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[D4_HOW03_Appendix 47_In_Principle_Monitoring_Plan_V3.0.pdf](#)
[D4_HOW03_Appendix 48_O2.9.3.pdf](#)

Dear Kay, K-J

Please find attached the 11th instalment of documents.

Best regards,
Dr Dominika Chalder PIEMA
Environment and Consent Manager



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Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three Offshore Wind Farm

Appendix 41 to Deadline 4 Submission
– Regeneris Consulting Report, 2015

Date: 15th January 2019

Hornsea 3
Offshore Wind Farm

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ECONOMICS • RESEARCH • ANALYSIS

Impact of DONG Energy
Investments in the Humber
Area

A Final Report by
Regeneris Consulting

DONG Energy

Impact of DONG Energy Investments in the Humber Area

November 2015

Regeneris Consulting Ltd
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Contents Page

Executive Summary	i
<hr/>	
1. Introduction	1
<hr/>	
2. Sustained Investment in the Humber	5
<hr/>	
3. Supporting Economic Impact & Employment	6
<hr/>	
4. Offshore Wind Supply Chain Development	7
<hr/>	
5. Boosting Skills Development	9
<hr/>	
6. Contributing to a Prosperous Future	10
<hr/>	

Executive Summary

- i. The city of Hull and the wider Humber region have faced significant challenges over recent decades. The overall economic picture has been one of economic decline, the loss of manufacturing, high unemployment, weak skills levels, and low population growth.
- ii. In recent years, the offshore wind industry has emerged as a major higher-value sector, providing the area with a new economic driver. The sector is at the heart of local strategic plans, with the Humber LEP recognising it as the number one economic opportunity for the region, and Hull aiming to become the 'leading UK Energy City'. To ensure the offshore wind sector brings sustainable economic benefit in the region, securing a series of investments over a longer period is critical.
- iii. DONG Energy's total investment in Humber offshore wind farms between 2013 and 2019 is expected to be around £6 billion, of which approximately £1bn will be captured by businesses and employees in the Humber area. Its investment will continue beyond this period with the operations and maintenance (O&M) phase of its current investments and new development plans, following DONG Energy's acquisition of the whole Hornsea offshore wind zone.
- iv. Including all construction and operational activity, DONG Energy's investments could generate **£1.21 bn of gross value added (GVA¹)** in the Humber area by 2030. This includes:
 - **£210 m** based only on activity confirmed to be delivered through the Humber and its ports²
 - **£1.0 bn** if other consented wind farm investments also use Humber based ports for construction and O&M phases³. Port use for these wind farm phases are not yet confirmed.
- v. Assuming that Race Bank and Hornsea 1 wind farms deliver construction and O&M phases through Humber ports, it is anticipated that DONG Energy's current investments will support:
 - **an average of 1,600 jobs in the Humber per year over 2015-20 (ranging between 700 - 2,700 each year)**
 - up to **500 long-term jobs** in O&M activity from 2020 onwards.
- vi. DONG Energy's involvement in the Humber has also supported increased investment in the region.
 - Siemens's £310m investment in a new wind turbine factory in Hull was key to the sector securing a substantial foothold in the Humber, and DONG Energy's relationship with Siemens was cited as a key significant factor in the investment decision.
 - Other activity has followed Siemens, including approval for the Able Marine Energy Park, and investment plans for a new green technologies business park in Hull.
- vii. Sustained investment in the Humber by DONG Energy, alongside other firms, has also:
 - Provided significant new supplier opportunities in the business base
 - Supported enhanced skills provision in the area, relating to sector opportunities
 - Helped to raise confidence and aspiration in both public and private sectors.

¹ Gross value added is a standard UK measure of economic value generated, capturing employee income and business profit

² Note: This includes: construction phases for both Westernmost Rough and Race Bank and O&M for Westernmost Rough.

³ Note: This includes O&M phase for Race Bank, and both construction and O&M phases for Hornsea 1.

1. Introduction

Economic development in the Humber area is one of the big economic success stories currently taking place in the UK. At the core of this economic transformation is the development of the offshore wind sector, which was primarily catalysed by investment in a critical mass of offshore wind farms close to the coast of the Humber estuary. By far the largest investor in these wind farms in the Humber region is DONG Energy.

This report sets out an overview of the economic impact that DONG Energy’s investments to date have had, and that future investments will have in the Humber area. It focuses on both the direct impacts of the investment, and the wider supply chain, skills and inward investment benefits that DONG Energy’s investments have supported.

