Study of the Humber Energy Intensive Industries Cluster

SUMMARY

March 2018

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Carbon Trust prepared this report based on an impartial analysis of primary and secondary sources. Carbon Trust is an organisation of independent experts with the mission to accelerate the move to a sustainable, low carbon economy. We operate at a worldwide level from London, Edinburgh, Cardiff, Beijing, Johannesburg, Delhi, Sao Paulo, and Mexico City.

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1 SUMMARY

1.1 Introduction

The Humber has a long-standing reputation as one of the UK's leading industrial regions, one of the top chemicals clusters, as the capital of seafood processing, and as a leader of other industries facilitated by its east coast deep-water ports. Its industries are a significant user of energy, and the Humber and neighbouring authorities are major contributors to the UK's generation capacity. In 2015 the energy intensive industries are estimated to have consumed over 8GWh energy, at a cost of over £300m. The total of all industrial and commercial energy use in the region is 23GWh, costing nearly £1bn. There is over 4.4 GW of installed electrical capacity in the region – the majority powered by fossil fuel.

The past decade has seen significant investment in the Humber region. The development of offshore wind in the North Sea has led to some revival in the region's fortunes and new facilities have taken root in Hull and Grimsby to build and maintain offshore installations. This has stimulated a wider adoption of renewable and clean energy developments, including bioenergy and energy from waste. Existing industries are also investing in expansion, as the Humber holds significant positional strengths that provide global advantages, including several ports, transport connections, energy infrastructure, land availability and low costs. In total the Gross Value Added (GVA) in the Humber was over £18bn in 2016, with over ¼ related to manufacturing.

There is a real opportunity for the Humber region to expand its strategic ambitions to:

- Become the **UK Hub for Renewables Excellence** with an extensive renewables supply chain of global reach, grown by new ideas cultivated and championed by regional institutions. In doing so become the UK's leading exemplar of green, low cost power and heat.
- Set an **energy intensive industries decarbonisation vision** to overcome key barriers holding back widespread decarbonisation and industrial symbiosis across energy intensive industries. Such a vision might include:
    - Creation of a **Process Industry Testing Hub** to de-risk processes before live deployment
    - A **Novel Business Models Accelerator** to give solutions to known but unresolved commercial barriers
    - **Pathways to decarbonisation of the energy intensive industries**, including decarbonisation of energy supply

  Through executing such a vision, the Humber could become **a world leading exemplar of a low carbon manufacturing region**

- Identify markets with reducing commercial longevity (gas production, gas storage, conventional power generation, oil refineries) and work with these markets to develop diversification strategies.
- **Maintain, reinforce and grow traditional industries** to increase UK competitive advantage in expanding globally competitive markets (e.g. steel, oil refining, commodity chemicals, speciality chemicals, food).
- Utilise the region's leading industrial university and industrial training capabilities to **take a leadership position in applied STEM skills and industrial process training**. Establish national capabilities in the training of engineers and technologists for process, renewables and digital industries.

- Encourage growth in digital & AI, and transport sectors, to align with Industrial Strategy priorities

In order to begin to realise these ambitions, the Humber LEP commissioned the Carbon Trust to conduct a cluster study to increase understanding of the energy intensive industries (EII) cluster, and to make recommendations to ensure that it plays a significant and strategic role in UK value creation, amid increasing environmental challenges and requirements. The businesses that make up the Humber Energy Intensive Industries Cluster are defined as the highest users of energy, including chemicals, other energy intensive manufacturing (e.g. food, steel, minerals), renewables manufacturing, ports and logistics, along with energy generation businesses and supporting businesses to these sectors.

This study was built upon a strong base of existing secondary research covering the regional economy, industry and energy system, and was informed by primary research comprising 33 in-depth semi-structured stakeholder interviews across the Humber's EII Cluster. The outputs provide a detailed snapshot of the Cluster, and a baseline against which to measure improvements. They identify a series of opportunities and recommendations for the Humber LEP, which will support organisations and local industry to accelerate the Humber's industrial decarbonisation and growth.

Benefits of industrial clusters:

- Improved firm visibility
- Diffusion of knowledge and good practices
- Development of trust
- Sharing of common resources
- They act as a 'trusted partner'
- They facilitate networking
- They act as a focus for industry expertise
- They are a source for long-term strategic leadership
- They increase the visibility of a region

1.2 The national context

Opportunities

The UK's strategic trading, industrial and regional narratives are changing. The recent release of the Industrial Strategy, the Clean Growth Strategy and the Industrial Decarbonisation and Energy Efficiency Action Plans to 2050, and greater interest by central government in regional industrial and decarbonisation opportunities set the stage for a renewed strategic engagement leading to growth and increased wealth for the region. The strengths of Humber in manufacturing and energy bring a great opportunity to capitalise on the industrial growth plans for the Northern Powerhouse.

Northern Powerhouse

- The planned contribution of the **Northern Powerhouse** to achieving the UK's economic potential brings a great opportunity to the Humber if properly leveraged, particularly given the focus on manufacturing and energy, which are inherent strengths of the Humber region. Humber should position itself as a key player.

Industrial Strategy

- The Humber LEP has actively engaged with the UK **Industrial Strategy** with a detailed response to its open consultation and is well-placed to build on the opportunities presented in the national strategy to drive forward the UK's industrial growth objectives.

Roadmaps

- The **Industrial Decarbonisation and Energy Efficiency Roadmaps and Action Plans** present opportunities that can be exploited by the Humber EII Cluster businesses. The Humber region could set itself the goal of working with BEIS as a leading change agent taking forward actions, particularly from the Chemicals and Oil & Refining Action Plans.

Clean Growth Strategy

- The **Clean Growth Strategy** announced £2.5 billion in national programmes and funding to accelerate clean growth, with a number of programmes that Humber-based industries can benefit from, including the Industrial Heat Recovery Support (IHRS) programme, the Industrial Energy Efficiency Accelerator (IEEA), the Industrial Fuel Switching Market Engagement Study and the Carbon Capture and Usage (CCU) Demonstration Programme**.**

Other opportunities include developments within the energy supply market, as electricity market mechanisms such as **demand side response, frequency response** and other **smart energy network** mechanisms work to align supply and demand to compensate for irregular electricity generation patterns. Similarly, the uptake of alternative technologies such as energy storage, small scale renewables and decentralised energy are affecting the way we consume and generate energy in the UK as a whole.

In terms of specific support programmes for **industrial symbiosis**, the Humber EII Cluster can build upon previous experience from the National Industrial Symbiosis Programme **(NISP)**, the EU Enhanced energy and resource Efficiency and Performance in process industry Operations via onsite and cross-sectorial Symbiosis **(EPOS)** programme and the EU low carbon industrial manufacturing parks **(LOCIMAP)** programme.

Threats

National and global threats exist for the Humber EII Cluster, some with high uncertainty, such as **exiting the EU** and **climate change**. Wider political threats to industry have grown in significance since the 2016 referendum and a significant lack of clarity remains around the impact that withdrawal from the European Union will have on the UK economy. Issues that have been identified in the Humber as threats to industry include: being the UKs leading port for European trade, area uncertainty impacting investor confidence, currency devaluation increasing costs of imported raw materials (though positive for the export market), immigration regulations restricting EU labour and trade deals restricting access to markets. Given the high interdependencies and interconnectedness of the Humber chemicals/petrochemicals industries with the EU (as suppliers, customers, investors and owners), leaving the EU is considered to bring disproportionate uncertainty, and therefore risk.

Climate change risk and adaptation is also an important issue for the Humber EII Cluster given its coastal location and dependence on import and export of materials, and a more in depth assessment will be required to assess the potential risks and adaptation strategies most suited to minimise the impact on Humber-based industry.

