,985	10,837
UK	8,640	8,689	11,612	13,771	17,935

5.3 Turnover

The trends in the direct and supply chain turnover of the onshore wind sector to 2020 are likely to vary considerably for each of the scenarios. The analysis summarised in Chapter 4, found that the total direct and supply chain turnover of the onshore wind sector in the UK is currently £1.1 billion.

This could grow to as much as £2.7 billion in 2020 (Table 5-5 and Table 5-6) under the 19GW deployment scenario but only to £1.2 billion under the 10GW scenario.

The turnover trends under each of the scenarios are similar to those in GVA. These trends are discussed in section 5.4 on GVA below.

Table 5-5: Total Direct & Supply Chain Turnover 2020 by Scenario, UK (£m)

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Development	525.1	463.1	503.9	554.1	578.3
Construction	378.5	272.4	505.0	713.9	1,165.9
Operations & Maintenance	214.8	476.1	618.9	748.1	954.6
Decommissioning	0	1.1	1.1	1.1	1.1
Total	**1,118.4**	**1,212.7**	**1,678.9**	**2,017.2**	**2,700.0**

Table 5-6: Turnover in 2020 by Locality (£m)

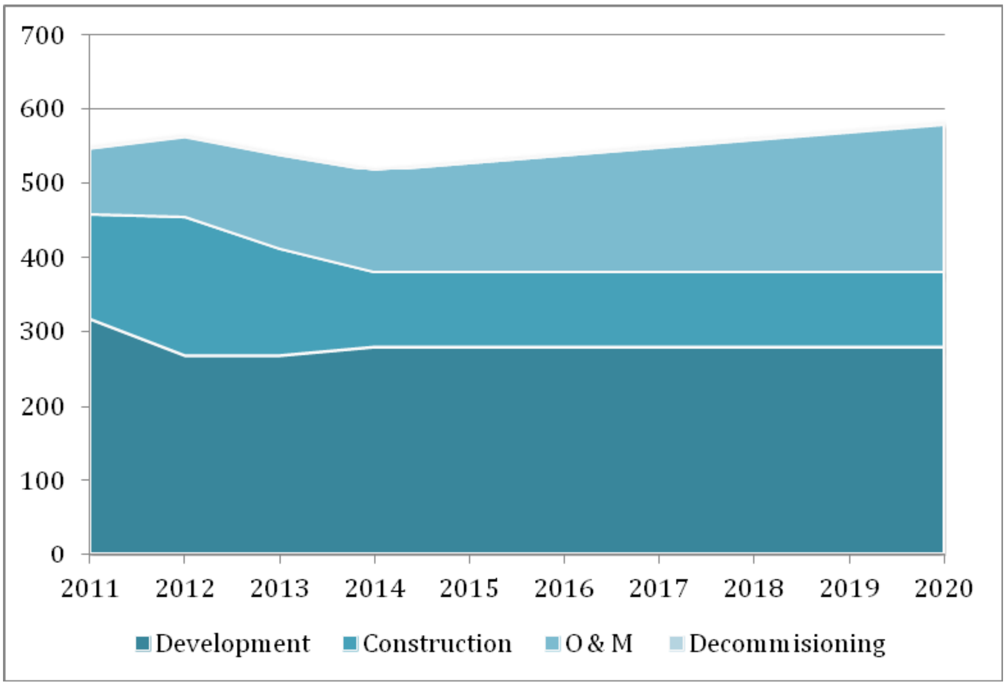
	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Local	166.9	229.6	240.5	393.2	568.1
Region/Nation	620.9	713.7	1,021.5	1,229.0	1,697.9
UK	1,118.4	1,212.7	1,678.9	2,017.2	2,700.0

5.4 GVA

The analysis summarised in Chapter 4, found that the total direct and supply chain GVA of the onshore wind sector in the UK is £548 million. As with employment and turnover impacts, the future direct and supply chain GVA impacts vary considerably depending on the level of deployment of capacity to 2020.

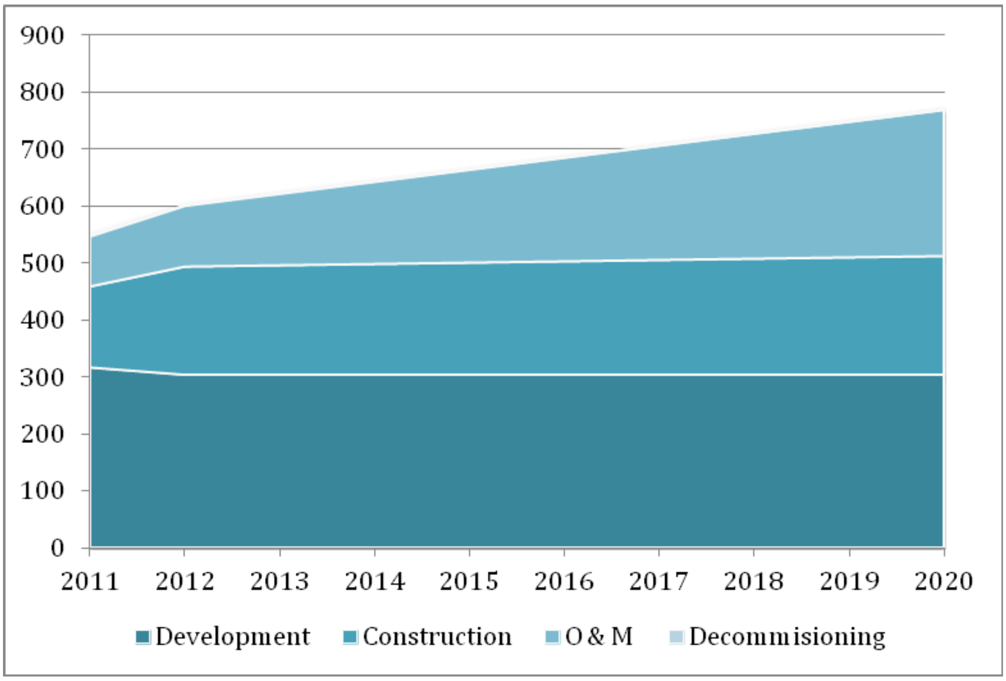
In scenario 10GW the total GVA would be marginally higher in 2020 than it was in 2011 (Figure 5-2) but the composition of the impact in 2020 would differ from 2011. The contribution from the development and construction of onshore wind farms would decrease between 2011 and 2014 since this scenario implies a slow down in deployment when compared to the last five years. However, the deployment of additional capacity means that increased operations and maintenance GVA would compensate for the loss in GVA in other phases.

Figure 5-2: Direct & Supply Chain GVA Scenario 10GW, UK Market Share (£m)



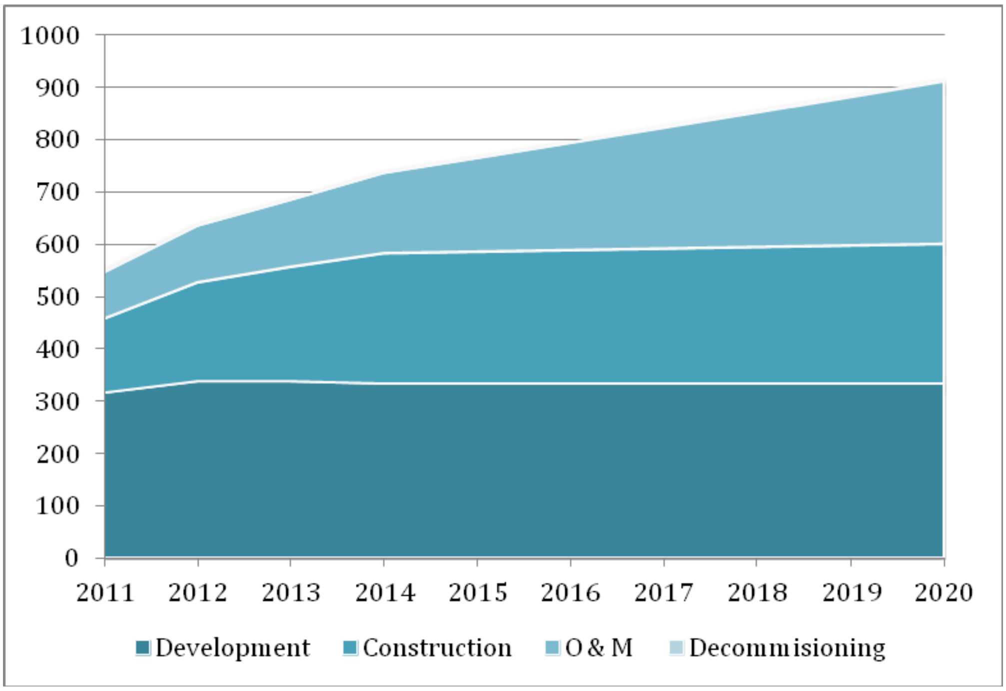
For scenario 13GW GVA grows from £548 million in 2011 to £770 million by 2020 (Figure 5-3). There would be a marginal decrease in the GVA contribution in the development phase and a 30% increase in the contribution of the construction phase; however, three quarters of the growth comes from operations and maintenance phase, as installed capacity increased from 4.5GW to 13GW.

Figure 5-3: Direct & Supply Chain GVA Scenario 13GW, UK Market Share (£m)



In scenario 15GW the GVA grows by two-thirds between 2011 and 2020 to £913 million (Figure 5-4). All phases would contribute to GVA growth. GVA growth from the construction phase would account for a third of the growth, with most of that occurring between 2012 and 2014 before levelling out at this higher level until 2020. The operations and maintenance GVA would continue to grow as new capacity becomes operational and would be responsible for more than 60% of the GVA growth in the sector between 2011 and 2020.

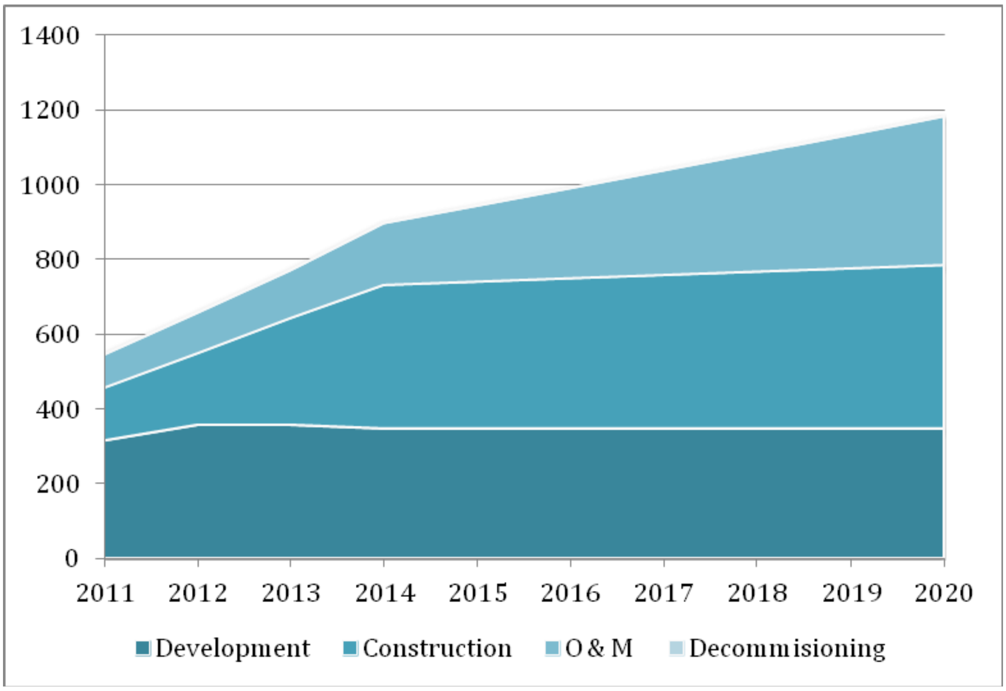
Figure 5-4: Direct & Supply Chain GVA Scenario 15GW, UK Market Share (£m)



In scenario 19GW the GVA would more than double on 2011 levels to almost £1.2 billion by 2020 (Figure 5-4). All phases would contribute to GVA growth. Both the construction and operations and maintenance phases would contribute just under half of the overall sector growth.

Compared with 2011, construction GVA would double and by 2020 and operations and maintenance GVA would be almost three and a half times 2011 levels.

Figure 5-5: Direct & Supply Chain GVA Scenario 19GW, UK Market Share (£m)



The GVA contributions at the local and regional/national level for each of the scenarios for 2020 are summarised in Table 5-7.