The study draws together information gathered through desk based analysis as well as:

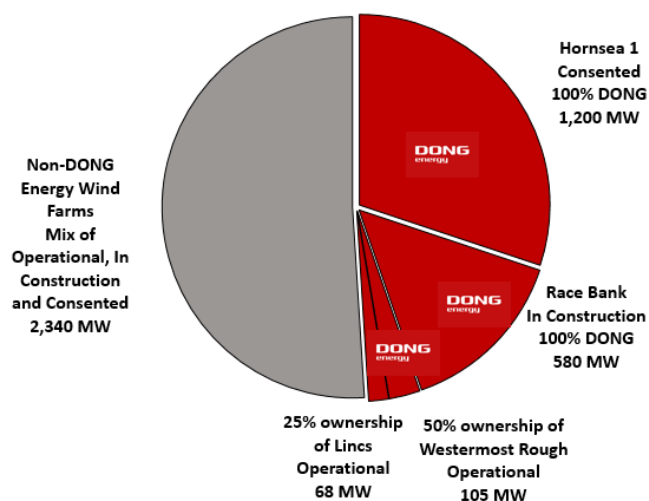
- Economic impact modelling of the direct, supply chain and induced impacts of DONG Energy investments in offshore wind farms off the coast of the Humber.
- Consultation with economic development officers, supply chain firms and other stakeholders within the Local Enterprise Partnership, local authorities, the University of Hull and business & sector bodies.

1.1 DONG Energy Investments in the Humber

Offshore Wind is a major new economic engine for the Humber region. DONG Energy is the largest wind farm investor in the area fuelling this.

Headquartered in Denmark, DONG Energy is one of the leading energy groups in Northern Europe, and is rapidly expanding in the UK. With fewer than ten employees in the UK in 2004, the UK part of the company has grown to around 600 today. DONG Energy is the UK market leader in offshore wind, directly owning around 22% of all offshore wind farms currently installed in the UK, which represents 44% of total UK offshore wind capacity. DONG Energy has a strong UK presence, with national headquarters in London and other office locations in Grimsby, Aberdeen, Liverpool and Barrow.

Figure 1.1 DONG Energy’s Investment across all Humber Offshore Wind Farms (Current and Consented)



Note: Full details of wind farms set out in Appendix B.

Within the Humber area, DONG Energy is part or full owner of four offshore wind farms including ones which are operational (Westermost Rough and Lincs), in construction (Race Bank) and consented (Hornsea 1).

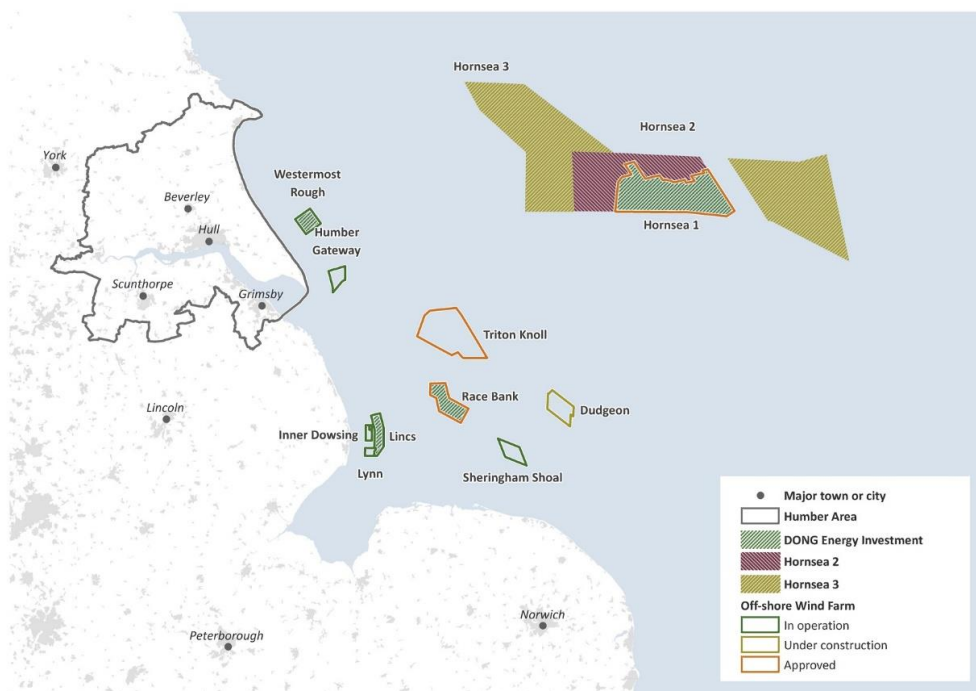
As Figure 1.1 shows, the wind farms which DONG Energy has invested in comprise around half of the total energy generation potential of Humber’s offshore wind farms (operational and

consented). This will equate to over 2GW of generating power, enough to power well over 1.5 million homes⁴, or two thirds of all homes in Yorkshire and the Humber, when completed.