1.3 Profile of the Humber Energy Intensive Industry Cluster

The Humber region incorporates the four local authorities of Hull, East Riding of Yorkshire, North East Lincolnshire and North Lincolnshire. It is effectively on the dividing line between the Midlands and the North of England and therefore marks the southern boundary to the Northern Powerhouse.

The Estuary is home to four port towns including: **Grimsby** a renowned centre for food processing, which more recently has established leading offshore wind operation and maintenance (O&M) activities; and **Immingham** the UK's largest port by tonnage. Together these two ports handled 54 million tonnes of cargo in 2016. **Goole** is the UK's most inland port situated around 50 miles from the North Sea.

Kingston upon Hull (commonly known as **Hull**) is the only city in the Humber Estuary region, and is home to Siemens Gamesa, a new offshore wind turbine blade manufacturing facility, with a vision to establish the region as a world class centre for renewable energy. In 2017 Hull was awarded the UK City of Culture status, which brought 2,000 events, exhibitions and cultural activities to the city and attracted millions of visitors.

Energy is at the heart of the region's economy, and it is described and marketed as the 'Energy Estuary'. Around 25% of UK oil refinery and coal import requirements are provided through the Humber, in addition to over a fifth of national gas demand. Due to its proximity to North Sea offshore wind farms, the Humber Estuary has also become a hub for offshore wind manufacture and servicing. The industry in the region is also a significant energy user - 6% of England's industrial and commercial energy use is by businesses in the Humber region.

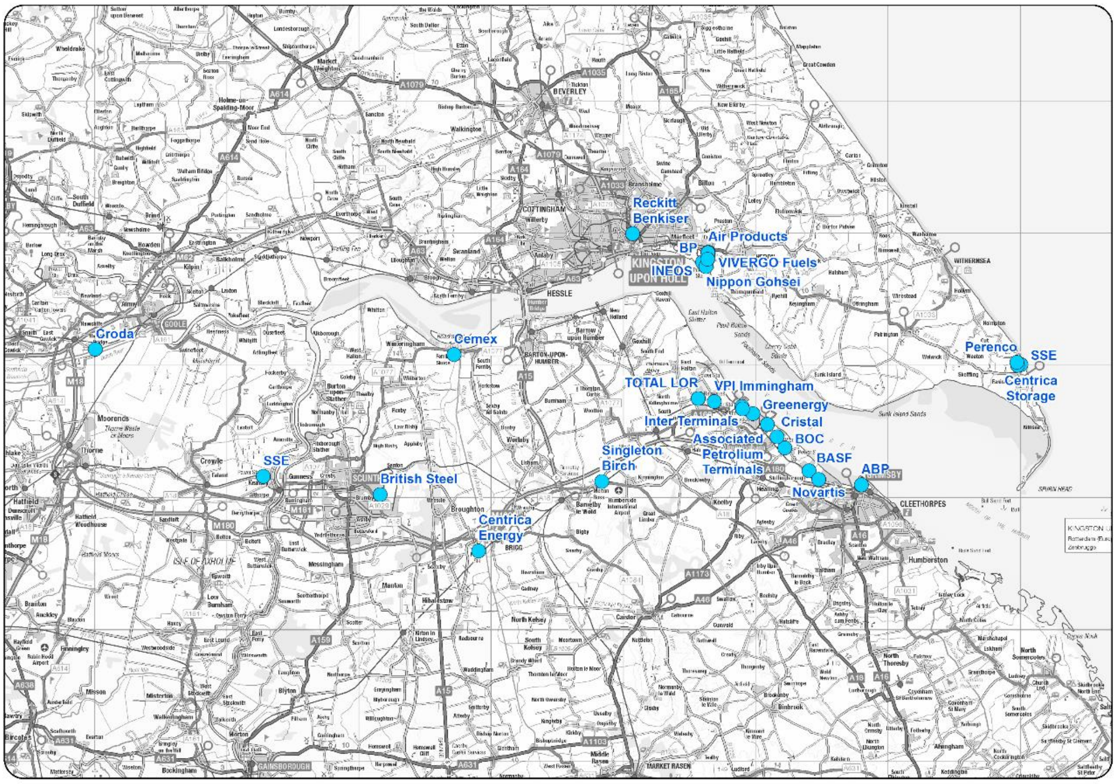
The largest **Enterprise Zone** in the UK is located across over 40 sites around the Humber Estuary, principally composed of areas on the north and south bank of the river around Hull, Brough, Immingham, Grimsby, Cleethorpes and Goole, as well as inland locations around Scunthorpe and Humberside Airport. These areas offer a variety of benefits to businesses such as access to deep sea ports, proximity to renewable energy generation and availability of land. The Enterprise Zones offer incentives such as business rate reductions and Enhanced Capital Allowances and simplified planning arrangements.

A wide range of organisations provide support to businesses within the Humber region. A selection of these are listed at the end of this Public Summary document.

Snapshot of energy intensive industry in the Energy Estuary

The Humber hosts a number of energy intensive industries, including: petrochemicals, refineries and alternative fuels production; chemical manufacture and storage; steel making; cement and lime manufacture; glass manufacture; food processing and manufacture; and onshore and offshore gas production and storage.

Although industries are spread across the estuary many businesses are located close to the ports of Hull, Grimsby and Immingham. The figure below shows the interview respondents for this study, which comprise the majority (but not all) of the largest energy users in the region.



The Humber's ports complex is, with 77m tonnes cargo in 2016 (16% total UK cargo), the UK's largest for both import of raw materials and components and export of UK manufactured products. It offers excellent access to Europe; with ~30m tonnes annual trade it is the UKs largest port complex trading with the EU.

The region forms one of four major chemicals producing regions in the UK. There are two major chemicals clusters: the Saltend Chemicals Park, and a cluster spread along the South Humber Bank between Immingham and Grimsby, which includes two of the UK's four oil refineries. Manufacture of renewable fuels and infrastructure represents another key industry in the Humber, notably offshore wind turbine manufacture and servicing, and large UK players in the biofuels industry. Further energy intensive industry in the region includes one of the two UK integrated steel works, a cement works, a lime works and a float glass plant at Goole.

In addition, The Humber is believed to have the largest concentration of food manufacturing research, storage and distribution facilities in Europe, contributing over £1bn to the UK economy. Grimsby is referred to as 'Europe's Food Town', with around 500 food related businesses and a full supply chain of food sector services. Large food manufacturers, are also concentrated around Hull, in addition to major pharmaceutical and personal care product manufacturers.

Energy Consumption

Total annual energy use in the Humber is around 37,000 GWh, of which nearly two thirds is accounted by the Industrial and Commercial sectors. The energy intensive industries are estimated to consume over 8,000GWh/yr at a cost of around £330million/yr. A number of heat maps have been prepared which show the concentrations of energy use (as well as potential opportunities for heat recovery). Significant potential remains to reduce energy consumption by energy intensive industry in the Humber, as well as to decarbonise processes by increasing the proportion of renewables and alternative fuels, and installing heat networks to distribute lower carbon and waste heat.

Heat map showing total consumption of Humber Energy Intensive Industry

Most businesses spoken to had made some investments in energy efficiency. Energy is a high and controllable cost for energy intensive industries and in the current competitive market place, many companies have programmes in place to reduce operating costs through operational energy efficient improvements. Several sites claim to be world class exemplars of energy efficiency for their sector – with further savings requiring increasingly larger investment. Carbon Trust experience of working with such forward thinking sites has shown these businesses often export their knowledge to their sister operations located elsewhere in the world. A number of recent, current and planned £multi-million investments have been identified.

Smith and Nephew, Croda, Indivior and RB have all invested in new research centres or manufacturing facilities. And Siemens Gamesa / ABP, Greenergy and Vivergo have invested £hundreds of millions between them into their operations within the renewables sector. A number of chemicals and other manufacturers are planning investments of £tens of millions in debottlenecking, increased manufacturing capacity and energy efficiency.