Table 5-7: Direct & Supply Chain GVA 2020 by Locality

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Local	84.2	117.9	123.3	168.6	234.0
Region/Nation	277.3	305.9	427.3	538.7	727.4
UK	547.8	579.7	769.6	913.2	1,183.1

5.5 Summary of 2020 Direct & Supply Chain Impacts

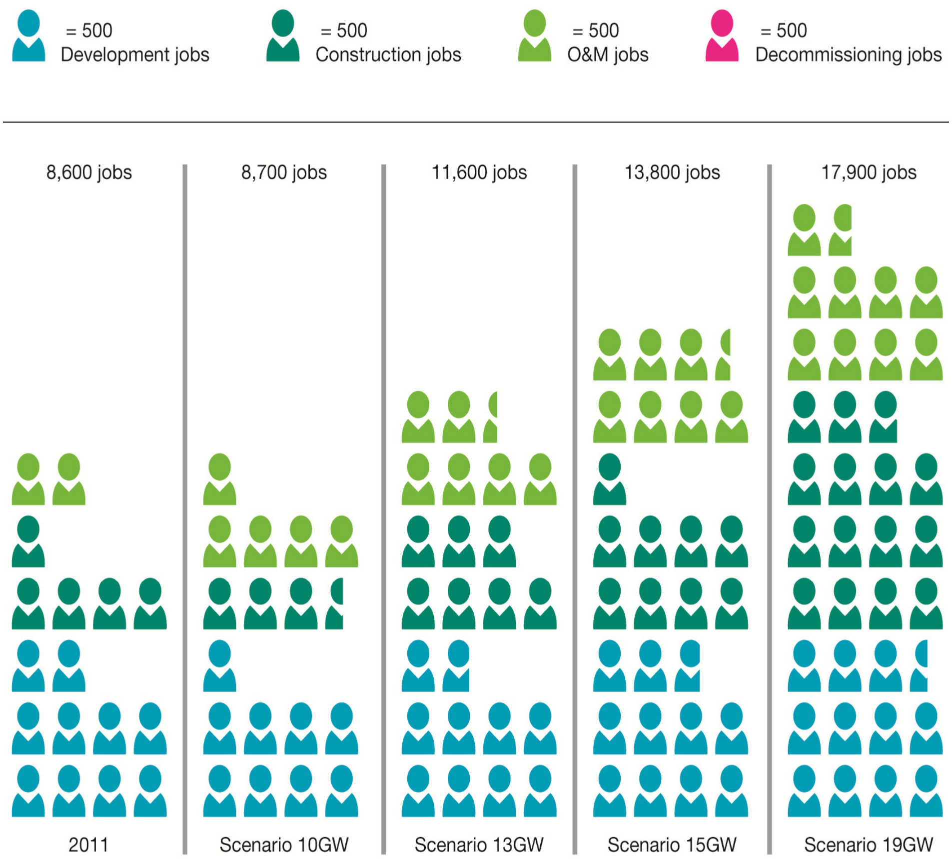
The total direct and supply chain economic impacts of the scenarios in 2020 are summarised in Table 5-8 and in Figure 5-6 and compared to the levels in 2011, demonstrating the substantial growth potential of the onshore wind sector. Overall this shows growth on 2011 economic impact (expressed in terms of jobs directly supported by the sector and in the supply chain) by 2020 of:

- scenario 10GW: 1%;
- scenario 13GW: 34%;
- scenario 15GW: 59%; and
- scenario 19GW: 108%.

Table 5-8: Summary of 2020 UK Direct & Supply Chain Impacts by Scenario

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Jobs	8,640	8,689	11,612	13,771	17,935
Jobs % change on 2011	*-*	*1%*	*34%*	*59%*	*108%*
Turnover (£m)	1,118.4	1,212.7	1,678.9	2,017.2	2,700.0
GVA (£m)	547.8	579.7	769.6	913.2	1,183.1

Figure 5-6: Future Direct & Supply Chain Employment Impacts by Scenario



For comparative purposes, the scenarios have also been run, but with no increases in UK market share assumed (Table 5-9) which demonstrates that:

- Scenario 13GW – market share growth assumptions add further 3% growth to jobs supported in UK (in addition to growth of 30% on 2011 associated with increased deployment of onshore wind energy capacity);
- Scenario 15GW – market share growth assumptions add further 5% growth to jobs supported in UK (in addition to growth of 52% on 2011 associated with increased deployment of onshore wind energy capacity); and

- Scenario 19GW – market share growth assumptions add further 10% growth to jobs supported in UK (in addition to growth of 89% on 2011 associated with increased deployment of onshore wind energy capacity).

Table 5-9: Summary of 2020 UK Direct & Supply Chain Economic Impacts by Scenario (with No Increase in Market Share)

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Jobs	8,640	8,689	11,257	13,116	16,324
Jobs % change on 2011	-	*1%*	*30%*	*52%*	*89%*
Turnover (£m)	1,118.4	1,212.7	1,623.1	1,906.3	2,437.0
GVA (£m)	547.8	579.7	748.7	870.0	1,082.5

6 Wider Impacts

In addition to providing direct and supply chain employment and generating GVA, the onshore wind sector supports activity in the UK economy and in the regions and localities in which wind energy projects are based in a wide range of other ways. This chapter highlights the wider economic impacts of the onshore wind sector in the UK, based on information gathered from the case studies and during the consultation programme.

The wider impacts include:

- local and regional supply chain development at Tier 2 and beyond;
- income effect;
- impacts on land owners;
- community ownership and investment in wind energy projects;
- community benefit funds;
- tourism economy effects;
- wildlife and habitat management; and
- investment in local infrastructure.

In addition to the wider impacts discussed in this chapter, the onshore wind sector also contributes taxation receipts including non domestic rates and national business and employment taxes. These exchequer impacts are considered in Chapter 7.

6.1 Local and Regional Supply Chain Development

The economic impact of the onshore wind sector in the UK depends on the proportion of work that is secured by UK based businesses and the extent to which this impact occurs at the local or regional level[15] depends on the location of the businesses involved in the supply chain. The greater the value of contracts secured by local and regional businesses, the bigger the local and regional impact of a project will be.

Maximising local and regional impacts is not only beneficial for the communities in which wind farm projects are located but also for the developer investing in the project. Benefits to the developer are likely to include reduced transportation costs and environmental impact due to supplies being sources closer to the site.

The importance of developing the local and regional supply chain to wind farm developers is illustrated by Scottish and Southern Energy's decision to invest in the wind turbine tower manufacturing and assembly plant in Argyll. It is also illustrated by the willingness of many wind farm developers to work with local authorities and economic development agencies to identify opportunities for local and regional suppliers, for example by participating in meet the buyer events.

Consultations undertaken as part of this study also confirm businesses commitment to securing supplies and components from UK based businesses

[15] Here 'local and regional' refers to local regional and devolved nations (i.e. Northern Ireland, Wales and Scotland)

where possible. Hewlett for example, a civil engineering company that specialises in wind farm construction, generally purchases non-specialised supplies such as concrete and bricks as close to the site as possible in order to minimise transportation costs.

6.2 Income Effect

There are currently around 8,600 jobs in the onshore wind sector, which could rise to up to 17,900 in 2020 (under scenario 19GW). The average salary in the sectors active in the onshore wind industry has been estimated at around £35,000[16]. This compares well to earnings in the economy as a whole; gross median annual earnings in 2011 were £26,100[17].

This implies that total salaries received by employees in the sector is currently around £300 million, which could rise to up to £670 million in 2020 (under scenario 19GW). It has been assumed that 95% of these salaries were spent in the UK. The spending of salaries by employees in the onshore wind sector represents turnover in businesses where employees spent wages. In order to estimate the economic impact this is converted into GVA using a turnover to GVA ratio[18] and converted into employment using a turnover to employment ratio[19].

This calculation produces an estimated £85 million GVA impact from businesses where employees spent their wages, supporting an estimated 2,400 jobs. The future impact could range from £90 million GVA and 2,500 jobs to £192 million and 5,400 jobs, depending on future deployment scenarios (Table 6-1).

Table 6-1: Economic Impact of Income Effect, UK

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
GVA (£ million)	85	90	122	145	192
Jobs (ftes)	2,423	2,541	3,450	4,118	5,433

6.3 Impacts on Land Owners

The economic impact on the owner of the land depends on how the land is used by the wind farm i.e. is land owned by the developer, has the developer bought the land or is the land rented by the developer. It also depends on the landowners' business objectives. Benefits for businesses include:

- energy management – some landowners look to wind energy development to help manage their energy consumption. For example the University of St Andrews has recently applied for permission to develop a small wind farm in Fife that will help to reduce the University's energy costs and improve its financial performance;
- greening the business – many companies develop onshore wind energy in order to meet their aims of being green. For example, Mackie's of Scotland's vision is "to become the greenest company in Britain". As part

[16] ONS, *Business Register and Employment Survey 2010,* BiGGAR Economics analysis of relevant sectors; relevant sectors and their proportionate contribution to employment in the onshore wind sector based on data from case studies
[17] ONS, 2011 Annual Survey of Hours and Earnings
[18] ONS, *Annual Business Survey 2010,* BiGGAR Economics analysis of Sections A-S
[19] ONS, *Annual Business Survey 2010,* BiGGAR Economics analysis of Sections A-S

of this the business has three wind turbines on its premises, which are prominently featured as part of the design of the packaging on Mackie's Ice Cream; and .

- business diversification – land owners have used the development of wind farms to diversify their businesses and therefore support the rest of their operations. This was the driver for projects as varied as Clyde Wind Farm and the Methlick Farmers Wind Energy project.

6.4 Community Ownership and Investment in Wind Energy

There are many models of community management and ownership. The main two types involved in ownership of wind farms are co-operatives and community development trusts.

6.4.1 Community Ownership Example

Many of the islands in Orkney have challenges in maintaining a sustainable community, particularly in terms of depopulation and aging population and many of the islands have a Community Development Trust, tasked to deal with the issue. Jobs and economic development are key to creating social sustainability and many Trusts have taken forward community owned onshore wind projects. As well as the benefits arising from the energy generation and the associated income and the jobs supported during construction, the projects can have a wider role in community development since they require community consensus in order for the project to be given the go ahead.

There are a variety of co-operatives including the Energy4All family of co-operatives, which has seven renewable energy co-ops, three in England and four in Scotland. Energy4All was formed in 2002 in response to enquiries received by Baywind Co-operative from people looking to replicate the model. Baywind Co-operative currently has 1,300 shareholders (of whom 29% live in Cumbria or Lancashire). It provides a financial return to shareholders of around 7% per annum.

Another example of a community owned wind farm is the turbine erected by Bro Dyfi Community Renewables (BDCR), a community energy cooperative established in 2001 to develop community owned renewable energy projects in the Dyfi Valley area in Wales. The cooperative raised part of the funding for the turbine from a share offer and in return, shareholders now receive an annual dividend. In addition, 30% of BDCR's profits go to a community energy fund, which is used to fund energy efficiency measures within the Dyfi Valley area. Further details about the BDCR project are included as a case study.

6.5 Community Benefit Funds

There are a wide range of models for community benefit funding, where the owner of the wind farm distributes funding to be used for community projects, usually on an annual basis and often related to the scale or production of a wind farm.

Organisations that administer such funds include organisations specifically set up to do so, local authorities, community councils and specialist community fund management organisations.

The community benefit funds will improve quality of life by supporting investment in community projects. However, they can also generate economic impacts by creating jobs relating to the administration and management of the income and as a result of the projects themselves. This would include, for example, supporting construction jobs where an investment is made in a community facility or supporting jobs in the social economy where local charitable organisations receive support.

The size of community benefit funds found in the case studies varied significantly depending on the model of community benefit used and on other commitments made by developers and so it is not possible to quantify the total impact of community benefit for the sector as a whole. However, it seems possible that community benefit fund could support hundreds of jobs, often in rural communities, as the capacity of onshore wind increases in the decade to 2020.

6.6 Tourism Economy Effects

The tourism sector is a key sector of the UK economy and objectors to wind farm cite negative impacts to tourism as an example of the negative economic impact a wind farm can have. However, there has been no evidence of actual negative impacts on tourism and recent research by VisitScotland[20] has confirmed earlier research that found that the presence of wind farms had no influence on decision making of the vast majority of tourists.

Onshore wind farms can have wider positive impacts on tourism. In rural areas, tourism is often one of the key sectors and therefore crucial to economic development and prosperity. Wind farm projects can be used to improve tourism infrastructure, for example funding (either directly or via community benefit funds) improvements to path networks, improvements to tourism attractions and the creation of tourism facilities.

6.6.1 Local Services Used (Onshore Wind Business Tourism)

Another impact wind farms have on tourism is through the spending of workers when they visit wind farms and stay away from home. This will benefit accommodation, food and drink providers. This occurs at all stages of the wind farm life cycle: from the community consultation to construction and operation and maintenance.

During the case study research three projects were able to provide examples of what the magnitude of this impact could be, in terms of numbers of workers visiting an area, time spent in the area and levels of spending. Based on this information and the scale of the case study projects it was estimated that for every MW constructed £7,500 is spent in the local area on accommodation and on food and drink.

Applying this to the MW under construction for 2011 and for the 2020 scenarios provides an estimate of the total spend in the sector and employment has been estimated by applying a turnover to employment ratio[21].

The increase in the turnover of businesses local to wind farm developments where workers spend money due to being on-site and working away from home in 2011 is estimated to be £11 million, which could support around 300 jobs in the tourism accommodation sector. In the future this could range from £8 million to £27 million, supporting between 200 and 800 jobs, depending on the scale of deployment to 2020.

[20] VisitScotland, *Windfarm Consumer Research*, April 2012
[21] ONS, *Annual Business Survey 2010,* BiGGAR Economics analysis of Section I

Table 6-2: Local Services Used (Business Tourism)

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Local businesses turnover (£m)	11	8	14	18	27
Employment supported (ftes)	301	217	396	510	757

6.6.2 Visitor Services

There are examples of wind farm visitor centres being created, providing information on the wind farm itself and on other tourism facilities and attractions. This includes Whitelee wind farm which has a visitor centre that has a café, shop, learning hub and exhibition centre. The visitor centre is run by Glasgow Science Centre, hosts educational visits and provides bus tours of the wind farm. In its first year of opening it attracted 120,000 visitors.