The map below shows all of the wind farms, consented, under construction and operational, in close proximity to the Humber area, by DONG Energy and other developers.

DONG Energy has also recently acquired the full Hornsea zone and is currently taking forward the planning application for a second Hornsea wind farm, which is in the Examination stage with the Planning Inspectorate.

Figure 1.2 Offshore wind farms in close proximity to the Humber area



Source: Contains Ordnance Survey data © Crown copyright and database rights, 2015;

1.2 Overview of the Humber Economy and its Challenges

The city of Hull and the wider Humber region have faced significant economic challenges in recent decades, including high unemployment, skills challenges and a narrow business base.

Decline in Manufacturing

Manufacturing employment in the Humber area has declined significantly in recent decades. Data going back to the late 1990s shows that manufacturing sector employment fell by around one third between 1998-2013, equivalent to a loss of around 28,000 jobs⁵.

⁴ Assuming load factor of 42% (typical DONG project performance) and typical annual electricity demand of 4.192MWh (DECC, 2014, Energy consumption in the UK, <https://www.gov.uk/government/statistics/energy-consumption-in-the-uk>) 2GW produces enough power for 1,755,344 homes.

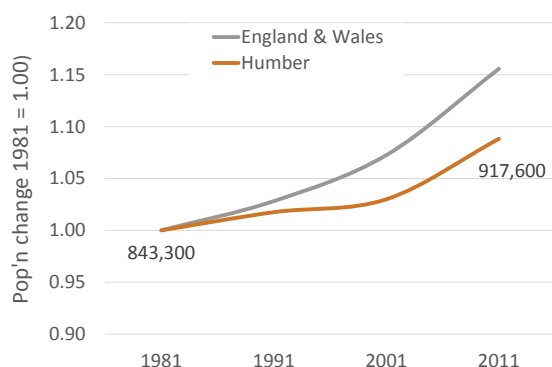
⁵ Note this data draws from two sources: Annual Business Inquiry (pre-2008) using SIC 2003 codes vs Business Register and Employment Survey (post 2008) using SIC 2007 codes, and while broadly comparable, there are minor differences in sector definitions between the two.

Although this manufacturing decline mirrored national trends, other parts of the country have been more successful in diversifying their economic base to provide new employment in other growing sectors.

Limited Population Growth

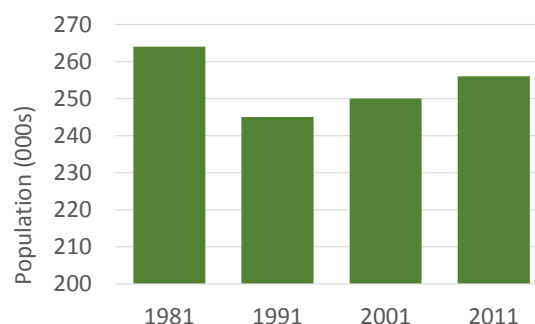
Economic weaknesses in the area have also had a significant impact on population change. The charts below show that between 1981 and 2011 the population of England and Wales rose by 16%, yet in the Humber it increased by only 9%, and in Hull the population is lower now than it was in 1981.

Figure 1.3 Population change in the Humber 1981-2011



Source: ONS, Census 1981-2011

Figure 1.4 Population change in Hull 1981-2011



Source: ONS, Census 1981-2011

High Levels of Unemployment

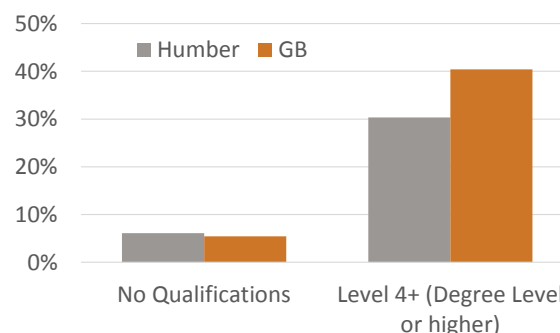
Unemployment levels across the Humber have been amongst the highest across England in recent years, and increased more greatly than other areas during the economic downturn, peaking at 9.9% in 2009/10. Data from March 2015 shows that over 30,000 working age people in the Humber area were unemployed, a rate of 6.9% of working age people. This remains significantly higher than the rate of 6.1% nationally.

Shortage of High Level Skills

Unemployment in the Humber area is partly driven by shortages in local skills levels. Figure 1.5 compares local skills levels with the national average, and highlights the greater proportion of people with no qualifications in the Humber than nationally and a significantly smaller proportion with degree-level (Level 4) skills.

This shortage of workers with higher level skills in the area represents both a constraint on developing new knowledge based and higher value sectors in the Humber area, but also a reflection of the lack of higher value jobs in the area that might attract such workers.