However other sites are at an earlier stage of their energy efficiency and decarbonisation journeys. Several companies stated that recent ESOS audits have identified a number of new energy saving opportunities that are still being considered, or that they need more metering equipment to be able to accurately determine where the best potential for savings occurs.

Despite the high concentration of carbon dioxide emitting plants in the region, there is relatively little current activity with regards to reuse of CO_2 or research or investment in carbon capture and storage (CCS). The withdrawal of funding for the major “White Rose” project in 2015 is seen as a significant setback in the enthusiasm to develop CCU/CCS in the region. Several companies retain an interest and would consider bringing expertise to a CCU/CCS project, possibly in partnership with other regions.

Snapshot of energy generation in the Energy Estuary

The Humber region has long been the seat of a number of important conventional power generation businesses and in recent years has established itself as a key region for the distribution of renewable power, heat and biofuels. The split of electricity generation capacity within the region is shown in the table below.

Installed electricity generation capacity in the Humber, compared with other regions

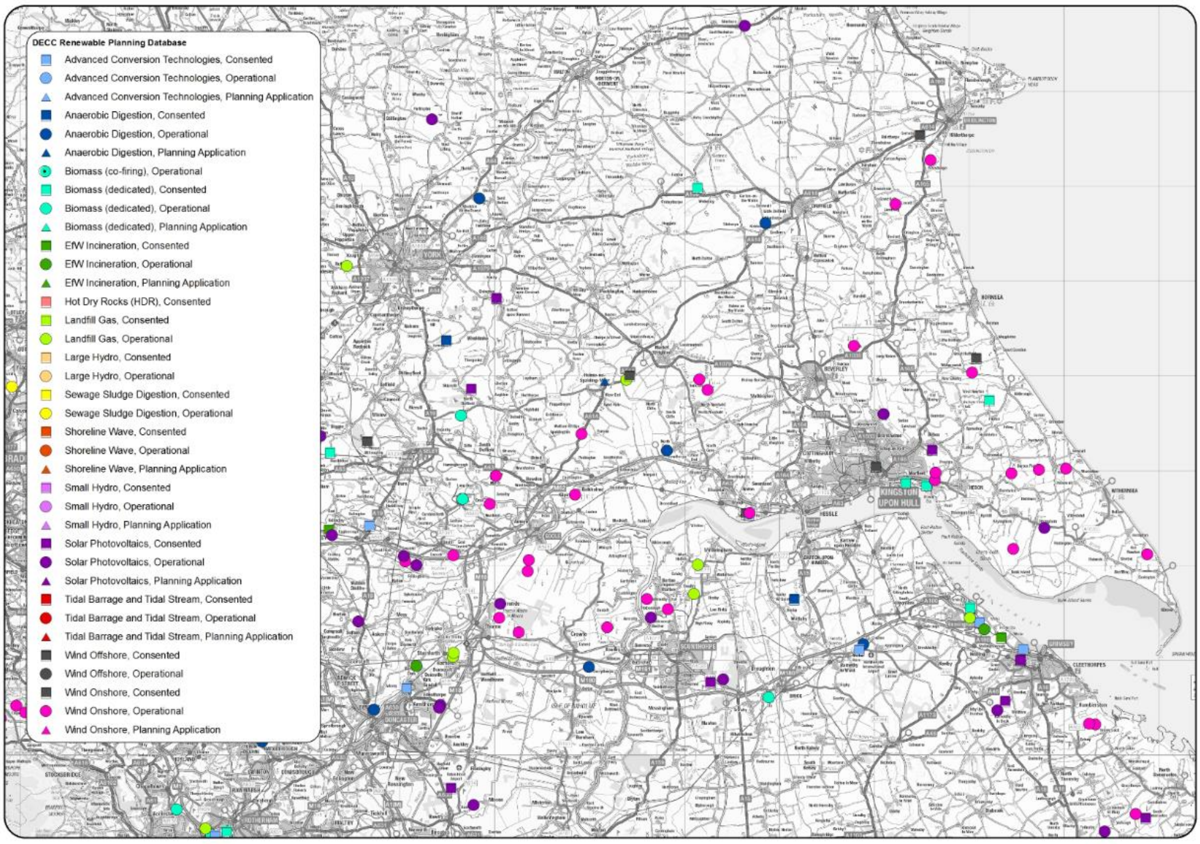
	UK	Humber	Yorkshire & the Humber	Wirral	North West	Teesside	North East
Advanced Conversion Technologies	2,516	51	51				
Biomass	2,314		2,092				38
CCGT	29,855	3370	3,476	1,710	1,825		
Coal	11,776		3,940	1,961	1,961		
Diesel	138						
EfW Incineration/Landfill gas/AD	365	21	62	81	89		
Gas	2,114		1,280	10	190		84
Gas oil	1,257	25	100	34	34		
Hydro/pumped storage	3,756						7
Light oil	17						
Meat & bone meal	14						
Nuclear	8,918				2,385	1,180	1,180
OCGT	632	600	600				
Solar Photovoltaics	444		211				5
Straw	38						
Wind Offshore	4,755	219	219	240	1,087	62	281
Wind Onshore	5,467	135	544	50	288		434
TOTAL	**74,376**	**4,421**	**12,575**	**4,086**	**7,859**	**1,242**	**2,029**

The generation of power through conventional means (coal or gas fired power stations) is still an important industry for the region. A significant proportion of EII company energy needs are provided by gas-fired CHP plant. Whilst CHP is usually lower carbon than grid electricity, this will change in the future as the grid decarbonises – potentially as early as 2020. The locations of proposed and operational renewable energy plants are shown in the diagram overleaf.

The renewables sector is growing rapidly in the Humber, with the offshore wind and bioenergy sectors leading the way. The Humber contributes to the UK's leading position for offshore wind both with existing wind farms and planning additional developments in the North Sea; and offshore wind represents the largest share of renewables production in the region. Humber's offshore wind industry spans almost every stage of wind farm development and operation, including turbine manufacture, assembly, installation and ongoing operation and maintenance through offshore wind servicing facilities.

The Humber region is gaining a reputation for operations and maintenance (O&M) expertise with the largest concentration of offshore wind O&M supply chain businesses in the north of England and Scotland. Expertise in the region is also set to grow, with the announcement in 2017 of an offshore wind Operations and Maintenance Centre of Excellence led by the Offshore Renewable Energy (ORE) Catapult and the University of Hull.

Locations of proposed and operational renewable energy plants



A growing biofuels and biogas market provides a significant opportunity for the Humber region, which already has strong existing biofuel capability. Anaerobic digestion and energy from waste facilities continue to grow in the region, further stimulating local biofuels production. Energy Works' 25MW energy from waste plant in Hull will be the newest addition to this, due to become operational in 2018, producing biomethane to inject directly into the gas grid, as well as powering turbines to generate electricity.