Some wind farms are also listed on tourism websites. For example Altahullion wind farm is listed on the regional tourism's body website,[22] the national tourism website[23] and the borough council's tourism section of its website[24]. Sheringham Shoal Wind Farm's visitor centre is listed on the local tourism website[25].

6.6.3 Access to Countryside

The construction of a wind farm can result in the creation of new access tracks. Sometimes these are left after the construction phase in order for the local residents to use them to access the countryside for walking, horse riding and mountain biking. For example Whitelee farm has over 70km of trails as a result of the additional tracks added to the area during construction including trails for the disabled. In order to encourage the use of the area for outdoor activities a Whitelee Countryside Ranger Service was set up.

6.7 Wildlife and Habitat Management and Enhancement

Many wind farms have habitat management and enhancement schemes. For example Scottish Power Renewables has developed habitat management plans for its wind farms and is therefore responsible for habitat management areas covering 8,201 hectares. The habitat schemes have encouraged Golden Eagle breeding in Kintyre, increased Black Grouse populations at projects in Argyll as well as protecting rare types of habitat.

Scout Moor and the surrounding moorland spans two locally designated sites of nature conservation importance. Prior to the development of the wind farm, the moorland has suffered major damage and loss and its ability to support flora and fauna has been significantly reduced. The moorland supports a wide range of habitats including blanket bog, dry and wet heathland and acid grassland. The wind farm provides for a fund for a habitat enhancement plan worth £500,000.

Another way the environment has been improved is through the setting up of a local habitat management group. For example a local habitat management group was established at Little Cheyne Court Farm as part of the consent for the wind

[22] www.sperrinstourism.com/activities/walking/viewdetails.asp?ID=27 Accessed 5th April 2012
[23] www.discovernorthernireland.com/Altahullion-Wind-Farm-Dungiven-Londonderry-Derry-P15074 Accessed 5th April 2012
[24] www.limavady.gov.uk/visiting/attractions/14/ Accessed 5th April 2012
[25] www.experiencesheringham.com/page.php?page_id=73 Accessed 5th April 2012

farm and includes representatives from Natural England the Royal Society for the Protection of Birds. RWE npower renewables has provided the group with £450,000 to carry out surveys including of birds and water voles. An example of an activity carried out is the work being done to turn the wind farm into a suitable habitat for the short haired bumble bee which is being reintroduced to the Dungeness area as it is thought to be extinct in the UK.

Whitelee visitor centre also contributes to wildlife and habitat management by hosting RSPB Information Officer, in particular due to the presence of kestrels[26].

6.8 Investment in Local Infrastructure

Section 106 (S106) of the Town and Country Planning Act 1990 allows a local planning authority (LPA) in England and Wales to enter into a legally-binding agreement or planning obligation with a landowner in association with the granting of planning permission. The obligation is termed a Section 106 Agreement. The equivalent in Scotland is the new Sections 75 to 75G of the Town and Country Planning (Scotland) Act 1997 together with two new regulations, the Town and Country Planning (Modification and Discharge of Planning Obligations) (Scotland) Regulations 2010 and the Town and Country Planning (Modification and Discharge of Good Neighbour Agreement) (Scotland) Regulations 2010, came into force. The equivalent in Northern Ireland is Article 40 Planning Agreement.

These agreements are a way of delivering or addressing matters that are necessary to make a development acceptable in planning terms. This can be done by reducing the impact the project may have on the local area of to undertake or to contribute to the provision of services and infrastructure that benefit the local area such as education and health facilities and roads. These agreements can deliver additional local infrastructure to an area.

[26] www.rspb.org.uk/datewithnature/308892-whitelee-kestrels Accessed 5th April 2012

7 Exchequer Impacts

The economic impact of the onshore wind sector will also generate benefits for the exchequer since the companies working in the sector pay a range of local and national taxes.

7.1 Approach

There are difficulties in measuring the taxation benefits of the sector accurately since taxes are not paid on specific projects but on overall revenue, profitability, property ownership, salaries and activities. It is therefore not possible for companies in the sector to identify taxes paid on individual onshore wind projects (with the exception of site specific taxes such as non-domestic rates).

However, it is possible to estimate the scale of the exchequer impacts on the basis of the taxes that might be expected relative to the levels of turnover and employment associated with the sector. The most useful source for such information is an annual survey undertaken by PriceWaterhouseCoopers of the Total Tax Contributions Report of members of the FTSE 100[27] since this contains a comprehensive review of taxes paid and borne. The group represents 7% of the UK workforce and pays tax equivalent to 13% of the UK Government receipts. The companies who were surveyed had a UK turnover of £513.6 billion and employed 1.9 million people. The average salary in this group was £46,000 in 2011. The amount of tax paid under each category is displayed below in Table 7-1 along with appropriate multipliers from turnover and employment.

Table 7-1: Tax Paid and Multipliers of Hundred Group 2011

	Amount (£m)	Multiplier
Taxes Borne		
Corporation Tax	9,077	1.77% of turnover
Employer National Insurance	5,364	£2,823 per employee
Irrecoverable VAT	2,464	0.48% of turnover
Other[28]	874	0.17% of turnover
Sub Total	*17,779*	
Taxes Collected		
Income Tax	11,417	£6,009 per employee
Employee National Insurance	3,252	£1,711 per employee
Other[29]	20,234	3.94% of turnover
Sub Total	*34,903*	
Business Rates	3,461	
Combined Total	**56,143**	

Source: PWC, Total Tax Contribution, Surveying the Hundred Group, 2012

[27] PwC, Total Tax Contribution Surveying the Hundred Group, 2012
[28] Excluding Petroleum Revenue Tax, Betting and Gaming Tax Bank Payroll Tax and Business Rates.
[29] Excluding Tobacco Duty and Alcohol Duty

7.2 Current Exchequer Impacts

The above multipliers can be applied to the current economic contribution of the onshore wind sector in the UK to estimate its current exchequer impact.

The average salary in the onshore wind industry is estimated at £34,613[30]. This is 75% of the average salary of £46,000 in the Hundred Group. Assuming the per employee exchequer impacts for the onshore wind industry are 75% of the impacts for the Hundred Group, we can apply the multipliers to the current and future scenarios to obtain an estimate of the impact that the industry will have on the exchequer. The average business rates from the case studies have been calculated to be £13,000 per MW installed, based on information gathered during the case study research.

Applying these multipliers to the level of turnover, employment and installed capacity in 2011 gives the total tax paid by the onshore wind industry as £198 million. This includes £59 million in business rates.

These taxes only include those borne and collected by the onshore wind sector and so include taxes associated with downstream activity such as the distribution and sale of the electricity generated.

Table 7-2: Summary of Exchequer Impacts for 2011 (£m)

	Onshore wind tax payments
Taxes Borne	
Corporation Tax	19.8
Employer National Insurance	18.4
Irrecoverable VAT	5.4
Other	1.9
Sub Total	*45.4*
Taxes Collected	
Income Tax	39.1
Employee National Insurance	11.1
Other	44.1
Sub Total	*94.3*
Business Rates	58.7
Combined Total	**198.3**

7.3 Future Exchequer Impacts

The same multipliers can be applied to the future scenarios as described in the previous chapter. The different scenarios have different numbers ratios of people working in each of the sectors of industry. As a result of this the anticipated average salary is slightly different between scenarios and therefore the percentages of the Hundred Group employee exchequer impacts are different.

[30] ONS, *Business Register and Employment Survey 2010,* BiGGAR Economics analysis of relevant sectors

Table 7-3: Estimated Average Salaries

	2011	Scenario 10GW 2020	Scenario 13GW 2020	Scenario 15GW 2020	Scenario 19GW 2020
Average Salary	£34,613	£36,094	£36,680	£36,917	£37,394
% of Hundred Group	75%	78%	80%	80%	81%

The results of this are summarised in Table 7-4. By 2020, the exchequer impact of the sector could increase to:

- £279 million, including £130 million in non-domestic rates (scenario 10GW);
- £373 million, including £169 million in non-domestic rates (scenario 13GW);
- £438 million, including £194 million in non-domestic rates (scenario 15GW);
- £572 million, including £247 million in non-domestic rates (scenario 19GW).

Table 7-4: Summary of Exchequer Impacts for 2020 by Scenario (£m)

	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Taxes borne				
Corporation Tax	21.4	29.7	35.7	47.7
Employer National Insurance	19.2	26.1	31.2	41.2
Irrecoverable VAT	5.8	8.1	9.7	13.0
Other	2.1	2.9	3.4	4.6
Sub Total	*48.6*	*66.7*	*80.0*	*106.4*
Taxes Collected				
Income Tax	41.0	55.6	66.4	87.6
Employee National Insurance	11.7	15.8	18.9	25.0
Other	47.8	66.1	79.5	106.4
Sub Total	*100.4*	*137.6*	*164.8*	*218.9*
Business Rates	130.0	169.0	193.6	247.0
Combined Total	**279.0**	**373.4**	**438.3**	**572.4**

7.4 Non-domestic Rates in England

The Local Government Finance Bill, in the later stages of the Parliamentary process at the time of writing, provides for non-domestic rates being retained by local authorities in England. The estimated non-domestic rates paid by the onshore wind sector in England in 2011 was £12 million and this could rise to between £27 million and £52 million by 2020, depending on the deployment scenario.

8 Summary of Employment Impacts

Taking the direct and supply chain economic impacts (detailed in Chapters 4 and 5) and the quantifiable wider economic impacts (detailed in Chapter 6) together, gives a total quantifiable employment impact of 11,400 in 2011. By 2020 the total quantifiable employment impact could be:

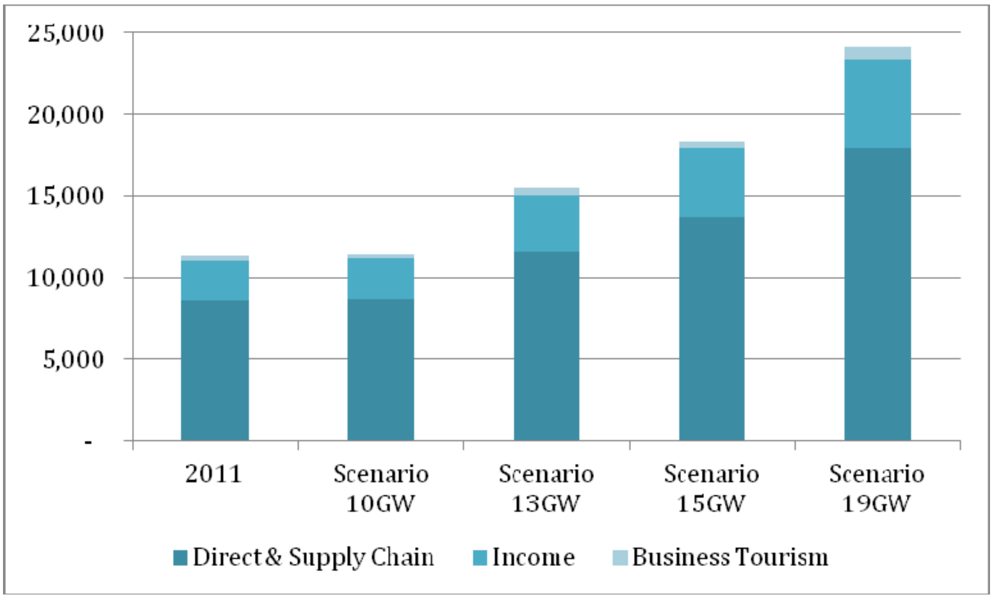
- 11,400 (scenario 10GW);
- 15,500 (scenario 13GW), an increase of 36% on 2011;
- 18,400 (scenario 15GW), an increase of 62% on 2011;
- 24,100 (scenario 19GW), an increase of 112% on 2011.

This is summarised in Table 8-1 and Figure 8-1.

Table 8-1: Summary of Quantifiable Employment Impacts

	2011	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Direct & Supply Chain	8,640	8,689	11,612	13,771	17,935
Income Effect	2,423	2,541	3,450	4,118	5,433
Business Tourism	301	217	396	510	757
Total	**11,363**	**11,446**	**15,459**	**18,399**	**24,125**
Change on 2011	-	*1%*	*36%*	*62%*	*112%*

Figure 8-1: Summary of Quantifiable Employment Impacts



Appendix A
Methodology

9 Appendix A – Methodology

9.1 Approach

The first stage in this research was to review existing information on the economic impact of the onshore wind sector in the UK. This review considered previous reports published by RenewableUK and DECC. The RenewableUK Wind Energy Database was also considered during the literature review in order to gather information about current and planned deployment. The literature review is summarised in Appendix B.

Before commencing this research, it was anticipated that the economic impact of onshore wind could vary significantly between projects so a case study approach was adopted to try and capture this variation. The case studies were selected to reflect the diversity of projects across the UK from very small, community based single turbines to large projects of more than 50MW and include projects from each UK nation. For each case study, detailed information was sought about the total investment costs at each stage of the project (development, construction, operation and maintenance and decommissioning) and how this was allocated between different contractors around the UK and elsewhere, as well as details of wider indirect impacts.