Figure 1.5 Skills levels in the Humber region vs skills levels nationally.



Source: ONS, Annual Population Survey, 2014

1.3 Offshore Wind at the Heart of Strategic Economic Plans

Offshore wind is the most important economic growth sector in the Humber, at the heart of plans to regenerate the region. DONG Energy's investments have been critical in enabling this major economic opportunity.

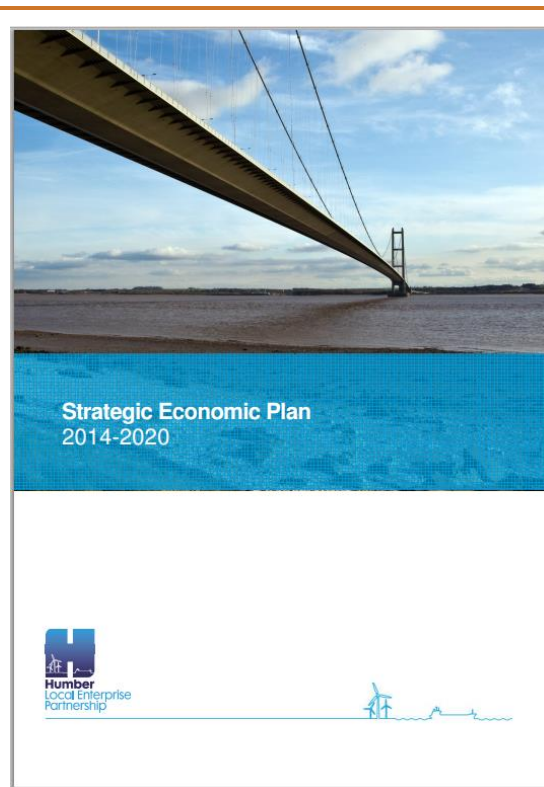
Humber LEP Economic Strategy

The Humber Local Enterprise Partnership (LEP) is responsible for setting the strategy for development of the local economy and includes local authorities, the university, local colleges, and the private sector.

In their strategic economic plan, the Humber LEP identifies the development of offshore wind and renewables as the number one economic opportunity for the region, it states a vision that:

By 2020, the Humber will have a thriving renewables sector, with ambitious capital schemes well underway and a growing reputation for excellence and expertise. Many thousands of jobs will have been created, driven by this major growth in renewables.

The plan particularly highlights that only the Humber has sufficient portside land in the right location to create a UK energy manufacturing cluster of the scale needed for the major North Sea offshore wind farm developments.



Hull City Growth Plan



Hull
City Council

Hull City Council's ten year city plan sets out the key aspirations for the city. The first of its five priority aims is to ensure Hull becomes the 'leading UK Energy City'.

It recognises the locational advantage of the city for this sector, which particularly builds on the major opportunities presented by the offshore wind sector

2. Sustained Investment in the Humber

Establishing an offshore wind supply chain requires a pipeline of wind farm investments over a sustained period. With over £6bn investment in Humber offshore wind farms anticipated this decade, DONG Energy has provided this sustained investment for the area.

In order for the offshore wind sector to have a sustainable economic benefit in the Humber region a series of investments over a long period is critical.

The nature of the sector is such that there is a large level of activity during the construction phase including manufacture and installation of components (typically over one to three years), followed by a smaller, sustained level of activity in the ongoing operation & maintenance of the wind farms.⁶

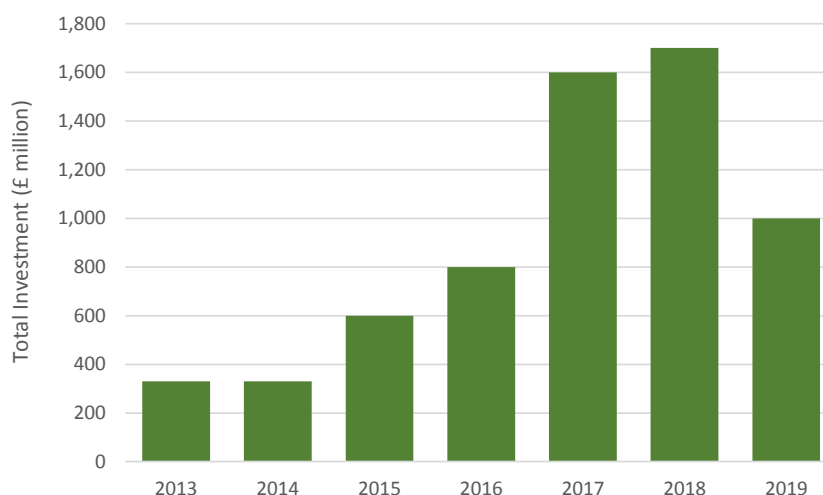
This means that a one-off wind farm development in an area would have limited sustained economic impact, because most of the local construction phase activity would be delivered by workers based temporarily in the area, who would move on once the construction was completed.