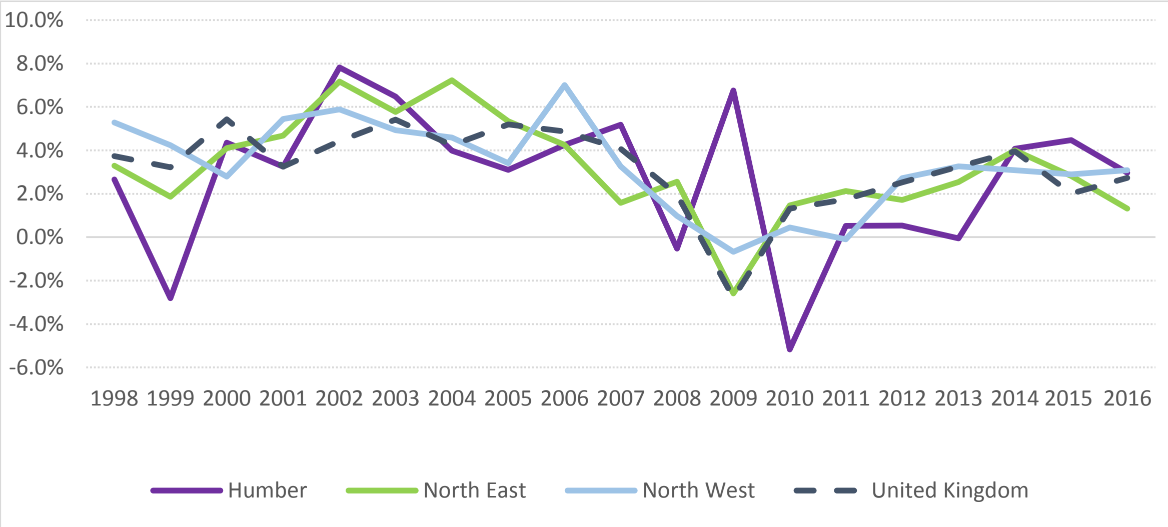
In terms of solid biofuels, the Drax biomass power station is a major influence locally. Whilst the power station itself is just outside of the Humber region, two major biomass handling facilities have been constructed in the Humber ports to transport biomass to be used as fuel.

The Humber region has historically had strong energy grid infrastructure for both gas and electricity, due to a legacy of energy intensive industry. Whilst there are grid constraints in some areas around the estuary, there is generally spare capacity for the connection of both demand and generation.

Economy

Humber industries delivered £18.38 billion in **Gross Value Added (GVA)** in 2016, out of a nominal GVA for the UK of £1,748 billion. Aside from a short post-recession period between 2009 and 2013, the Humber region's year on year growth – as GVA per head of population - has remained broadly aligned with the UK and its regional neighbours. GVA per headcount is £19,807, compared with a UK average of £26,584. Growth over 3 years has averaged 2.6%. GVA per employee (as opposed to per head of population) is only 7% lower than the UK average.

GVA per head growth, Humber LEP Region and neighbouring regions, 1998-2016



Source: ONS GVA Reference Tables2 December 2017, Carbon Trust analysis

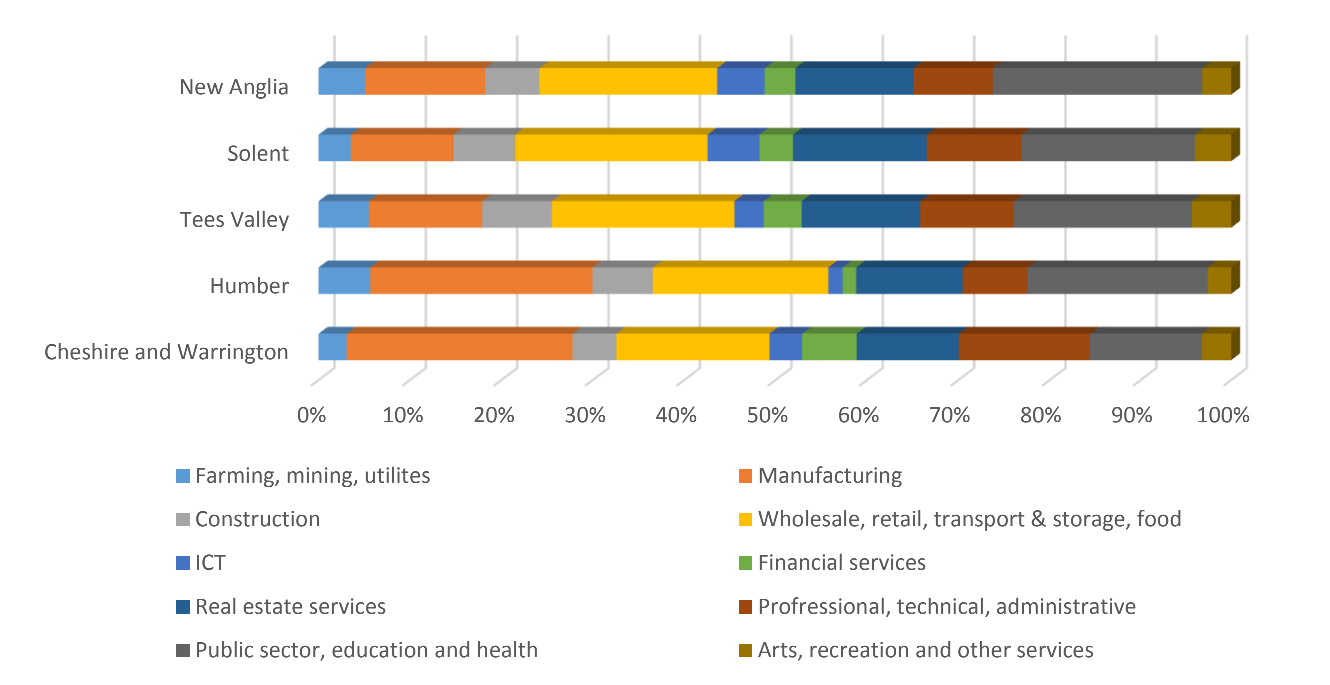
Good progress has been made in the Humber in respect to falls in unemployment which fell from 6.4% to 5.0% between September 2016 and September 2017. Compared to similar industrial regions (Cheshire & Warrington and Tees Valley), the Humber is the only one to have shown consistent growth in the employment rate over the past four years.

Progress on employment rate is likely tied to the significant progress the region has made in the area of skills and training, a combined effort from the public sector, academia and local industry. Also, between 2015 and 2016 the number of businesses in the Humber grew by 3.3%.

An analysis of GVA by sector has been carried out versus serval comparable regions (those including ports and/or significant chemicals industry and/or renewables industries). This shows that at nearly 25% the Humber has a highest GVA contribution due to manufacturing, closely followed by Cheshire and Warrington at 24%. The Tees Valley, Solent and New Anglia have much lower GVA contributions from manufacturing (12%, 11.2%, 13%). However, compared with the comparator regions the Humber has smaller GVA contributions from ICT, financial service and professional and technical services.

Manufacturing plays a significant role in the Humber, providing more than 55,000 jobs (15% of employment). The Humber has a diversified manufacturing base with substantial employment in the food products (29%), chemicals (23%), and metals including fabrication sectors (19%).

Sectorial GVA analysis for Humber, Tees Valley, Solent, New Anglia, and Cheshire & Warrington



Data source: ONS GVA by LEP Reference Tables December 2017, Carbon Trust analysis

In seeking to strengthen the regional economy, the Humber's focus on developing a strong UK capability as an offshore renewables hub, and in developing the Energy Intensive Industries cluster is a valid goal. For businesses to achieve these ambitions they will require well trained and highly skilled professional, technical and administrative labour which should deliver growth to this sector of the economy.

Equally, thought may still need to be dedicated to how to ensure that opportunities in the ICT, financial service and professional and technical services sectors are not lost to other regions. Alongside existing ambitions the region should examine its capacity in the cold economy: chemicals, refrigeration technology, cold storage and more broadly the emerging concept of clean cooling.

1.4 Findings

Over 30 of the largest energy using companies in the region were interviewed for this study. There was overwhelming support for the Humber as a good location for their operations. Most of their operations are currently stable, or growing, and some major future expansion opportunities exist.

Stakeholders were asked for their views on the **strengths and weaknesses** of operating in the Humber region. Their feedback can be summarised as follows:

STRENGTHS	**WEAKNESSES**
- Trading estuary and infrastructure - Sectoral strengths (manufacturing and engineering, port and logistics, chemicals, agribusiness and food) - Energy supply - Support organisations and academia - The people and skills	- Road/Rail transport links - Business struggle - Local brand - Leakage of skilled employees - Promotion of the region

.