The case studies were complemented by a wider consultation programme with companies that are part of the supply chain for the UK onshore wind sector. These consultations were undertaken to provide insight into the wider economic impacts of the onshore wind sector in the UK and about how much of the supply chain has been secured by UK companies. A range of companies were consulted covering the full range of activity across the sector, from steel production and tower and turbine manufacturing to transportation, civil engineering and on-going site maintenance. The types of company consulted ranged from multinational corporations to highly specialised UK based manufacturers of electronic and mechanical components. A list of those consulted is provided at Appendix C.

The next stage of the research was to use the information gathered to estimate the total impact of the onshore wind sector in the UK. This was done using an economic model that was based on an approach used by BiGGAR Economics to estimate the impact of numerous individual wind farms across the UK. The analysis has been based on data gathered from the case study projects on the level of expenditure required during each phase of the project, the breakdown of this expenditure into its main components and the proportion of this work secured, locally, regionally and nationally.

The next stage of the research was to consider the wider economic benefits and economic linkages of the onshore wind sector in the UK. This was done based on information gathered for the case studies, during the consultations and from BiGGAR Economics previous experience of the sector.

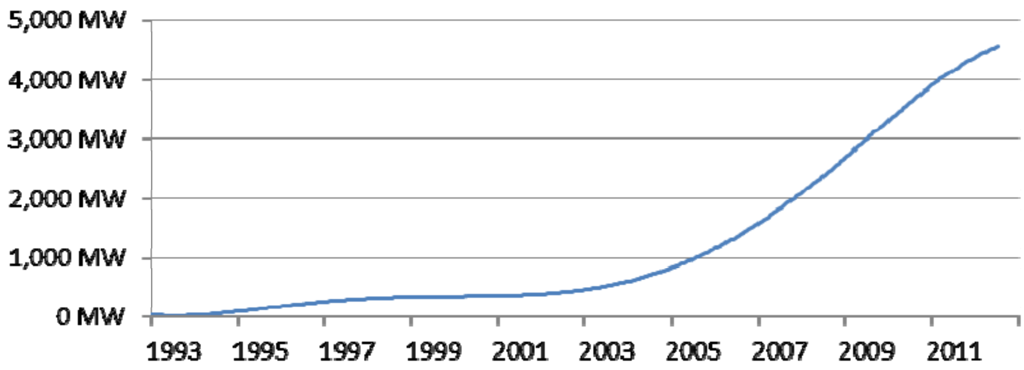
The final stage of this research was to consider how the economic impact of the onshore wind sector in the UK might change between now and 2020. This was done by considering what the impact of the sector might be under four different deployment scenarios. The deployment scenarios, three of which were based on the Renewable Energy Road Map published by DECC in 2011 and one of which was based in the National Renewable Energy Action Plan published by DECC in 2010, assume that by 2020 installed onshore wind capacity across the UK will increase to 10GW, 13GW, 15GW or 19GW.

9.2 Current and Planned Capacity

RenewableUK has maintained a database of all the commercial wind energy installations in the UK. This gives information about the wind farm sites that are operational, under construction, consented (but not yet under construction) and in planning.

The wind energy industry has grown since it's beginnings in the early 1990s and has seen rapid growth in the UK since 2005 (Figure 9-1). The installed capacity of onshore wind farms in January 2012 was 4.5GW.

Figure 9-1: Installed onshore wind in the UK since 1993



Source: RenewableUK Onshore Wind Database

In addition to the January 2012 4.5GW installed capacity of onshore wind farms, a further 4.0GW has been approved but has not been built and connected yet and 1.4GW was under construction as of January 2012. There are also a further 7.7GW of projects going through the planning stages.

The majority of the installed and proposed developments are based in Scotland, which currently has 61% of the installed capacity for the UK. England has 21% and Wales and Northern Ireland both have 9%.

The largest contributor to the installed capacity figures is expected come from large wind farms that have over 50MW in capacity. There are currently 17 of these sites connected to the grid and 39 in planning.

The most numerous sites are in the 5-20MW range. There are currently over 107 of these sites that are operational and there are a further 222 sites in the pipeline: 6 in under construction, 104 that have consent and 112 in planning. These sites currently make up 25% of the total UK capacity.

The case study research was designed to be as representative of the current and potential future UK onshore wind sector as possible.

9.3 Case Studies

Initial approaches were made to 27 wind farm projects across the UK. These projects were selected to provide a sample of projects that would be 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, the wider region or elsewhere in the UK. Eighteen of the projects approached provided information for the draft report and these are listed in Table 9-1.

Table 9-1: Case studies undertaken by BiGGAR Economics

Name	Location	Turbines	Capacity (MW)
An Suidhe	Scotland	23	19.3
Arecleoch	Scotland	60	120.0
Bro Dyfi Community Turbine	Wales	1	0.5
Burnfoot Hill	Scotland	13	26.0
Castle Pill Farm	Wales	4	3.2
Clyde	Scotland	152	349.6
Crystal Rig II	Scotland	61	138.0
Curryfree	Northern Ireland	6	15.0
Dalswinton	Scotland	16	30.0
Ferndale	Wales	8	6.4
Gordonbush	Scotland	36	71.8
Hazlehead	England	3	6.0
Little Cheyne Court	England	26	59.8
Marr	England	8	6.0
Methlick Farmers Wind Energy	Scotland	4	9.2
Ore Brae	Scotland	1	0.9
Scout Moor	England	26	65.0
Westmill	England	5	6.5

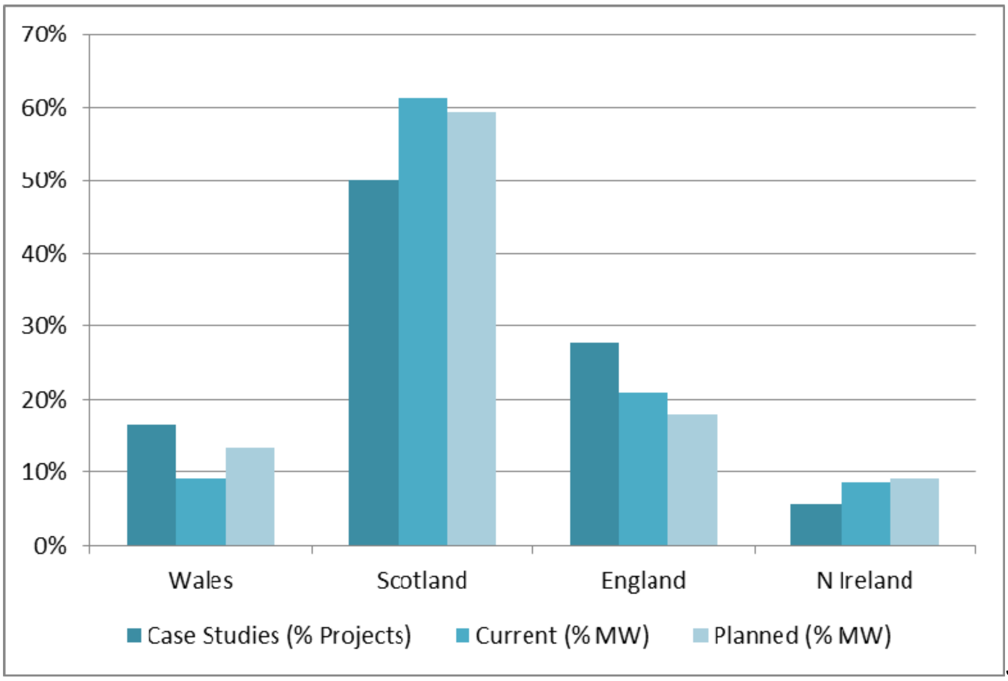
Source: BiGGAR Economics

9.3.1 Location of Case Studies

Nine (50%) of the case studies are in Scotland, five (28%) are in England, three (17%) are in Wales and one (6%) is in Northern Ireland. At present, 61% of the UK's total installed capacity is located in Scotland, 21% is in England, 9% is in Wales and 9% is in Northern Ireland.

A breakdown of the case studies by location, compared to actual and planned installed capacity across the UK is provided in Figure 9-2.

Figure 9-2 - Case studies by location



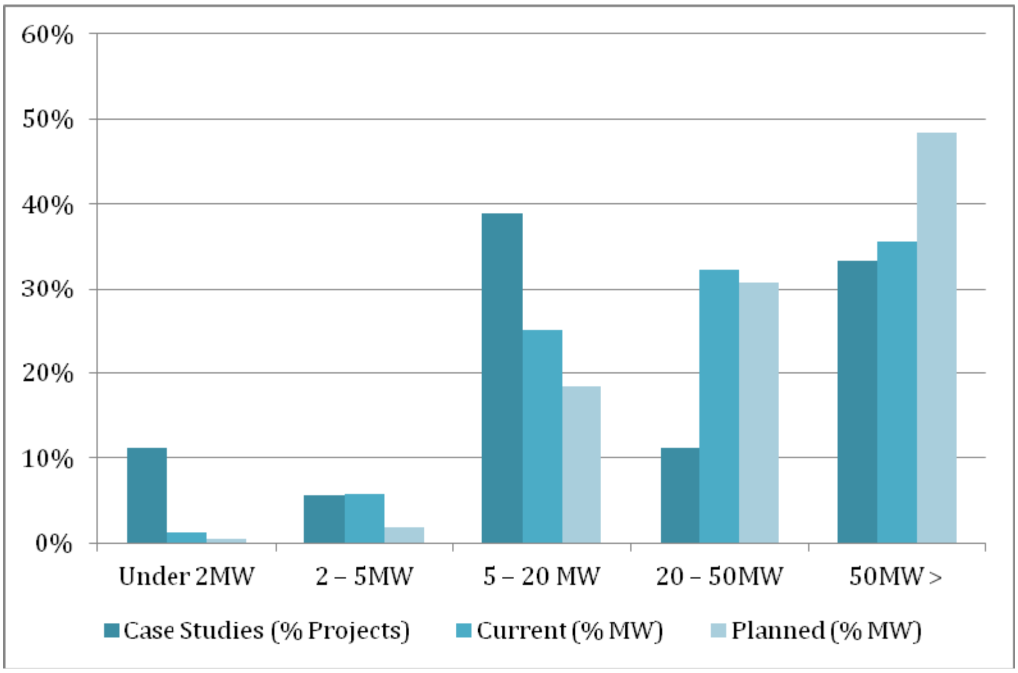
Source: BiGGAR Economics

9.3.2 Size of Case Studies

Two (11%) of the case studies are of small projects of less than two MW, one (6%) of the case studies is a project of between two and five MW, seven (39%) are of projects of between five and 20 MW, two projects (11%) are between 20 and 50MW and the other 6 projects (33%) are all over 50MW. Across the UK at the moment, 1% of installed capacity is within smallest project range of less than 2 MW, 6% is in 2-5MW projects, 25% is in 5-20MW projects, 32% is in 20-50 MW projects and 36% is from largest project range.

A breakdown of the case studies by size, compared to actual and planned installed capacity in projects of various sizes across the UK is provided in Figure 9-3.

Figure 9-3 - Case studies by size of project

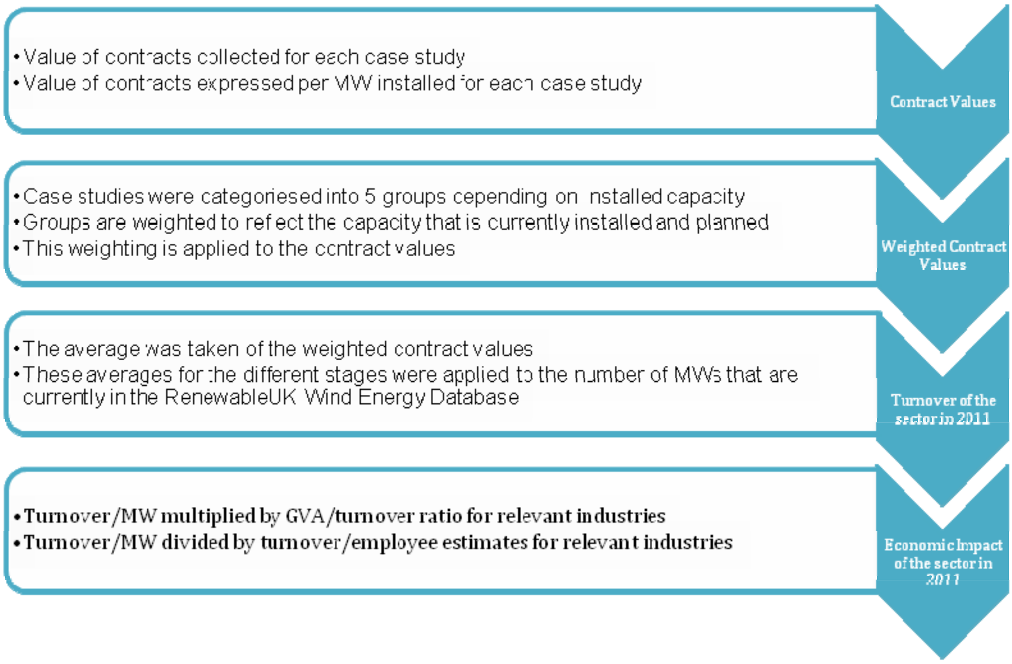


Source: BiGGAR Economics

9.4 Current Direct and Supply Chain Economic Impact: Approach to Analysis

Analysing the data obtained from the case studies involved four main steps. First it was necessary to calculate the value of investment made at each stage of the case study projects, and then to adjust the data from the case studies to ensure that it was representative of actual and planned deployment across the UK. This data was then used to calculate the total turnover of the sector in 2011, which was then used to estimate the GVA and jobs supported by the sector in 2011. This process is summarised in Figure 9-4 and described below.