In the Humber, however, the group of wind farm developments over 10+ years has provided the area with the opportunity to establish a stronger foothold in the sector, secure inward investment and enable local businesses to access supply chain opportunities.

Figure 2.1 below shows an estimate of DONG Energy's investments and planned future investment in the Westernmost Rough, Race Bank and Hornsea 1 wind farms. The overall £6.4bn of investment represents the construction investment for these wind farms broken down by delivery timescales.

DONG Energy has also recently acquired the full Hornsea zone, and so it is anticipated that this investment timescale will extend further, beyond 2019. DONG Energy is currently taking forward the planning application for a second Hornsea wind farm.

Figure 2.1 Scale of Annual Investment by DONG Energy in Humber Offshore Wind Farms



Source: DONG Energy

⁶ Subsequently there is a final phase of decommissioning or repowering the wind farm, typically after at least 20 years of O&M. As it is not yet known which option would be taken, employment relating to this phase is not included in this report.

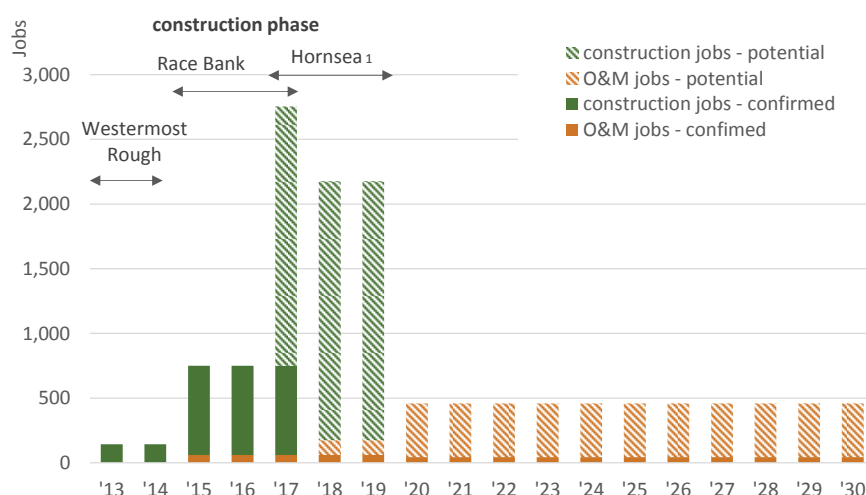
3. Supporting Economic Impact & Employment

Assuming DONG Energy continues to use Humber ports to support its local offshore wind farms, its investments will support an average of 1,600 jobs in the Humber over the period 2015-20 (ranging between 700 - 2,700 each year), and almost 500 long-term operational jobs after 2020. This will generate around £1.2bn of gross value added⁷ in the Humber economy by 2030.

The main economic benefits of DONG Energy’s investments in the region are the jobs its investment has supported in the local economy. Through its direct employment and the contracts during both the construction and operational phases of its wind farms, DONG Energy is supporting substantial employment in the Humber area.

Figure 3.1 sets out the total job creation in the Humber expected during construction and operational phases. For the construction phase of Hornsea 1 and the operational phases of both Race Bank and Hornsea 1, the main ports have not yet been identified. The hatched areas in the chart show the potential job numbers if ports within the Humber are used for these activities.

Figure 3.1 Humber Employment Supported by DONG Energy Investments



Source: Data from DONG Energy, Economic Modelling by Regeneris Consulting. Note: in each case the figures include direct, indirect and induced employment. See Appendix A for further information on the economic impact assessment methodology.

Based on the confirmed jobs (construction and O&M), we estimate that DONG Energy’s investment in the Humber will generate a total of £210m of gross value added by 2030, which could increase by a further £1.0bn if Humber ports continue to be used for the construction and O&M phases of the Race Bank and Hornsea 1 projects.

DONG Energy has recently acquired the full Hornsea zone, and is taking forward a planning application for a second Hornsea wind farm, which is currently in the examination phase with the Planning Inspectorate. If consent is given and the scheme proceeds, there will be a further period of construction related expenditure, to sustain the flow of business opportunities in the area, and further increase longer-term operational phase employment.

⁷ Gross value added is a standard UK measure of economic value generated, capturing employee income and business profit.

4. Offshore Wind Supply Chain Development

4.1 Supporting Inward Investment to Kick-start the Humber Supply Chain

Attracting a major industry partner to the Humber was fundamental to growing the offshore wind supply chain. The Siemens wind turbine factory investment in Hull has provided this critical anchor body and is recognised locally as a potentially transformational investment.