Stakeholders were also asked to describe the **drivers and barriers** for investment in energy saving and decarbonisation projects, as well as inward investment in growth more generally.

Drivers reported by EIIs for investment in growth and energy saving projects are centred around financial and strategic priorities. Climate change mitigation and adaptation is a secondary driver once financial and business needs have been met. Barriers surround risk, cost and competing business priorities. Some EIIs reported these barriers as prohibitive to investment, whilst others identified them as issues that could be overcome.

A summary of the most commonly quoted factors are shown below:

	Drivers
Financial	• Energy is a significant variable and controllable cost. • Third party developers may provide capital investment for renewables. • Energy saving projects can offer more certain returns than process optimisation projects.
Strategic/ operational	• Investment can be driven by demand for new products or increased capacity. • Carbon performance is often published in annual or CSR reports, especially for larger companies. There can be pressure from shareholders. Some multinational EIIs have company-wide emission reduction targets. • There can be supply chain demand, especially from B2C customers. Investment in decarbonisation is more important where the product is sold on its green credentials. • Reducing energy demand and diversifying supply increases security of supply and cost control. • Energy benchmarking can increase need to perform well against other sites.
Physical	• Climate change poses a threat to business as usual, so adaptation (e.g. protection from flooding) is a long term driver.

	Barriers
Financial	• Renewables and storage projects can require significant upfront capital and may fail to meet corporate payback requirements (often < 2 years). • The cost of environmental compliance can restrict capital for

	decarbonisation projects.
Strategic/ operational	• EIIs report the need to compete with international subsidiaries for investment capital, which limits the rate of investment. • Projects that are outside of core business are given lower priority. • There is a lack of metering in industrial sites. Lack of data thus restricts the business case for energy efficiency projects • Some EIIs report that markets are not stable enough for investment.
Political	• Uncertainty around Brexit impact reduces willingness to invest in the UK. • Lack of certainty on policy direction and history of changing subsidies discourages long term investment.
Physical	• SSSIs and planning consent issues can restrict development. • There is a flood risk and history of flooding in some areas. • Grid capacity constraints limit growth at some sites.

Some common themes emerged from stakeholders regarding the prioritisation of future support to industry within the region. A key message from interviewees was the need not to limit the focus of growth to renewable energy developments. They stated that maintaining a strong traditional manufacturing base is also essential to the long term prosperity of the region, although some recommended focussing on low carbon credentials for manufacturing.

Stakeholder feedback was split as to whether investment should be focussed on local infrastructure and improving the image of the area i.e. make the area an attractive place to invest and industry will come. Or whether to provide more focused and direct support to protect, maintain and grow existing industry for example through funding mechanisms (tax relief, loans, grants) and consultancy support (e.g. feasibility studies). Both are likely to be needed as part of a strategic platform to maintain, grow and decarbonise industry in the cluster.

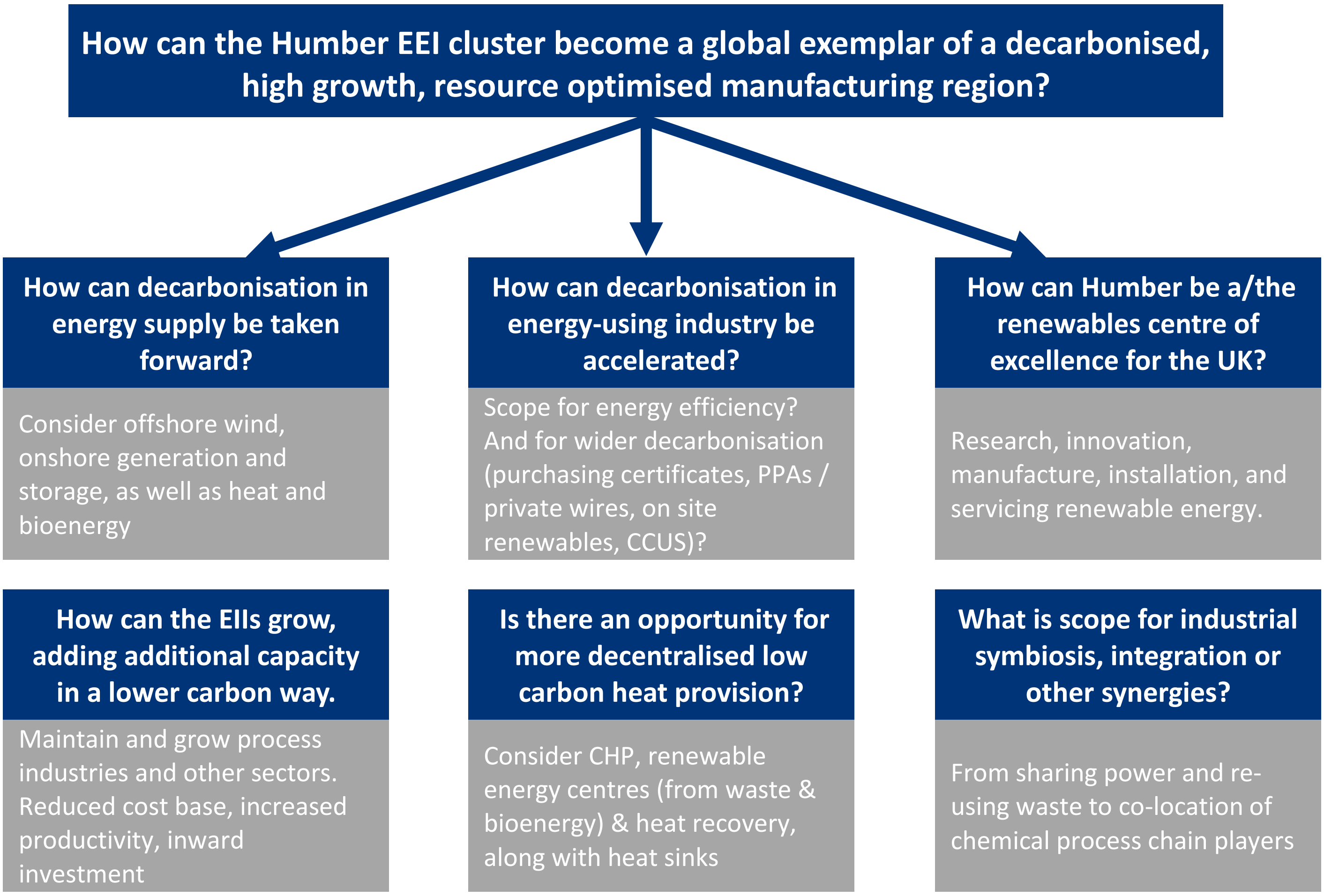
Some specific representative comments were:

- "Focus on industries that make things with long term demand"
- "Promote Humber as a green or low carbon manufacturing region"
- "Offshore wind industry investment is fantastic. Leverage this. But maintain a broad focus – energy storage, battery technology, AD, tidal etc."
- "Try to encourage/influence a longer term view by Government – so they don't move the goal posts"

One critical aspect highlighted was the need to ensure that potential inward investors from outside the region (and the UK) know about the opportunities, the facilities, the incentives (e.g. enterprise zones), and the regional benefits. This requires a more proactive and targeted marketing approach, coordinated across stakeholders supporting the EII cluster.

SWOT and TOWS analysis

A detailed analysis of strengths, weaknesses, opportunities and threats (SWOT) has been undertaken for the Energy Intensive Industries Cluster. To understand the different areas of potential six pertinent questions were selected and an individual SWOT analysis was undertaken for each one:



A combined summary of the SWOT findings is shown overleaf. A TOWS strategic options analysis was then created for each individual SWOT, to identify a series of options to intensify the strengths and opportunities and limit the weaknesses and threats. Resulting options were prioritised and themed, and fed into the report recommendations.