Figure 9-4: Direct & Supply Chain Economic Impact in 2011 Methodology Summary



9.4.1 Contract Values

The first step in analysing the information provided about the case study projects was to compile all of the data received into a standard format. The value of each contract was then divided by the installed capacity of the associated wind farm to obtain a value for the amount of investment made per MW for each type of contract. This enabled comparisons to be made directly across all the case studies.

9.4.2 Weighted Contract Values

The case studies included sites of varying sizes so it was necessary to weight the contract values to ensure that they were representative of the actual and planned installed capacity across the UK. To do this, the sites were first categorised into 5 groups depending on their installed capacity. These categories were under 2MW, 2-5MW, 5-20MW, 20-50MW and above 50MW. The next step was to calculate the proportion of all operational and planned capacity across the UK that fall into each of these categories.

The weighting of each of the groups was then calculated by dividing the proportion of actual (operational and planned) installed capacity in each category by the proportion of case study projects in each category (i.e. by dividing row 2 of Table 9-2 by row 1).

Table 9-2: Weighitng of case studies

	< 2MW	2-5MW	5-20MW	20-50MW	50MW+
% of case studies	11.1%	5.6%	38.9%	11.1%	33.3%
% MW in Wind Energy Database	0.8%	2.9%	20.1%	31.1%	45.1%
Weighting	0.07	0.52	0.57	2.80	1.35

Source: BiGGAR Economics and RenewableUK Onshore Wind Database

9.4.3 Turnover of Sector in 2011

The weightings were then applied to the data provided by each of the case study projects to obtain weighted estimates of the amount of investment/MW at each stage of the wind farm life cycle. An average for each stage of the wind farm life cycle was then calculated using the weighted data for each project.

The next step was to establish how many MW of onshore capacity are currently installed or in the development pipeline across the UK. This was done by consulting the RenewableUK Wind Energy Database. The weighted average contract values were then applied to the total number of MW in planning, construction and operation across the UK in order to obtain an estimate of the total turnover of the sector for 2011.

9.4.4 Direct and Supply Chain Economic Impact of Sector in 2011

In order to estimate the economic impact of the sector it was necessary to estimate how much GVA and how many jobs will be supported by the turnover of the sector. This was done by applying GVA/turnover ratios and estimates of the amount of turnover generated per employee in relevant sectors. The GVA of the sector was calculated by multiplying turnover/MW by a GVA/turnover ratio for the industries involved in each stage in the project lifecycle. Employment was estimated by dividing turnover/MW by an estimate of the turnover/employee in industries involved in each stage of the life cycle. The GVA/turnover ratios and turnover/employee estimates were both obtained from the UK Annual Business Survey 2010.

9.5 Future Economic Impact: Approach to Analysis

In January 2012, the installed capacity of operational onshore wind farms across the UK was 4.5GW. The RenewableUK wind energy database suggests that, after taking account of projects currently under construction or in pre-construction phases, there will be 6.4 GW of installed onshore wind capacity across the UK by 2013. The impact of the sector after will however depend on future levels of deployment. The study considers four potential scenarios:

- Scenario 10GW is that there will be 10.0GW of installed onshore wind capacity across the UK by 2020, an increase of 5.5GW from the 2011 level;
- Scenario 13GW is that there will be 13.0GW of installed onshore wind capacity across the UK by 2020, an increase of 8.5GW from the 2011 level;
- Scenario 15GW is that there will be 14.89GW of installed onshore wind capacity across the UK by 2020, an increase of 10.4GW from the 2011 level; and
- Scenario 19GW is that there will be 19.0GW of installed onshore wind capacity across the UK by 2020, an increase of 14.5GW from the 2011 level.

Three of the scenarios (10GW, 13GW and 19GW) are the same as those adopted in the Renewable Energy Roadmap published by DECC in 2011[31] and the other is from the National Renewable Energy Action Plan[32].

[31] Department of Energy and Climate Change, UK Renewable Energy Roadmap, 2011
[32] Department of Energy and Climate Change, National Renewable Energy Action Plan for the United Kingdom, 2010.

The economic impact of each of the three scenarios was calculated by applying the same method as for the 2011 baseline economic impact calculations.

In addition, the study considered the impact that would be associated with an increase in the UK market share, since the greater the installed capacity the greater the opportunity for UK companies to enter the sector or expand and the greater the likelihood that companies from other countries will increase their UK presence. The assumptions on increased market share for each of the scenarios are summarised in the table below. The scenario analysis was also undertaken on the basis of no increase in market share.

Table 9-3: Increases in market share for each scenario

	Scenario 10GW	Scenario 13GW	Scenario 15GW	Scenario 19GW
Development				
Local	0%	1%	1%	2.5%
Region/Nation	0%	2.5%	2.5%	5%
UK	0%	0%	0%	0%
Construction				
Local	0%	1%	1%	2.5%
Region/Nation	0%	2.5%	2.5%	5%
UK	0%	5%	5%	10%
Operations				
Local	0%	1%	1%	2.5%
Region/Nation	0%	2.5%	2.5%	5%
UK	0%	5%	5%	5%

Source: BiGGAR Economics assumption

9.6 Consultations

In addition to the case studies, this study also involved a programme of consultations with businesses engaged in the onshore wind supply chain. Consultations were undertaken with a wide variety of businesses including manufacturers of turbines, turbine towers and electrical components to companies involved in civil engineering, transportation and wind turbine maintenance.

The outputs from the consultation programme are incorporated in Chapter 3, which describes the activity that occurs at each stage of the wind farm lifecycle and the type of businesses engaged. The information provided by consultees was also compared with the information provided about the case study projects in order to test the robustness of the economic model described in Chapter 4.

9.7 Exchequer Impacts

In common with other sectors of the economy, companies in the onshore wind sector bear and collect a range of taxes. There are difficulties in measuring the taxation benefits of the sector accurately since taxes are not paid on specific projects but on overall revenue, profitability, property ownership, salaries and activities. It is therefore not possible for companies in the sector to identify taxes paid on individual onshore wind projects (with the exception of site specific taxes such as non-domestic rates).

However, it was possible to estimate the scale of the exchequer impacts on the basis of the taxes that might be expected relative to the levels of turnover and employment associated with the sector. The analysis has been based on information on taxes paid by companies from an annual survey undertaken by PricewaterhouseCoopers of the Total Tax Contributions Report of members of the FTSE 100[33].

[33] PwC, Total Tax Contribution Surveying the Hundred Group, 2012

Appendix B
Literature Review

10 Appendix B – Literature Review

There have been a number of previous reports on the wind energy industry in the UK and the reports that are most relevant to this study have been identified. These reports have been commissioned by regional and national trade bodies as well as government departments and consider the economic impacts that the industry has on different areas of the country, as well as the anticipated levels of deployment that may occur in the future.

10.1 Deployment Potential

10.1.1 DECC Roadmap

The DECC document *UK Renewable Energy Roadmap 2011*[34] sets out a range of potential scenarios for 2020; lower central range suggests there could be 10GW of onshore wind capacity installed, the upper central range suggests there could be 13GW installed and the high scenario, which includes industry input, suggests that there could be 19GW installed. The major actions that are proposed in the document to mitigate the challenges to deployment and being taken forward by Government are to minimise the investment risks, reform the planning system in England and Wales, overcome radar interference and ensure cost-effective grid connections and investment.

10.1.2 National Renewable Energy Action Plan

The *National Renewable Energy Action Plan*[35] published by DECC in 2010 includes a set of measures that would enable the UK to meet its 2020 renewable target and makes clear that the UK Government wants to go a lot further, building on its programme for government which set out a range of proposals to ensure that the UK goes as far as it can in exploiting it's renewable energy resources.

The document also provides an estimation of the total contribution (installed capacity, gross electricity generation) expected from each renewable energy technology in the UK to meet the binding 2020 targets. For onshore wind the installed capacity estimate for 2020 is 14,890MW.

10.1.3 European Wind Energy Association

The European Wind Energy Association (EWEA) represents the industry at the European level. It published its report *Pure Power* in 2009, which predicts the levels of wind power installed across Europe by 2020 for high and low capacity scenarios[36]. In the UK, the low scenario was 13GW installed by 2020 and in the high scenario the EWEA projects that the UK could have 14GW of onshore wind capacity installed. These scenarios were based on consultations with member organisations; with the low scenario based on the EWEA's conservative approach to future targets while the high scenario takes into account the targets of the EU's member states.

10.1.4 Arup Review

To support the RO Banding review, Arup was commissioned by DECC in 2010 to assess the opportunities and costs for deployment of renewable energy

[34] Department of Energy and Climate Change, UK Renewable Energy Roadmap, 2011
[35] Department of Energy and Climate Change, National Renewable Energy Action Plan for the United Kingdom, 2010.
[36] European Wind Energy Association, *Pure Power*, 2009

technologies in the United Kingdom. DECC published the *Review of the generation costs and deployment potential of renewable electricity technologies in the UK Study Report* in June 2011.

The Arup report sub-categorises onshore wind instalments, with farms larger than and smaller than 5MW treated separately[37]. The report highlights planning as the main constraint that will impact on the installed capacity of wind farms in the UK, as well as potential bottlenecks in the national grid. The report focuses on three scenarios for the deployment of onshore wind energy; the low scenario considers the possibilities if the current market constraints are not overcome; the medium scenario if some of the constraints are overcome and the high scenario if all of the constraints are overcome. The projections for installed capacity are detailed below in Table 10-1.

Table 10-1 - Arup's Projections for Installed Capacity by 2020

	Low	Medium	High
Total	10.2GW	11.4GW	14.7GW

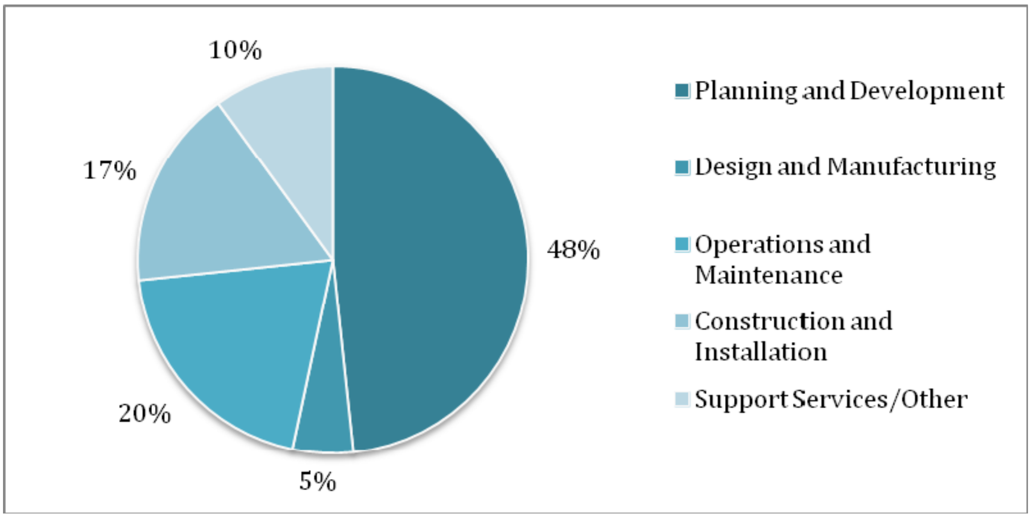
Source: Arup, Review of generation costs and deployment potential of renewable energy electricity technologies in the UK, 2011

10.2 Economic Impacts

10.2.1 RenewableUK Employment

RenewableUK considers the current state of employment within the onshore wind sector in the document *Working for Green Britain*[38]. It estimates that there are currently 6,000 full time equivalent employees in the UK's large-scale onshore wind sector. The sub-sector of the industry that accounts for the largest number of employees is planning and development, employing 2,900 while the operations and maintenance of the wind farms employs 1,200. This is the equivalent to one employee per 3MW installed.

Figure 10-1:Direct employment in onshore wind (2010)



Source: RenewableUK, Working for a Green Britain, 2011

[37] Arup, Review of generation costs and deployment potential of renewable electricity technologies in the UK, 2011
[38] RenewableUK, Working for a Green Britain, 2011

The operations and maintenance is predicted to be the fastest growing in RenewableUK's follow up document[39] that looks at the future prospects for jobs growth until 2021. The document projects the employment and capacity figures for 2021 as in Table 10-2. In all cases the growth in employment comes chiefly from the operations and maintenance sector, because this is related to the total installed capacity rather than the rate of deployment. However, the high case scenario also anticipates growth in the numbers employed in the manufacturing and design of the turbines, due to a modest revival in domestic manufacturing.