Due to its size and strong supply relationship with Siemens, DONG Energy is cited as having been a significant factor in their decision to invest in Hull.

The nature of the offshore wind supply chain is such that suppliers tend to locate in proximity to original equipment manufacturers (OEMs), such as wind turbine manufacturer Siemens.



Securing the £310m Siemens inward investment in a new wind turbine factory in Hull (confirmed in 2014), was central to the Humber maximising the major economic benefits that the sector potentially offers.

As well as creating an anticipated 1,100 direct new jobs, the Siemens investment will create local supply chain opportunities, attract further investment to the area, and enhance the branding of the Humber, helping the area to develop as a major offshore wind sector hub.

As part of this study, Siemens was invited to comment on the importance of their relationship with DONG Energy in making its investment decision in Hull. Siemens confirmed that its close working with DONG Energy was a significant factor in the Siemens investment decision.

In press statements⁸, Siemens has highlighted that it anticipates its investment in Hull to be for the long-term, that it will become a household name as a Hull employer, and that the turbine factory in Hull will be producing for export, as well as serving the UK market.

The Siemens investment has also already acted as a catalyst for further investment activity in the area, and particularly within the supply chain for offshore wind. Examples include:

- Planning **approval for Able Marine Energy Park** in 2015, providing a further major investment opportunity for the Humber, which could support over 4,000 new direct jobs.

“DONG Energy’s pipeline of offshore wind energy projects is a significant part of the UK pipeline, and therefore Siemens’ close working with DONG has been a significant factor in the decision to build the Hull Siemens factory.”

Matthew Knight, Director of Strategy and Government Affairs (Energy), Siemens

⁸ Hull Daily Mail, 15 November 2014, <http://www.hulldailymail.co.uk/Siemens-ll-household-Hull-like-Reckitt-s-Smith/story-24536049-detail/story.html>. Accessed 15th October 2015.

- An announcement in May 2014⁹ that planning permission had been submitted for phase one of a **£25m business park** in Hull, targeted at high technology green energy businesses.

4.2 Developing the Business Base

DONG Energy works closely with local business to increase Humber and UK sourcing where possible in its supply chain, and is a strong contributor to the development of the Humber offshore wind sector.

The sustained level of investment across a number of Humber area offshore wind farms by DONG Energy, alongside developments led by other firms, has provided significant new supplier opportunities in the Humber business base.

There are very positive early signs at this stage that local businesses are engaged with and interested in opportunities that the sector offers, and are already securing new work through these opportunities or preparing themselves to do so:

- Team Humber Marine Alliance, a sector body focused on the offshore wind sector has seen its membership double in recent years with membership now reaching 200 companies.
- Regional Growth Funding secured by the Humber LEP is delivering offshore wind sector support to local businesses and individuals. The programme has already supported 90 businesses and engaged over 20 foreign businesses interested in investing in the Humber.

The case studies below illustrate the economic and employment benefits of DONG Energy's investments in Humber supply chain companies.

Figure 4.1 Port of Grimsby East

The Port of Grimsby East is a major player in the ongoing development of the offshore wind sector in the Humber region. The port currently provides essential services to a number of windfarms located off the Humber Estuary, and counts DONG Energy, Siemens, EON and Centrica among its key tenants.

Over the past three years the Port of Grimsby has seen around £30m of investment in buildings and marine infrastructure, which was used as a construction base for Westermost Rough offshore wind farm.

Figure 4.2 Case Study of CallMac Scaffolding

CallMac Scaffolding is a specialist scaffolding designer firm based in the Humber area, and has been working with DONG Energy on the Westermost Rough and Race Bank offshore wind farms over the past 18 months.

The total value of orders secured by CallMac Scaffolding is expected to be up to £1m, with work on Race Bank expected to run until 2018. These and other work in the area have enabled the firm to employ four new staff on a permanent basis, as well as taking on two additional trainees.

Furthermore, the industry's growth has given CallMac Scaffolding confidence to invest around £100,000 in a second yard that will act as a training and offshore base for the firm. DONG Energy's presence in the region was one of the key factors in making this decision.

⁹ Stoneferry Estates, 30th May 2014, <http://www.stoneferryestates.co.uk/news/planning-application-submitted>. Accessed 15th October 2015.

5. Boosting Skills Development

Skills development is a critical part of local supply chain strengthening in the Humber. DONG Energy has played an important part in supporting local skills development, through investment in its own workforce training.

In addition to investments in infrastructure and growth in the local business base, the presence of a growing offshore wind sector has triggered new public and private sector investment in skills development, which DONG Energy has played an important part in.