Overall summary of SWOT analysis key findings across all six strategic questions examined

STRENGTHS

- Local EIIs independently implement decarbonisation projects due to cost reduction and productivity drivers. They mostly have a pipeline of potential energy efficiency projects
- Industries are collaborative, helped by umbrella organisations (e.g. CATCH, Green Port)
- Unused waste heat streams from multiple local businesses, including high grade
- Increased interest in carbon saving at corporate level – esp. supplying B2C customers.
- Energy supply infrastructure is generally good – could enable electrification
- The Humber is home to leading offshore wind and biofuels companies and has land and substation capacity for additional low carbon supply. Enterprise zone provides incentives
- Engineering and renewables skillsets in local population and training centre expertise
- Good access to bio & waste resources e.g. rapeseed, straw, waste oil, domestic waste, industrial waste, wood
- The Humber is a world UK leader in research, innovation and production of offshore wind and biofuels
- Local infrastructure strengths, e.g. deep-water port, ethylene pipeline
- Existing track record of symbiosis projects among Humber EIIs and ongoing projects.

WEAKNESSES

- Other priorities override decarbonisation projects. 2 yr. payback often required.
- EIIs have high dependence on fossil fuels and electricity (frequently from gas CHP). Private wire supplies can eliminate or disincentives decarbonisation
- Lack of metering at industrial sites hides cost effective energy efficiencies
- Other regions may have more coordinated voice and influence in Government
- Grid constraints in some areas and new connections very expensive
- Other regions are more advanced in terms of CCS and H_2 feasibility and level of interest
- Low take-up of renewables aside from offshore wind and biofuels
- More work to do for region to be dominant in renewables Innovation/R&D
- Occupation of Able Marine Energy Park not secured, and infrastructure not guaranteed
- Reputation of EII cluster within Northern Powerhouse not strong enough. The region is lacking a single voice for manufacturing
- Transport infrastructure puts off some investors
- Cluster is spread out, making sharing/re-use of waste heat more difficult
- EIIs wary of symbiosis projects as it increases reliance on external players.

OPPORTUNITIES

- Position Humber for lead roles in N. Powerhouse, Industrial & clean growth strategies
- Financial incentives and support available (e.g. IHRS, IEEA, CCUS, offshore wind)
- Support through local programmes, e.g. Humber Growth Hub, Growing the Humber, South Humber Industrial Investment Programme (SHIIP), Green Port Growth Programme, North Lincolnshire Ambassador Programme, Let's Grow North & East Yorkshire
- Could lead on 2050 Industrial Decarbonisation and Energy Efficiency Action Plans
- Implementation of ESOS energy audit recommendations could be accelerated
- Clean cooling movement and decarbonisation of the cold economy can be exploited
- Significant potential for more diversity of energy supply in the region, plus smart energy solutions including storage. Growing trend for green energy purchase in UK
- UK and global renewables markets are growing
- Further collaboration between universities, Growth Hubs, Innovate UK, Catapults etc.
- Offshore wind expansion – Installation plus O&M for consented farms can be provided
- Decentralised energy is advocated and supported (incl. funding) by UK Government .

THREATS

- Uncertainty around national policy and incentives limits long term planning and project implementation. Changes in Government renewables policy restricts long term investment. Claimed uneven playing field on subsidies
- Brexit and associated market uncertainty, esp. regarding joining up UK and EU regulations. Regulation changes post-Brexit.
- Uncertainty of planning consent for future developments
- Uncertainty of energy and raw material price fluctuations. "High energy prices" limit EII propensity to invest
- Competition from other UK regions for skilled workers
- Other regions may be positioning and promoting themselves better for funding
- Increase in global competition for EII products limits product value
- Decentralised energy projects require long term investment and planning – raises risk
- Competitor ports may be more proactive with infrastructure development.

1.5 Industrial opportunities

The stakeholder engagement highlighted a number of industry-wide opportunities and threats captured through the SWOT analysis, but there were also a large number of specific projects identified within the companies interviewed. These comprise energy reduction projects, wider decarbonisation projects, symbiosis projects, and projects focussed on growth in capacity or production of new products. Many of these are confidential, but the types of projects that have been shared with the Humber LEP include:

- Cross-site energy reduction programmes e.g. new large compressor, improved heat integration, furnace efficiency optimisation, steam turbine replacements, more efficient motors, VSDs and LED lighting (multi MW savings available in largest sites)
- Waste heat recovery projects.
- Renewable energy (e.g. solar, onshore wind, AD) and battery storage installations.
- New CHP power plant installations.
- Various waste re-use projects e.g. sewage sludge, AD, energy from waste etc.
- Synthesis of chemical feedstocks from bio sources.
- Addition of new production lines within chemical manufacturing companies.
- Attracting new industries e.g. battery production, especially where these make use of locally produced products as their raw materials.
- A host of potential symbiosis projects eg
    - Upstream and downstream chemical intermediate manufacture
    - Use of waste such as dusts, tars, oils, effluent, sludges, ash, used filter media
    - Capture and sharing of waste heat

The report recommendations include measures to support the development of these projects, as well as harnessing the wider opportunities captured through the research.

1.6 Recommendations and next steps

There is a massive opportunity for the Humber region to become an exemplar of a **leading integrated low carbon manufacturing region** and the **UK Hub for Renewables Excellence**. The feedback from stakeholders is that there are numerous opportunities for **growth, innovation, efficiency and decarbonisation** – but that currently the support provided could be more joined up, more clearly coordinated and communicated and more focussed on specific goals. There is also a feeling that the Humber is not seen to punch its weight within the UK manufacturing base – that it is often forgotten within discussions about the Northern Powerhouse.

What is needed to enable the ambitious vision described is to **build a strategic platform for industrial leadership**, underpinned by a set of **strategic focus areas for action**.

This report highlights the key features of the platform and the focus areas – followed by a suggested list of recommended actions which could be implemented to push them forward.

To execute the platform objectives, the proposed focus areas (described further below) are:

- Strengthening strategic sectors
- Strengthening the region
- Unlocking new opportunities
- Improving efficiency of operations
- Collaboration and coordination

Recommendation 1

A strategic platform for industrial leadership

Key to the platform is a **vision and mission statement** for the EII cluster, agreed across a wide range of stakeholders. This should be backed by an appropriate **governance structure**, and supported by approved **regional strategy documents**, including a Humber energy strategy, local industrial strategy and updated strategic economic plan.

One critical success factor is to ensure there is an **overarching umbrella organisation that represents and speaks for the EII cluster**, which can coordinate cross sectoral programmatic activity. Rather than create another new organisation, **it is proposed that the remit of CATCH is expanded to fill this role**.

It is recommended that the LEP should set and oversee strategy, steered by business and the local authorities, with CATCH's remit to design and implement programmes, with input from industry, academia and training providers.

The LEP will continue to **speak to Government on behalf of the region, with a united voice**. This discussion should seek to influence Government strategy and policy on the key issues facing EIIs, seek increased recognition of the strengths and opportunities for the EEI cluster, pursue increased funding and policy support for renewable and energy intensive industry development in the Humber, and seek high level and visible support and commitment for organisations considering inward investment.

Within this framework, the EIIs in the region will be enabled and encouraged to **collaborate more effectively**, have a **stronger voice in Government** and more **effectively take advantage of the opportunities** provided by the Industrial and Clean Growth Strategies and other industrial initiatives.