Table 10-2 – Employment projections April 2021

	Low	Medium	High
Installed Capacity	10GW	15GW	16GW
Direct Employment	6,500	10,300	11,900

Source: RenewableUK, Working for Green Britain Volume 2, 2011

10.3 Tourism Impacts

A number of surveys and reports have been published that aimed to assess the potential impacts of wind farms on tourism. The most comprehensive is the Moffat Report[40] commissioned by the Scottish Government and published in 2008. It finds that, based on a review of 40 studies from the UK and Ireland and reports from Denmark, Norway, the US, Australia, Sweden and Germany, there is no evidence to suggest a serious negative economic impact of wind farms on tourists.

The Moffat Report also include a survey of 380 people, undertaken at locations that maximised the likelihood that respondents would have seen a wind farm during their visit, which found that 75% of people felt that wind farms had a positive or neutral impact on the landscape.

The conclusion of the Moffat Report is that the effects of meeting targets on renewables on the possibility of meeting tourism impacts are so small that, provided planning and marketing are carried out effectively, there is no reason why the two are incompatible.

The findings of the Moffat Report have been confirmed by recent research by VisitScotland[41], which found that the presence of wind farms had no influence on decision making of the vast majority of tourists. Of the survey respondents, 77% of Scottish respondents and 67% of respondents from elsewhere in the UK had seen a wind farm while on a break on Scotland. However, 80% of survey respondents (and 83% of Scottish respondents) said that the presence of a wind farm would not affect their decision about where to visit or where to stay. Forty six percent of Scottish respondents and 40% of respondents said they would be interested in visiting a wind farm visitor centre.

[39] RenewableUK, Working for Green Britain Volume 2, 2011
[40] Scottish Government, *The Economic Impacts of Wind Farms on Tourism,* Moffat Centre, Glasgow Caledonian University, March 2008.
[41] VisitScotland, *Windfarm Consumer Research*, April 2012

10.4 Impacts in Other Countries

10.4.1 Impact in Canada

The impact of the onshore wind energy in the Canadian province of Ontario[42] was carried out to assess the Ontario Government's long-term energy plan. This energy plan aims to increase the level of installed wind capacity from 1.4GW to 7.1GW between 2011 and 2018. In achieving this, the wind sector in Ontario is expected to create 11,100 jobs by 2018 and generate $16.4 billion (approximately £10.5 billion) of investment. Ontario is expected to benefit from $8.5 billion of this investment and benefits from the domestic procurement requirements in the Feed in Tariff regulations. Similar to the UK documents the operations and maintenance benefits to Ontario will be the fastest growing.

There will be 14 person-years of employment in Ontario per MW installed of which 3.6 of them will be during the operations and maintenance phases. The document also anticipates that low levels of political support and significant problems with projects would lead to employment in the industry stagnating in 2016.

10.4.2 European Wind Energy Association Impact Study

In April 2012, the European Wind Energy Association published *Green Growth*[43], a study of the impact of wind energy on jobs and the economy. The report estimates that in 2010 the wind energy sector – both directly and indirectly – contributed €32.43 billion to the EU's Gross Domestic Product (GDP), 0.26% of the EU's total GDP for that year. Employment in the sector in the EU is estimated as 238,154.

The report notes that between 2007 and 2010 the wind energy sector increased its contribution to GDP by 33%. It states that the wind industry is growing faster than the EU's economy as a whole and that this will remain the case over the next two decades.

The report makes a number of projections for 2020 including that the wind industry will contribute €94.5 billion to EU GDP, an almost three-fold increase and that the number of jobs will increase to 520,000 by 2020, a rise of more than 200%.

[42] ClearSky Advisors Inc, the Economic Impacts of the Wind Energy Sector in Ontario 2011 – 2018, 2011
[43] European Wind Energy Association, *Green Growth*, April 2012

Appendix C
Consultees

11 Appendix C – Consultees

We are grateful for the assistance of the following organisations for providing information on which the analysis of the economic linkages within the onshore wind sector has been based.

- BGB Innovation;
- Collett Transport;
- GE Power Conversion;
- David Brown Gears;
- Enercon;
- EWT;
- Global Wind Alliance;
- Hewlett Civils;
- Mabey Bridge;
- Moog Insensys;
- Morrison Construction;
- Nordex;
- Siemens;
- Weir Group; and
- Windflow.

We are also grateful for the assistance of a number of onshore wind developers and operators for providing us with case study data. These include:

- Banks Renewables (Hazlehead and Marr);
- Bro Dyfi Community Renewables (Bro Dyfi Community Renewables II);
- Energy4All Ltd (Westmill);
- Fred Olsen Renewables (Crystal Rig II);
- Infinergy (Castle Pill Farm and Ferndale);
- Isle of Hoy Development Trust (Ore Brae);
- Methlick Farmers (Methlick Farmers Wind Energy Project);
- Peel Energy (Scout Moor);
- RES UK & Ireland Ltd and ESB Wind Development (UK) Ltd. (Curryfree)
- RWE npower Renewables (Little Cheyne Court and An Suidhe);
- Scottish Power Renewables (Arecleoch)
- SSE Renewables (Clyde, Gordonbush and Dalswinton);
- Wind Prospect and EDF Renewables (Burnfoot Hill).

Appendix D
Case Study Data Collected

12 Appendix D – Case Study Data Collected

BiGGAR Economics

<u>Data requirements</u>

1. Introduction

Renewable UK has commissioned BiGGAR Economics to undertake an assessment of the direct and indirect economic impacts of the onshore wind energy sector. The outputs from the work will be important in making the economic case for the onshore wind sector and demonstrating its current and future impact to the UK economy. Renewable UK and BiGGAR Economics are grateful for any assistance you can provide.

The data requirements as set out below, represent the information that we would ideally like and in a format that is intended to minimise the work required by companies in providing that data.

However, we would hope that much of the information we would like is readily available. We are conscious that many companies may well be suffering from 'consultation or survey fatigue' and we will be as flexible as possible in terms of our request for information. So if you don't have the information in the precise format we have asked for but have similar information in a different format, please just send us what you have.

If you have any questions please contact XXXXXX at BiGGAR Economics by telephone at XXXXXX or by email at XXXXXX

2. Details of the Wind Farm (to be completed by BiGGAR Economics)

Wind Farm Name	
Developer	
Operator (if different)	
Country/ Region	
Local Authority Area	
MW Capacity Installed	
Number of Turbines	
Turbine Manufacturer	
Main BOP Contractor	
Year that wind farm became operational	
Year that development process started	

3. Case Study Contacts (Name, organisation, email, telephone)

Developer initial contact	
Development contact	
Construction contact	
O&M contact	
BOP contact	
Turbine supplier contact	
Any other contacts	

4. Quantitative Data, Development

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Total Development Investment (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Project Management				
Legal & Financial				
Environmental Impact Assessment				
Other (please specify)				

5. Quantitative Data, Construction (Total)

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Total Construction Costs (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Turbines				
Balance of Plant				
Grid Connection				
Other (please specify)				

6. Quantitative Data, Construction (Turbine)

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Total Turbine Costs (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Tower Manufacturing				
Other Manufacturing				
Transport				
Assembly				
Other (please specify)				

7. Quantitative Data, Construction (Balance of Plant)

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Total BOP Costs (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Civil & Project Management				
Roads				
Substation buildings				
Turbine foundations & Hard standings				
Landscaping / Forestry / Fencing				
Mechanical & Electrical Installation				
Other (please specify)				

8. Quantitative Data, Construction (Grid Connection)

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Total Grid Connection (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Engineering services				
Construction				
Electrical components				
Industrial equipment & machinery				
Other (please specify)				

9. Quantitative Data, Operation and Maintenance

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Average Annual O&M Costs (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Turbine maintenance				
Site maintenance				
Operational management				
Land agreements				
Community Benefit				
Other (please specify)				

Note: will the operation and maintenance costs change when the turbine warranty period comes to an end? If so, please estimate how they might change:

		Proportion (%) or Value (£m) of work in:		
		Local	Region	UK
Average Annual O&M Costs (£m)				
Main categories of spend (£m or % of total and % or £m in local area, nation/region and UK)				
Turbine maintenance				
Site maintenance				
Operational management				
Land agreements				
Community Benefit				
Other (please specify)				

10. Quantitative Data, Decommissioning

Has any estimate been made of the decommissioning costs (in either total costs or costs per MW)?

11. Information on Indirect and Wider Impacts – we would like to discuss indirect and wider impacts with you. In particular, we are interested in:

- community benefit (value and model adopted) – any details of what has this supported would be welcome;
- direct investment in local infrastructure (e.g. local roads, bridges, ports);
- maintaining the viability of estates as a business and impact of this such as jobs, impact on tourism etc;
- maintaining the viability/increasing productivity of other organisations (for example offsetting energy bills);
- the windfarm itself attracting visitors;
- investment in facilities for visitors such as car parks, signs, interpretation panel, visitor centres, way markets, access management plans, employment of warden etc;
- any indirect investment in local facilities or infrastructure (e.g. where access to the countryside has been improved, encouraging outdoor leisure activities);

- preserving local habitat and supporting broader nature conservation such as employment of wildlife ranger etc;
- use of local services (e.g. local accommodation and business services);
- any measures taken to maximise the value of the local and regional supply chain and/or skills development;
- business rates paid.

12. Thank you

The information that is published will not contain data that would allow the value of individual contracts to be identified. However, the write up will include estimates of the total value of the investment and the economic impacts at the development, construction, operation and maintenance and decommissioning stages. If you have any concerns about the commercial confidentiality of the information provided, please highlight these, or discuss this with us.

Renewable UK and BiGGAR Economics are grateful for your contribution to this study. The study is due to be completed in late April 2012 and will subsequently be published on the Renewable UK website.

Appendix E
Consultation Issues

13 Appendix E – Consultation Issues

Aide Memoir
Renewable UK – economic impact of on-shore wind sector in the UK

Renewable UK has commissioned BiGGAR Economics to undertake an assessment of the direct and indirect economic impacts of the onshore wind energy sector. The outputs from the work will be important in making the economic case for the onshore wind sector and demonstrating its current and future impact to the UK economy.

As part of this study, BiGGAR Economics are undertaking a series of consultations with key members of the supply chain in the on-shore wind sector to gather information about the turnover generated and employment supported in various parts of the sector and linkages between different parts of the supply chain. Your input to this process is greatly appreciated.

For Companies

1. Company information
    a. Where is your company head-quartered?
    b. What are your key activities relating to the onshore wind sector?
    c. What estimated proportion of company activity is in the UK onshore wind sector market?
    d. What are your key sites?
    e. Why did you decide to locate in these (UK) locations?

2. Activity in UK
    a. Approximately what is the turnover of your company in the UK?
    b. How many people does your company employ in the UK?
    c. Approximately how much of this turnover relates to the on-shore wind sector?
    d. Approximately how much of this employment relates to the on-shore wind sector?
    e. How much do you spend on supplies as a % of the turnover obtained from on-shore wind sector?
    f. How important is the on-shore wind sector to your overall businesses (it's the only sector we work in/its our main sector/ business would not viable without it/supports the growth of our business/supports development of business in other sectors etc)?
    g. What investment have you made in the your wind turbine activities?

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h. Have you made investments in your wind turbine activities in other ways such as supporting skills training, or other things?
i. Where are your main regional areas of activity?

3. Supply Chain Information
    a. Who are your main suppliers and what do they do?
    b. Are these UK based?
    c. If not, who are your main UK suppliers?
    d. Do you have suppliers who rely significantly on business from you (i.e. if you didn't exist the supplier would be significantly affected)?
    e. Approximately how much do you spend on supplies from the UK?
    f. How important are locational factors when choosing suppliers?
    g. Are there opportunities for more of your supplies to be sourced from the UK?
    h. Where do these opportunities come from/what re the barriers from increasing sourcing from the UK

4. Future Plans
    a. Approximately how many other companies provide similar services?
    b. Are they all UK based?
    c. Who are your main competitors?
    d. Do you have any plans to expand or develop your activity in the UK on-shore wind sector in the future?
    e. How would this increase turnover/employment in the UK?
    f. What is this increase due to? (increased wind turbine construction in UK/increase export opportunities/greater competitiveness/increased share of supply chain taken up by UK suppliers/new products and services developed etc)
    g. Do your activities in the onshore wind sector impact on the development of other sectors/area of activities i.e offshore wind/other renewables/other?

5. Any further comments?

Appendix F
Case Studies

An Suidhe

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	19.3MW
Local Authority Area	Argyll and Bute
Number of Turbines	23

An Suidhe Wind Farm is located five miles west of Inveraray in Argyll. Construction started in January 2009 and it became operational in January 2011. An Suidhe is owned by RWE npower renewables which took control of developing the wind farm in 2005.

Economic Impact

Throughout all stages of the wind farm development, contracts were given to local companies. This included a contract, at the development stage, to an ecology consultant and also to an ornithology consultant. During the construction stage examples of the use of local businesses included the purchase of concrete, plant hire and tree felling, which benefitted two local businesses. In total 20% of the construction costs where spent in Scotland and 26% spent in the UK.