As well as investing in the training and development of DONG Energy staff, the investment that DONG Energy and others have made to develop offshore wind farms in the Humber area and trigger offshore wind supply chain growth, has also led to a range of new skills and training developments and investments locally:

- The University of Hull has invested in training provision to serve the offshore wind sector and offers a Masters programme focusing on the renewable energy sector. It is also constantly looking for opportunities to link its academic research with advancements occurring in industry.
- Hull College has opened a Digital and Green Energy Centre, to support local businesses looking to grow in the renewables sectors, and offer qualifications that will create future career opportunities for young people and adults looking to re-train.
- An £11m investment has been made into a new University Technical College (UTC) in Scunthorpe, specialising in engineering and renewable energy and with a strong emphasis on a core academic curriculum as well as working on real projects in partnership with top companies operating in the offshore wind and other sectors.
- The Regional Growth Fund programme led by the Humber LEP has supported more than 380 local apprenticeships in local priority sectors, including renewable energy.

6. Contributing to a Prosperous Future

Development of the offshore wind sector, closely tied to DONG Energy’s investments, has heralded an upturn in economic fortunes in the Humber which has had a notable impact on confidence and aspiration in public and private sectors and created foundations for a more prosperous economic future for the Humber.

6.1 Clear Economic Strategy and Changing Perceptions

The ten year Hull City Plan, launched in 2013 was a confident, forward thinking plan for the city, built on a clear economic strategy, twinning plans for the creation of high value long-term jobs in the renewable energy sector, alongside more accessible jobs for all in the tourism sector.

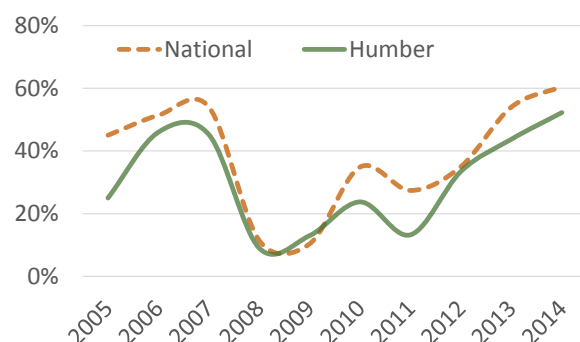
Through this strategy the city could focus its efforts at key goals, one of which was bidding to be the UK City of Culture in 2017, a prize which the city successfully secured.



Hull has received excellent national coverage from this, and made some ground in shifting negative perceptions about the city. The announcement in 2015 that Hilton is planning to build its first hotel in Hull reflects the perception shift that is occurring, and will bring further significant economic benefits to the city.

6.2 Growing Private Sector Confidence

Figure 6.1 Balance of Firms Which Expect Turnover to Increase Over the Coming Year



Source: British Chambers of Commerce, Quarterly Economic Survey. Annual data is based on averages across data for four quarters (and nationally across both manufacturing and service sectors).

Data on business confidence shown in Figure 6.1 shows the significant upturn in business confidence amongst Humber businesses in recent years, and that confidence levels amongst Humber businesses are a lot closer to the national average now than a decade ago in 2005.

The development of the offshore wind sector has provided a significant confidence boost to the area, generating a virtuous circle of economic development.

As a major offshore wind investor in the Humber area, and through its contribution to job creation, supply chain and skills development, DONG Energy has been a critical contributor to this transformative economic story.

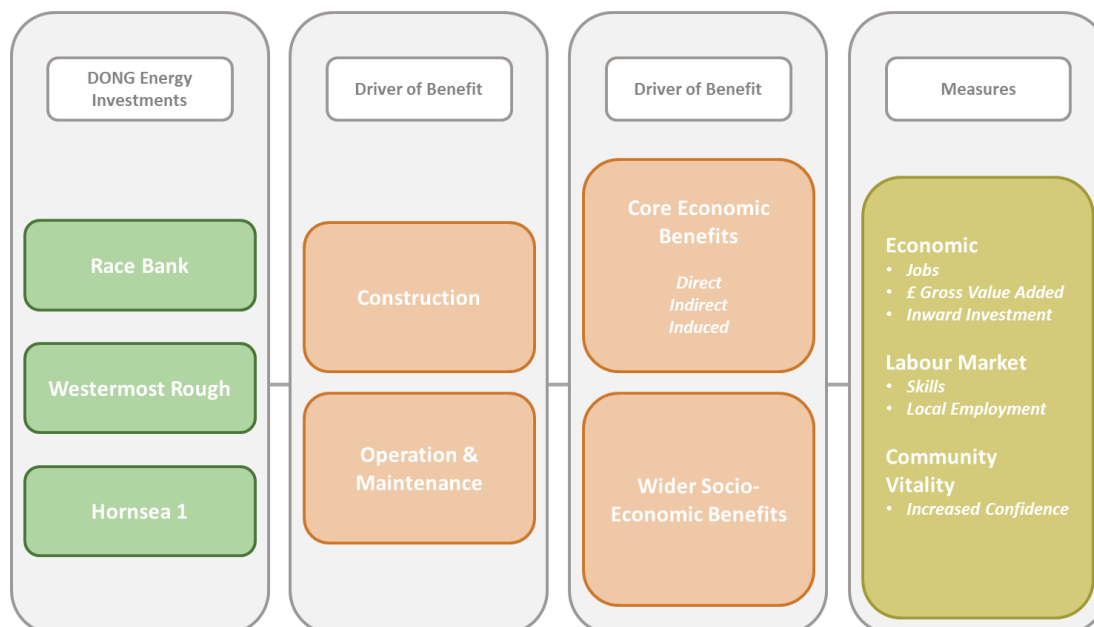
Appendix A - Economic Impact Assessment Methodology