Recommendation 2

Strengthening strategic sectors

This theme concerns growth in the key sectors in which the Humber can succeed, building on long fostered strengths and more recent successful progress. Many stakeholders have reiterated the need to **maintain and grow once more the traditional industries** of petrochemicals and speciality chemicals, high temperature industries (cement, lime, steel, glass) and food processing, whilst **bringing modernisation, flexible processing, and decarbonisation**. Alongside this, recent successes in **renewables, and the development of the port and other transport & logistics industries should be capitalised upon**. Finally, priorities should be linked to the key challenges within the national Industrial Strategy, for example **bringing Artificial Intelligence and digitisation to offshore wind optimisation and industrial process control**.

The priority is to **maintain a pipeline of growth and decarbonisation programmes and projects**, rank them against the mission criteria, and provide real and tailored support through the project lifecycles, starting with **funding for feasibility studies and business case development** to overcome initial hurdles. Beyond that hand-holding and both private and public backing will help maximise outcomes. There will be a need **to ensure that the voice of the key sectors is heard** within Government – especially for traditional manufacturing which is often not thought as exciting or as imperative to support.

One proposal to help the chemicals sector is to work with BEIS to establish a **process industry testing hub** – where new processes or methods of operation could be tested in a safe environment.

Recommendation 3

Strengthening regional support

For industry to succeed in the Humber, improvements in infrastructure, availability of skills, training and incentives must at least match those offered by other regions. Further improvements are required to road and rail infrastructure to bring in materials and move out goods more efficiently, but also to allow the workforce to more quickly and painlessly travel to/from work and on business. The electricity and gas networks must have the capacity for businesses to expand and new business to connect, without excessive cost and restrictions. Where possible decentralised energy provision, private wire and power purchase agreements etc. should be enabled to provide competitive cost, high reliability energy supplies, with an emphasis on incentivising lower carbon energy sources.

Some competitor ports are running initiatives that can help attract new operators. Humber should look to match or provide equivalent initiatives to those on offer in other UK locations, and **in competitor ports in Europe e.g. Cologne, Antwerp and Rotterdam.**

Crucially, new and existing investors need to know about the impressive offering and commitment to future support, to ensure Humber locations are first shortlisted for consideration, and then selected for inward investment. **A common voice, coordinated locally and marketed globally is needed.** It is recommended that the umbrella organisation proposed above has a role to work in partnership with the LEP and local authorities to facilitate a clearer, cross-region messaging to stimulate inward investment, and a role in promotion and outreach on behalf of the EEI cluster as a whole.

Recommendation 4

Unlocking new opportunities

Building on the existing strengths and successes, there are **opportunities to develop into new priority sectors and technologies** which will be needed as the UK moves to a decarbonised future, with carbon capture, smart grids, energy storage and clean cooling.

A series of deep dive technology and local market scoping studies is proposed to determine the benefits that could accrue to the Humber by taking a leading stance – or whether a collaborative approach with other regions would be more effective.

Where major new opportunities arise, be they proactive (e.g. wide roll out of energy storage to supplement offshore wind generation in the region) or reactive (e.g. potential for major investment from an existing industry player at their Humber site), **a mechanism is needed to mobilise all available resources to cultivate the opportunity and secure the best outcome for the region**.

Within this theme a **programme to identify and implement symbiosis opportunities** and other synergies should be initiated.

Conventional funding approaches can be a barrier to taking forward innovations. It is proposed to consider developing a **Novel Business Models Accelerator** to test solutions to known but un-tackled commercial barriers.

Recommendation 5

Improving efficiency of operations

The starting point in any programme of decarbonisation should be to **determine whether the processes being undertaken are necessary** at all – and then if so, **are they being undertaken efficiently**. It is always important to reiterate that there is no point in generating or buying renewable energy (for example) to power a process which could be run with 30% less energy, given some investment – especially as such investments will often bring other product or process benefits. And in some cases the level of investment required is minimal, or even zero.

Most energy intensive industries will have undertaken ESOS audits in the last 2-3 years, detailing energy efficiency recommendations. Many will be due a second audit soon. Several stakeholders have stated how the audits opened their eyes to a series of projects than are now being implemented, and savings being made.

It is recommended that local support programmes are implemented to **encourage and assist companies to improve their existing efficiency, building on ESOS**. More strategically, the LEP/CATCH etc. could work closely with BEIS and local process industries to **be front-runners in implementation of the of 2050 decarbonisation action plans**.

Recommendation 6

Collaboration and coordination

To enable all this to happen will require stronger coordination, collaboration and facilitation. It is proposed that this is managed by the umbrella organisation proposed above. There is already some good networking within mini-clusters (e.g. Saltend, and around the South Humber Bank refineries) but businesses across the Humber – and to the east and west - are less joined up. Working together to highlight common issues, agree priorities and share best practice will be to the benefit of all companies in the wider EII cluster.

To illustrate how the themes above could be enabled, a sample of suggested activities are proposed below. They are listed in priority order, with the most urgent activities presented first within each grouping.

Recommendation	Priority	Timescale	Difficulty	Investment needed	Impact/Comment
Develop strategic platform for industrial leadership – define Vision, Governance, Strategies and single region messaging	Highest	Immediate	Low	<£100k	Enables cluster / region to present a more coherent message
Create local industrial strategy and local energy strategy.	Highest	Immediate	Low	<£100k	Align closely with BEIS objectives to achieve maximum support
Set up EII cluster workshops to learn about, influence and prepare to take part in Government clean growth programmes	Highest	Immediate	Low	<£100k	Proactive approach could give Humber EIIs an advantage and maximise participation
Engage more widely with Government on biomass policy and programmes	Highest	Immediate	Med - High	<£100k	Seek influence which benefits the growing industry in the Humber
Expand remit of CATCH as umbrella organisation for EII cluster	Highest	Short	Med	<£1m	Organisation to represent and campaign for the interests of the cluster
Implement ESOS follow up and support programme to realise the potential energy efficiency savings. Invite in equipment suppliers and funding suppliers to support.	Highest	Short	Low	<£1m	Often savings of 10-20% identified. > 5% saving realistically achievable
Carry out series of deep dive technology reviews: Energy storage (and smart energy systems) Carbon Capture and use/storage Clean cooling Renewables potential (excl. offshore wind)	Highest	Short	Low	<£1m	Provide foundation for significant structural development and prepare for the future. Alignment with Industrial Strategy maximise chances of future action/investment.
Produce updated marketing brochures and websites for inward investment in the Humber.	Highest	Short	Low	<£100k	Important to showcase the best the region has to offer. Benefits the whole region.
Create and maintain a pipeline of industry decarbonisation and growth projects. Create mechanism to coordinate support: coordinate local champions, focussed assistance (planning, enterprise funding), obtaining local and national support and future commitment.	High	Short	Low	<£100k	Will help to prioritise and coordinate local support on highest impact projects – and bring in national Govt. backing, raising profile of region.
Expand existing fora to bring in working level, cross-cluster communication, collaboration and action planning mechanisms.	High	Short	Med	<£100k	Activity needs to be underpinned at working level to ensure action
Implement charm offensive to increase exposure of opportunities within EII cluster – lobby for devolution style	High	Med	High	<£1m	Lots of effort required, but potentially £multi-million rewards