Community and Wider Impact

The model for the community benefit fund was chosen after a consultation process that included written feedback from five local organisations. This concluded that the area that the fund would primarily benefit would be communities within a 10km radius of the site. The fund would provide £28,500 annually (which would rise with inflation) and is administered by the Scottish Community Foundation. So far eight grants have been awarded including grants for the repair and improvement of a church, museum and village hall. The fund will have an economic impact through making these facilities more attractive and accessible to tourists. The fund will also have an impact through grants such as the one to assist the running costs of Cairndow Community Child Care.

Arecleoch

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	120MW
Local Authority Area	South Ayrshire
Number of Turbines	60

Arecleoch is located in South Ayrshire and has 60 wind turbines with a capacity of 120MW. It is owned by Scottish Power Renewables, which became part of Iberdrola in 2007, creating one of the largest electricity groups in Europe. Iberdrola is the world's largest wind energy developer with an operating portfolio of over 14,000 MW.

The planning application for Arecleoch was submitted in March 2006 after several years of design and development. The project was consented by Scottish Ministers in June 2008. Construction of the windfarm substation started in October 2008, and the main windfarm infrastructure in July2009 and the site became operational in 2011.

Source: www.scottsihpowerrenewables.com

Economic Impact

Arecleoch is one of Scotland's biggest wind farms and cost approximately £200 million to construct. At its peak, 260 workers were employed at the site, ranging from chainsaw operators and crane operators to bricklayers and joiners. The wind farm is located in a remote site and required a new 35km single span bridge over a railway line and 65km of access tracks. These tracks and the turbine foundations required around 600,000 cubic metres of rock to be excavated.

The site is located in a commercial forestry area and required one of the largest tree felling operations ever seen in the UK to clear the 618 hectares of trees. At its peak this made the site was the largest producer of raw timber in the UK.

Community and Wider Impact

The turbine components for the Arecleoch wind farm were delivered to the Port of Ayr, which secured jobs for local people during the construction phase.

Bro Dyfi Community Renewables Turbine

Wind Farm Case Study – May 2012

Operational Year	2010
MW Capacity	0.5MW
Local Authority Area	Powys County Council
Number of Turbines	1

Source: Bro Dyfi Community Renewables Website

Bro Dyfi Community Renewables (BDCR) is a community energy co-operative that was established in 2001 to develop community-owned renewable energy projects in the Dyfi Valley area in mid-Wales.

In 2003, BDCR erected a 75 kW wind turbine, with money raised from a share offer and in 2007 BDCR began work on a larger 0.5 MW turbine, which became operational in 2010. The second turbine was purchased second-hand using finance raised by a share offer and European funding secured through the Mid Wales Energy Agency and Ecodyfi, the local regeneration organisation for the Dyfi Valley.

Economic Impact

The project development cost for BDCR's second turbine was £16,000, with the vast majority of this being spent on an environmental impact assessment. Construction costs amounted to £59,000 and the total cost of the turbine was £102,000. On-going operations and maintenance costs for the turbine amount to around £10,500 per year and the contract for undertaking this work has been awarded to a local company, ensuring that much of the impact from on-going operations is retained in the local area.

Community and Wider Impact

After a sinking fund to cover decommissioning has been established, the BDCR cooperative will distribute all profits to shareholders. Ecodyfi is a substantial share-holder and will use any dividends it receives to improve energy efficiency and address energy poverty in the Dyfi Valley.

The BDCR projects have helped to strengthen community cohesion in the Dyfi Valley by providing a shared objective for local residents. Other than a part-time book-keeper, the BDCR cooperative is staffed entirely by volunteers. Some members of the management committee are also qualified to undertake first line maintenance on the turbine and undertake a lot of work for free.

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Burnfoot Hill

Wind Farm Case Study – May 2012

Operational Year	2010
MW Capacity	26MW
Local Authority Area	Clackmannanshire
Number of Turbines	13

Burnfoot Hill is a 13 turbine, 26MW wind farm in Clackmannanshire in Central Scotland. The wind farm was developed by Wind Prospect and is owned and operated by EDF Renewables. Planning applications relating to the site were submitted in the first half of 2006 and consent was granted in spring 2007.

Economic Impact

EDF Energy Renewables develops, builds and operates wind farms throughout the UK and Wind Prospect has a well-established development and engineering office in Edinburgh. The construction of Burnfoot Hill Wind Farm was managed by EDF Energy Renewables and Wind Prospect's engineering team acted as owner's engineer. REPower supplied and installed the turbines, which was project managed from their Edinburgh office. Local contractors secured work in areas such as balance of plant, construction and fencing, while contractors from other areas made extensive use of local services, such as local tourism accommodation, while working on site.

Community and Wider Impact

Revenue generated from Burnfoot Hill Wind Farm has been used to support the Ochils Landscape Partnership (OLP), a £2.26 million portfolio of small projects (currently 22), which provide long-term social, economic and environmental benefits for the area. The objectives of the scheme are to conserve the area's built, social and natural heritage with opportunities for local people to learn and participate in the work. The wind farm provides more than 50% of the OLP's funding, with £0.5 million having already been contributed to get a number of projects up and running. This funding has also allowed the OLP to secure matched funding from other sources.

Projects include "Wee Bit Hill and Glen" (a programme to promote, celebrate and enhance access to the Ochil Hills); "By The Banks of the Devon" (a programme to the enhance, promote and conserve the River Devon); and "The Hills of Time" (a programme that promotes the cultural, social and industrial heritage of the area). Wind Prospect and EDF Energy Renewables will also be participating in the first annual Ochils Festival, by providing educational opportunities focusing on renewable energy and climate change.

Castle Pill Farm

Wind Farm Case Study – May 2012

Operational Year	2009
MW Capacity	3.2MW
Local Authority Area	Pembrokeshire
Number of Turbines	4

Source: EWT

In 2004 Infinergy installed a single 0.5MW wind turbine at Castle Pill Farm, near Milford Haven in south west Wales. In 2009, three new 0.9MW turbines were installed on the site, increasing installed capacity to 3.2MW. The EWT direct-drive turbine, where no gearbox is required in the hub, was selected for the site to address concerns about noise.

Economic Impact

Although Infinergy is a subsidiary of company based in the Netherlands, 90% of the project development work was undertaken in the UK. The turbines were purchased from EWT, which is also based in the Netherlands, but around 20% of the turbine contract benefitted companies in the UK economy. In particular, the turbine towers were manufactured in Scotland.

The balance of plant works were all undertaken by UK-based organisations. The lead contractor was Hampshire-based Raymond Brown, which has delivered a number of similar contracts for onshore wind farm projects throughout the UK, but more than half of the balance of plant work was undertaken by Welsh companies.

Almost all of the work during the operation and maintenance stage will be undertaken by Welsh companies, including many local contractors.

Community and Wider Impact

Infinergy, was established in the Netherlands but has set up a UK headquarters in Dorset. It is anticipated that this direct employment in the local economy will contribute to the development of a new hub of innovative businesses in the Milford Haven area, supporting a £13 million investment in the Technium project, which aims to target the energy sector.

Other local benefits include the payment of business rates.

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Clyde

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	349.6MW
Local Authority Area	South Lanarkshire
Number of Turbines	152

Clyde Wind Farm is in rural South Lanarkshire, near the source of the River Clyde, on either side of the M74, the main motorway between Scotland and England. It started as a project undertaken in the late 1990s by the son of a local upland hill farmer into farm diversification opportunities.

The project identified the potential of the farm and neighbouring farms for a wind energy project. A number of wind farm developers were approached to consider the site and Airtricity (Airtricity became part of SSE Renewables) began the process of assessing its feasibility in 2001, submitting a planning application in 2003. After a public inquiry, the 152 turbine wind farm was consented by Scottish Ministers in 2008. Construction started in June 2009 and the first phase started generating in May 2011.

Economic Impact

In addition to SSE itself, other major contractors on the construction of Clyde Wind Farm have included Blackwells, Hanson, Morgan Est, National Grid (Scottish Power Networks), Siemens and Kier. Based on an analysis of these main contractors, a total of around £118 million of work has been undertaken with companies either located within Scotland or with a significant Scottish regional office. This includes estimated £13 million undertaken by companies from South Lanarkshire and £95 million by companies from elsewhere in Scotland.

Community and Wider Impact

Clyde Wind Farm has been developed in sparsely populated rural South Lanarkshire and so the community benefit funding, administered by South Lanarkshire Council, valued at around £1 million per annum, is expected to have a significant impact on local social economy organisations. The fund opened to applications in the autumn of 2011 and a wide range of applications is expected from local organisations. One potential project is from a group developing a new museum to attract more tourists to the area. As part of a planning agreement, the company also committed to investing in the local roads used to access the site and has sponsored the local rugby club.

Crystal Rig II

Wind Farm Case Study – May 2012

Operational Year	2010
MW Capacity	138MW
Local Authority Area	Scottish Borders
Number of Turbines	61

Crystal Rig Wind Farm consists of 25 turbines and is located on the Lammermuir Hills approximately 40 km east of Edinburgh. When Crystal Rig commenced operation in October 2003 it was the largest (onshore) wind farm in Scotland. Permission was then sought to erect 61 further turbines to the west of the existing site.

Consent was received in 2005 and the extended site began operating in 2010. The installed capacity of Crystal Rig II is 138 MW. Both sites were developed and continue to be operated by Fred Olsen Renewables.

Economic Impact

The total construction cost of Crystal Rig 11 amounted to £168 million of which approximately two thirds was spent on the turbines. The on-going operational and maintenance costs associated with the site are £6.7 million per year. This includes £0.5 million for site maintenance which is retained in Scotland.

Community and Wider Impact

Fred Olsen contributes to a community benefit fund, which is used to enable communities around the site to carry out improvements to their local area. At present, around £142,000 per year is distributed in this way and this is index linked to inflation. A wide variety of projects have been supported through the community benefit fund, including a community Christmas concert, a children's theatre show, a local walking festival and an adult learners, guide. Funding has also been used to purchase playground equipment for a local primary school and a fishing boat for the community.

Curryfree

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	15MW
Local Authority Area	County L'Derry District
Number of Turbines	6

Source: Renewable Energy Systems (RES)

Curryfree is owned by ESB Wind Development Ltd. UK, a subsidiary of Irish utility ESB and developed by RES, an international renewable energy developer. Curryfree is located south of Drumahoe and north of Donemana. Planning permission was given in 2008 and the wind farm became operational in 2011.

Economic Impact

All of the money spent in the development of the project was spent in the UK and the environmental impact assessment contract was carried out in Northern Ireland. Almost half of the construction costs was spent in Northern Ireland.

Community and Wider Impact

A community benefit fund has been established. The fund is open to local non-profit making organisations or charities whose registered office or main place of business falls within a radius of six kilometres from the Curryfree Wind Farm. The fund prioritises capital projects and projects of community, education, health, environmental or sporting benefit.

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Dalswinton

Wind Farm Case Study – May 2012

Operational Year	2008
MW Capacity	30MW
Local Authority Area	Dumfries and Galloway
Number of Turbines	15

Dalswinton Wind Farm is a 30 MW wind farm around 10 miles north of Dumfries in the South of Scotland. The site, which consists of 15 REpower MM82 turbines, was developed by Airtricity, the Dublin headquartered renewable energy developer and operator.

The planning application for the site was submitted in 2005 and approved by Dumfries and Galloway Council in December 2006. Construction started in March 2007, the site became operational in June 2008 and was officially opened by the Scottish Energy Minister in October 2008.

During the construction period Airtricity became part of SSE Renewables. In 2011, SSE sold Dalswinton to Infinis as part of a £173.6 million transaction. Infinis was set up by Terra Firma, a private equity group that owns several UK wind farms.

Source: Wind Hoist Limited

Economic Impact

During the development stage, Airtricity worked with Scottish Enterprise to maximise the local impact of the construction of the wind farm, participating in studies to identify the local supply chain opportunities and events to brief local companies on the nature of the opportunities and the procurement procedures. Several local businesses received support to ensure they could meet the health and safety and other regulatory requirements for procurement. Many have since become established in the onshore wind construction sector, working locally in the South of Scotland and increasingly on projects elsewhere in the UK.

The construction costs included balance of plant, civil and electrical engineering contracts worth more than £8 million. All of these were secured by UK companies, most of which were based or had substantial operations in the South of Scotland.

The operation and maintenance of the site is contracted to SSE and REpower has a 5-year maintenance contract for the turbines. A 15-year power purchase agreement is in place.

Community and Wider Impact

The indirect economic impacts of the project include those associated with a habitat management plan, which includes 50 hectares of heather planting.

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Ferndale

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	6.4MW
Local Authority Area	Rhondda Cynon Taff
Number of Turbines	8

Ferndale Wind Farm was developed by Infinergy at Mynydd Tyntyla, between Ferndale and Ystrad, in the Rhondda Valleys of South Wales. The wind farm consists of eight 0.8MW Enercon E-48 turbines, providing an installed capacity of 6.4MW. Planning permission was granted in April 2005, following an appeal process that lasted two years. Construction started in March 2010 and was completed in the summer of 2011.


Source: Infinergy

Economic Impact

Although the turbines were manufactured in the Germany, UK economic impact was significant because turbine transport and assembly, balance of plant contracts and grid connection works were all undertaken by UK contractors. Contracts secured by UK companies amounted to almost £3 million, which was around a third of the total capital investment costs.

The great majority of the operation and maintenance work, which could total £5-6 million over the 25 year operational life of the project, is also being undertaken by UK companies. When the construction and operation and maintenance contracts are taken together, more than half of them will be undertaken by UK organisations.