The research tasks underpinning the economic benefits assessment of DONG Energy’s activity in the Humber region cover the drivers, types and measures of socio-economic impacts resulting from the Westermost Rough, Race Bank and Hornsea 1 offshore wind farms. The central research tasks have included the following:

- **Desk-based research** and analysis of the socio-economic impacts of DONG’s investments in the Humber area.
- Discussions with the **delivery teams** across Westermost Rough, Hornsea 1 and Race Bank to understand the costs of construction, operation and maintenance and the likely nature and geography of the supply chain.
- Development of a robust **socio-economic model** to capture and quantify the expected impacts of the construction as well as operation and maintenance phases of the wind farms.
- Discussions with **local stakeholders** (including Local Authorities, the Humber LEP, local trade bodies, businesses within the supply chain and local education providers) to understand the wider effects of wind farm developments in the Humber region.

The diagram below summarises the assessment framework that underpins this analysis. More detail of the methodology is presented below.

Figure 6.2 Summary of assessment framework for the study



Source: Regeneris Consulting, 2015

A.1 Types of Benefits

The economic impact assessment focuses on two main stages of activity generating economic benefit for the Humber area:

- The **construction and assembly** of the wind farms and related supply chain activity.
- The ongoing **operations and maintenance (O&M)** of the installed wind farms.

The core economic benefits have been assessed quantitatively through an economic impact model, which estimates:

- **Direct Impacts:** This measure captures the economic activity that is directly supported by spend on the construction, and operation and maintenance of the wind farms. This includes DONG Energy staff employed to work on the development, and all first tier supply chain expenditure.
- **Indirect Impacts:** This measures the supply chain impact of the additional output generated by companies in the supply chain supporting the tier one suppliers. The additional economic activity in these companies is passed down through their supply chains and generates additional, indirect benefits for many other companies.
- **Induced Impacts:** This captures the knock-on benefits that additional employment supported directly and indirectly has in the economy as salaries earned by those employed in additional jobs are spent on goods and services elsewhere in the economy.

A.2 Measures of Benefit

The direct, indirect and induced economic benefits of the scheme are measured using two headline indicators, which allow the overall impact of the scheme on the Humber economy to be quantified. The key measures used are:

- **Jobs** – the net number of full time equivalent jobs that will be created or safeguarded as a result of the scheme. This is calculated using the overall value of investments made for different goods and services in the local area, and UK benchmark figures for the turnover per job in these areas of investment.
- **Gross Value Added (GVA)** – the value to the economy of the activity generated by the scheme¹⁰. This is calculated using UK benchmark figures for the GVA generated per employee in sectors relevant to the jobs created.

¹⁰ GVA is a standard UK measure of economic value, used by Government and the Office for National Statistics. It is effectively a measure of profits generated in businesses and salaries paid to employees.

Appendix B - Summary of Humber Offshore Wind Farm Investments

Summary of Humber Offshore Wind Farms					
Wind Farm	Round	Status	Commissioning Date just so (Actual or Expected)	Size (MW)	Owner
Lynn and Inner Dowsing	1	Operational	2009	194	Centrica / EIG
Sheringham Shoal	2	Operational	2012	317	Statkraft / Statoil / Green Investment Bank
Lincs	2	Operational	2013	270	Centrica / DONG Energy, Siemens Project Ventures
Humber Gateway	2	Operational	2015	219	E.ON Climate & Renewables UK
Westermost Rough	2	Operational	2015	210	DONG Energy / Marubeni / Green Investment Bank
Dudgeon	2	Under Construction	2017	402	Statkraft / Statoil / Masdar
Race Bank	2	Under Construction	2018	580	DONG Energy
Triton Knoll	2	Consented	Unknown	900	RWE / Statkraft
Hornsea 1	3	Consented	2020	1200	DONG Energy
Hornsea 2	3	Consent expected 2016	Unknown	Unknown	DONG Energy



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