regional deal					
Undertake heat network master planning study focussed on use of industrial waste heat. Consider implementing incentives for the first industrial companies to connect.	High	Med	Low	<£1m	Impact of tapping into significant waste heat resource could be great, and also set a precedent for other UK schemes.
Further examination of shared, private wire, power generation opportunities – cost benefit analysis of installing further heat and power stations along the banks of the Humber. Seek HNIP funding	High	Med	High	£multi-million	Providing secure, good value energy production increases willingness to invest and allows maximum carbon saving by increasing control of technology selection.
Part fund local feasibility studies and assist with project business case development, and technical advice to de-risk projects	High	Med	Low	<£1m	Business is resource constrained but external help can unlock action
Undertake discussions with other regions to form cluster of clusters. Collaborate with Northern energy hubs.	Med	Short	Low - Med	<£100k	In some areas, greater impact by working together
Survey of local businesses and future trends in core EII and renewable industries – identify and proactively develop new training offers. Bolster regional engineering level training and development.	Med	Short	Low	<£100k	Already underway but stay ahead of the game – part of placing Humber in leadership position.
Seek funding for a Process Industries Testing hub	Med	Short	High	£multi-million	Could make Humber a real front runner in industrial decarbonisation agenda.
Seek industry support to work with BEIS as a leader in the implementing 2050 decarbonisation action plans across sectors. Provide appropriate incentive e.g. co-funding for technical assistance and R&D.	Med	Med	High	<£1m - £multi-million	Will be difficult to achieve but could driver forward industry is local players persuaded to engage.
Implement Symbiosis Incubator	Med	Med	Med	<£1m	Very high potential but time needed to realise benefits.
Implement Novel Business Models Accelerator	Med	Med	High	<£1m	Could prove to be a role model for other regions.
Review of enterprise zone effectiveness – can further encouragement be given to underperforming zones? Identify new areas that can be proposed for EZ status e.g. Saltend?	Med	Med	Med	<£100k	Setting up new zones is a long-term activity – but could bring significant expansion of process industries

Implement programme of measures through the ports to further increase sustainability. Complete the EcoPorts Self-Diagnosis to determine environmental benchmarks and consider applying for Eco Port certification Post to consider signing up to Green Award scheme for shipping	Med	Med	Low	<£100k	Could raise ports profile and attractiveness for inwards investment.
Road infrastructure improvements – acceleration of existing improvement plans for Hull and South Humber Bank	High	Short - Med	High	£multi-million	Multiple benefits across region – not just EII cluster
Rail infrastructure improvements	Med	Med - Long	High	£multi-million	
Electrical infrastructure – partnership with NPG and NGN to ensure that capacity is in place for planned developments – and if possible that excess capacity is considered – give confidence or "guarantees" of development plans to encourage this.	Med	Med	High	£multi-million	Difficult to encourage a pro-active approach. Stakeholders have said in Europe ports, the infrastructure is delivered first – and then investment follows.

1.7 Summary of selected industry support organisations in the Humber

Feedback from interviewed industry stakeholders is that there are some excellent organisations providing very strong support to businesses in the Humber region. A brief summary of some of those mentioned is provided below:

Organisation Name	Description	Types of Support Offered
Humber Local Enterprise Partnership (LEP)	Aims to drive economic growth in the Humber region, by way of supporting businesses, developing local skills and providing infrastructure to encourage growth, as well as playing a more general strategic role in promoting devolved government and directing its resources. Includes: • **Single Conversation** creating a smoother process for local developments. • **Humber Business Growth Hub:** business advice and support to local SMEs. • **Growing the Humber: capital** investment grants to SME businesses. • **Business Loan Fund**: capital loans aimed at unlocking infrastructure projects. • **Growth Deals and Local Growth Fund** funding for local growth priorities. • **Supporting Northern Powerhouse Investment Fund delivery in the Humber**	• Strategic role in lobbying for the Humber region and its key industries • Key role in giving wider strategic steer to the regions' economy through targets, information and training • Vehicle for the resources of devolved government • Offers loans, grants, advice, and can help in the development of projects that will benefit the region • Will 'champion' particular projects that are well aligned with its objectives
Humber Enterprise Zone	Managed by the LEP, the Humber Enterprise Zone is the largest enterprise zone in the country, at 1,238 hectares. Sector focuses include energy and offshore wind, ports and logistics, chemical and process, creative and digital, and food manufacturing.	• Provides space for manufacturers and their supply chains to co-locate • Offers efficiencies in infrastructure, in logistics, and in networking • Provides affordable sites and tax incentives, such as business rate discounts and Enhanced Capital Allowances
Green Port Hull	The Green Port Hull initiative is currently funded by the RGF Round 2 funded Green Port Growth Programme, and acts as a key enabler to establishing Hull and the Humber Energy Estuary as a world class centre for renewable energy.	• Supports the local renewables sector supply chain • Encourages investment in renewables • Provides local residents with the skills training needed to access the opportunities on offer
CATCH	A partnership led by industry and supported by local public authorities, which promotes the interests of the process, energy, engineering and renewable region across the Humber.	• CATCH focuses on skills development to match the needs of local industries • The CATCH Network provide forums for groups interested in specific knowledge and training

Organisation Name	Description	Types of Support Offered
		topic areas to meet regularly throughout the year
University of Hull	The only university in the Humber region. A range of academic institutes relating to business, industry and energy: • Business School • Logistics Institute • Enterprise Centre • Engineering Innovation Institute • Environmental Technologies Centre for Industrial Collaboration • Institute for Chemistry into Industry	• Published studies on industry within the Humber • Hosts research institutes relevant to the Humber's key sectors • Planning to support industry though the creation of an offshore wind talent and innovation hub
Hull and Humber Chamber of Commerce	The Chamber has a network of 2,000 members and affiliates covering North East Lincolnshire, North Lincolnshire, Hull and the East Riding of Yorkshire.	• Produces and shares resources and publications, and hold events and exhibitions to bring local businesses together
Bondholders	A membership organisation that promotes the Humber across the UK and internationally, showcasing business success stories and promoting the benefits of choosing to locate in the region.	• Facilitates networking through Bondholder breakfasts • Holds promotional events, including Young Talent Network Events, Humber Roadshows and hosting national/international delegations • Offers marketing material and resources to members
Humberside Engineering Training Association (HETA)	HETA is a local specialist training provider offering apprenticeships at all levels, industry upskilling courses and Higher National Certificate (HNC)/ Higher National Diploma (HND) courses.	• Runs an apprenticeship programme with a focus on engineering
IChemE – Hull and Humber Members Group	The local branch of the Institution of Chemical Engineers.	• Provides events and networking opportunities for chemical engineers based within the Humber region.
IMechE – Yorkshire Region	The regional branch of the Institution of Mechanical Engineers, with a dedicated sub-group for Humberside Process Industries.	• Runs events and mentoring activities for mechanical engineers based in the Humber.

2 Appendices

Appendix 1 List of industry stakeholders interviews undertaken

Industry Stakeholder	Production
Air products	Industrial gases
Associated British Ports	4x ports in Humber
Associated Petroleum Terminals	Oil refinery material movements
BASF	Chemicals manufacture
BOC Immingham	Industrial gases
BP Chemicals	Chemicals manufacture
British Steel	Steel manufacture
Cemex	Cement production
Centrica Storage	Off shore gas storage
Cristal	Chemicals manufacture
Croda	Chemicals manufacture
Drax Group	3x coal & 3x biomass generators
Greenergy	Biofuel production
Ineos	Chemicals manufacture
Nippon Gohsei	Chemicals manufacture
Northern Powergrid	Electricity grid provider
Novartis	Chemicals manufacture
Ørsted	Offshore wind
Perenco	Natural gas production
Phillips66	Oil refinery
PX Group (Saltend)	Chemicals site owner and operator
Reckitt Benckiser	FMCG manufacture
Siemens Gamesa	Offshore wind
Singleton Birch	Quarry and Lime manufacture plus AD plant
SSE Gas Storage	Onshore gas storage
SSE Keadby	Power generation
Total Lindsey	Oil refinery
Vivergo Fuels	Bioethanol production
VPI Immingham	CHP

In addition discussions were conducted with local stakeholders including:

Humber LEP	Green Port Hull
CATCH	**East Riding of Yorkshire Council**
Hull City Council	**North East Lincolnshire Council**
North Lincolnshire Council	**University of Hull**
Team Humber Marine Alliance	