A significant proportion of the contracts secured by UK organisations have been awarded to Welsh companies. The total direct impact on the Welsh economy of the construction and operation and maintenance phases will be in excess of £7 million, equivalent to £1.1 million per MW. The expenditure of those employed directly on the project will also support further indirect employment.

Community and Wider Impact

The project has delivered direct local economic impacts by increasing the sustainability of the landowner's rural business.

Gordonbush

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	71.8MW
Local Authority Area	Sutherland
Number of Turbines	35

The construction of SSE Renewables' 35-turbine, 71.75MW Gordonbush Wind Farm near Brora in the Scottish Highlands began in autumn 2010 and was commissioned in March 2012. The project involved a lengthy development phase with the initial planning application submitted in June 2003 and consent being granted in April 2008.


Source: Gordonbush community newsletter, Rod Crawford

Economic Impact

Although the turbines were made in Germany, transporting them to the site created jobs in local ports and haulage companies. The parts for the turbines required 280 return lorry journeys between Invergordon Harbour and the site, which were timed to minimise disruption to local communities.

SSE Renewables invested £100 million in the Gordonbush wind farm and many of the larger contracts were awarded to local businesses. For example, the lead balance of plant contractor was RJ Macleod, which is headquartered in Glasgow and has a large regional office in Dingwall, in the Highlands. The work undertaken at Gordonbush included 22.2 km of new roads, 12 km of upgraded roads and 48,000 square metres of hardstandings.

Community and Wider Impact

Onshore wind farm developments have contributed to SSE becoming one of the largest employers in the Scottish Highlands with an estimated 1,800 direct and indirect employees. The critical mass of projects, in hydro power and grid upgrading as well as onshore wind has meant that long-term opportunities have been created in construction as well as in operation and maintenance.

Hazlehead

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	6MW
Local Authority Area	Barnsley
Number of Turbines	3

Hazlehead Wind Farm consists of three turbines on formerly derelict brownfield land between the villages of Crow Edge and Carlecotes in South Yorkshire. It has an installed capacity of 6MW and became operational in 2011. The project was developed by Banks Renewables, part of Banks Group based in the North East of England.

Economic Impact

The total capital cost of Hazlehead wind farm was almost £10 million, including more than £1 million of development costs, all of which was secured by UK businesses, a third of which were based in the Yorkshire and Humber region. The turbine contract accounted for more than half of the investment and 20% of the associated supply chain was within the UK. The balance of plant contract was the next biggest part of the project and was mostly undertaken by UK businesses.

UK suppliers secured 55% of the construction expenditure associated with Hazlehead. The economic impact of the operations and maintenance phase will be even more significant for the UK economy, with around £15 million in work to be undertaken over the 25 year operational period.

Source: www.banksgroup.co.uk

Community and Wider Impact

Banks Renewables will contribute £150,000 to a community fund over the lifetime of the wind farm and is engaging with local people about how it will be administered.

In December 2011 the wind farm hosted a visit of around 50 primary school children. During the visit staff from Banks Renewables explained how the wind farm was built and how electricity is generated and transmitted. This helped to bring the environmental topics studied by the children that term to life.

Little Cheyne Court

Wind Farm Case Study – May 2012

Operational Year	2009
MW Capacity	59.8MW
Local Authority Area	Kent
Number of Turbines	26

Little Cheyne Court is situated near the coast and the Kent and East Sussex border in an area known as the Romney Marsh. There are 26 turbines with a capacity of 59.8 MW. The developer and operator is RWE npower Renewables. The wind farm became operational in 2009 after seven years in development.

Economic Impact

The development and construction of Little Cheyne Court is estimated to have supported 101 jobs in the region and 127 jobs in the UK.

Community and Wider Impact

The community benefit fund was worth in £66,500 in 2011 and over the life of Little Cheyne Court it will invest £1.2 million into the local economy. A panel of local community members makes decisions about grants and Kent and Sussex Community Foundations administer it. In 2011 31 grants were given. This refurbished community buildings such as churches, day centres, memorial halls and visitor centres. Events including the New Romney Country Fayre and an open-air concert took place. CARM, a charity that supports older and vulnerable people living in the area was supported. A service was also created to support young people not in employment, education or training, helping them to take the next step into these activities.

In addition a local habitat management group, which includes representatives from Natural England and the RSPB. RWE npower Renewables has provided the group with £450,000.

Marr

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	8MW
Local Authority Area	Doncaster
Number of Turbines	4

Source: www.cheethamhillconstruction.co.uk

Marr Hill Wind farm is located in the Doncaster Metropolitan Borough Council Area and is owned by Banks Renewables.

Economic Impact

The balance of plant contract was undertaken by Cheetham Hill Construction Ltd, a company located in the North of England that historically was involved in water and sewage works and civil engineering works. The company employs 170 staff. The pressure of the recession means that they are constantly looking for new opportunities. This was given to them in 2011 when they secured their first wind farm balance of plant contract for Marr. This is their first contract in the renewable energy sector.

Many of the subcontractors for the contract where from the local and regional area. Subcontractors from Doncaster included roofers, cleaners, scaffolders, site security and plasters. Firms in Doncaster also benefited from the purchase of supplies such as aggregates and other construction materials. In total 26% of the balance of plant spend went to firms in the local area and 57% of the spend was in the region (Yorkshire and Humberside).

Of the remaining construction contracts most of the grid connection costs occurred in the UK along with 28% of the turbine costs. Half of this was spent on turbine towers from Mabey Bridge and the remaining half was split between transport and assembly.

Community and Wider Impact

As well as creating local impact through creating jobs locally and supporting jobs in local companies through the use of local suppliers, Marr has also established a community benefit fund.

Methlick Farmers

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	9.2MW
Local Authority Area	Aberdeenshire
Number of Turbines	4

The Methlick Farmers Wind Energy project is based on three farms in the Methlick and Oldmeldrum areas of Aberdeenshire. The project was initiated and developed by the farmers on whose farms the turbines have been installed (Ernie Lee and John Lind). Orkney Sustainable Energy Limited worked with the farmers, initially advising on project feasibility and then on project design.

An initial planning application and environmental statements were submitted in August 2006. Planning permission was given in June 2009 and the four Enercon E70 wind turbines, each rated at 2.3MW (giving a total installed capacity of 9.2MW), started generating in the early summer of 2011.


Source: Methlick Farmers

Economic Impact

All of the development phase and the grid connection phase of the project occurred in the UK. Most of the balance of plant activity occurred in the UK, while 12% of the turbine costs occurred in the UK. The economic impact of these activities was estimated as 31 jobs. The farmers set up an operational company to manage the operation and maintenance of the wind farm. The power generated has been contracted for sale in a five-year power purchase agreement with Marks & Spencer. This agreement helped the farmers secure bank borrowing for the project.

Community and Wider Impact

The project followed the example of other farm-based onshore wind energy projects in Aberdeenshire, which are conceived as a farm diversification project. Therefore as well as generating economic impact directly during construction and operation, it generates impact by securing the viability of the existing farm businesses and by generating revenue for investment in other business opportunities. This includes possible further investment in onshore wind.

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Ore Brae

Wind Farm Case Study – May 2012

Operational Year	2011
MW Capacity	0.9MW
Local Authority Area	Orkney
Number of Turbines	1

The Island of Hoy, part of the Orkney Islands has a population of around 400 and is known for its birdlife and natural beauty. In common with many of the islands in Orkney it has challenges in maintaining a sustainable community and has a Community Development Trust – the Isle of Hoy Development Trust – to deal with this issue.

The trust has set up a trading company, Hoy Energy Ltd, to operate the Ore Brae project, which is a 67m high 0.9MW wind turbine that was handed over to the community in November 2011. The funding for the project was raised via a 90% loan from the Co-op. The remaining 10% was raised from grants.

Economic Impact

There are two main sources of economic impact from this project. The first is the creation of employment. The development and construction of the project has supported seven jobs in the Orkney Islands, mostly from the balance of plant contract undertaken by an Orcardian company, Heddle Construction. This expertise exists due to the many onshore wind projects that have taken place in Orkney. This particular company is now becoming involved with the marine renewable sector including work at the European Marine Energy Centre which is a test and research centre for wave and tidal power development in an area with one of the highest marine energy potentials in Europe.


Source: Hoy Energy Ltd

On the island three part time jobs have been supported for the administrative and technical support of the turbine. In addition, five directors of Hoy Energy Ltd, of which four are island residents receive a small annual income. In total this will inject £40,000 into the local economy. These figures may seem small but in communities such as these, they are vital for sustaining the population.

Community and Wider Impact

The second source of economic impact is the operating income it provides to the community which will be used on projects which will develop and sustain the island. This income is through a community benefit fund which will be created by the Island of Hoy Development Trust. It will receive a minimum of 50% of the operating surplus of the turbine project. The remaining 50% will be spent on long-term maintenance and ultimately for a 'follow on project' to provide for the community in the longer term.

Scout Moor

Wind Farm Case Study – May 2012

Operational Year	2008
MW Capacity	65MW
Local Authority Area	Lancashire/Bury/Rochdale
Number of Turbines	26

Scout Moor wind farm has 26 wind turbines and is situated on open moorland between the village of Edenfield, Lancashire, and the town of Rochdale, Greater Manchester.

It is owned by Peel Energy and HG Capital. It became operational in 2008 after a seven year development process. It has a capacity of 65 MW.

Economic Impact

The development and construction of Scout Moor supported an estimated 208 jobs in the UK, 61 jobs were at the development stage, 96 resulting from the balance of plant and 50 from grid connection. A further economic impact will occur due to the business rate paid, which is currently £650,000 per annum.

Community and Wider Impact

Scout Moor and the surrounding moorland spans two locally designated sites of nature conservation importance. Prior to the development of the wind farm, the moorland habitat had suffered major damage and loss and its ability to support flora and fauna had been significantly reduced. The wind farm provides for a habitat enhancement plan fund worth £500,000.

There has been anecdotal evidence that the legacy of improved access to Scout Moor left by the construction of the wind farm has resulted in greater usage of this recreational asset by local residents who both walk and cycle across the moor.

Peel Energy also organise school visits to talk about renewable energy and to discuss jobs in the wind sector with sixth formers.

Rochdale is famous as the place where the prototype of the modern co-operative society was created. The plans for an extension to Scout Moor include a proposal to create a co-operative ownership scheme for individuals and community groups to obtain a stake and return on investment on the wind farm. This is in addition to a proposed community benefit fund.

Westmill

Wind Farm Case Study – May 2012

Operational Year	2008
MW Capacity	6.5MW
Local Authority Area	South Oxfordshire
Number of Turbines	5

Westmill wind farm is a community owned facility built on the site of an old airfield near Watchfield, South Oxfordshire. The farm consists of five 49 metre towers with an installed capacity of 6.5 MW.

The wind farm is owned by the Westmill Co-op, which was established in 2004 and now has 2,374 members. The Co-op was founded with the aim of giving local people an opportunity to invest in the production of renewable energy. The co-op managed to raise £4.6 million through a share issue and fundraising campaign and supplemented this with a bank loan from the Co-Op Bank.

The project development process for Westmill began in 1998 and the site became operational in 2008. Westmill was the first wind farm to be constructed in the South East of England and the first 100% community owned scheme in the UK.

Economic Impact

Initial development work for the project cost almost £0.5 million. All of this was retained in the UK with almost half retained in the South East of England and 8% was retained in the local area.

The total construction costs of Westmill wind farm amounted to £8 million. Construction began in July 2007 with initial work, valued at £1.4 million, being undertaken by a UK-based contractor. Around 10% of the value of this initial work was retained in the local area. The turbines were connected to the national grid at a cost of £0.6 million, all of which was retained within the South East of England.

Community and Wider Impact

The Westmill Sustainable Energy Trust is an established charity associated with the Westmill wind farm. The Trust receives 0.5% of the annual revenues of the wind farm (approximately £5,000-£6,000/year) which it uses to encourage and promote the deployment of sustainable energy in the local area. To achieve this, the Trust organises visits to the site, educational projects for local schools and maintains a website about the wind farm.

BiGGAR Economics

This report has been produced by BiGGAR Economics for DECC and RenewableUK.

Our vision is of renewable energy playing a leading role in powering the UK.

RenewableUK is the UK's leading renewable energy trade association, specialising in onshore wind, offshore wind and wave & tidal energy. Formed in 1978, we have an established, large corporate membership ranging from small independent companies, to large international corporations and manufacturers.

Acting as a central point of information and a united, representative voice for our membership, we conduct research; find solutions; organise events, facilitate business development, lobby and promote wind and marine renewables to government, industry, the media and the public.

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The Department of Energy and Climate Change (DECC) was created in October 2008, to bring together energy policy (previously with BERR, which is now BIS - the Department for Business, Innovation and Skills), and climate change mitigation policy (previously with Defra - the Department for Environment, Food and Rural Affairs).

DECC is a small department, with a big mission. Its vision is of a thriving, globally competitive, low carbon energy economy.

Its key priorities are to:

- Save energy with the Green Deal and support vulnerable consumers
- Deliver secure energy on the way to a low carbon energy future
- Drive ambitious action on climate change at home and abroad
- Manage our energy legacy.

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