

## 4. North West Industrial Cluster Overview

The North West industrial cluster stretches from Cheshire in the South, Manchester in the East, and Cumbria in the North, covering the entirety of the North West of England. The region contains the cities of Liverpool and Manchester and the suburban areas that are surrounding, as well as a significant number of industrial zones, electricity generators, offshore wind farms and gas storage sites (including Stublach). Several projects and consortiums in the region have been funded through recent government funding schemes, to support the development of hydrogen, CCUS and industrial decarbonisation.

Figure 2 Regional breakdown of the North West and industrial sites, illustrates the breakdown of regions in the North West of England into Cumbria, Lancashire, Greater Manchester, Merseyside, and Cheshire as well as the geographical spread of industrial sites studied in this analysis. Data sources of these industrial sites were discussed in Section 3. Cumbria, Lancashire, Greater Manchester, Merseyside, and Cheshire represent the following number of industrial sites respectively; 20, 30, 31, 30 and 70. The figure also demonstrates the geographical extent of the proposed Hynet project in terms of indicative hydrogen and CO<sub>2</sub> network. Data sources, year of origin and proximity of

industrial sites to indicative hydrogen network is further discussed in the WP5 Electrolytic Hydrogen report.

The proposed Hynet umbrella of projects, led by Progressive Energy, is a significant project in the North West as it collectively drives the region to meet its net zero target through over £1bn of investment. Main workstreams within the proposed Hynet are the development of a blue (gas derived) hydrogen and CCUS network. It is the UK's leading low carbon hydrogen and CCUS project, offering a low-cost, low risk route to decarbonising North West industrial cluster as well as other sectors of the regional economy.

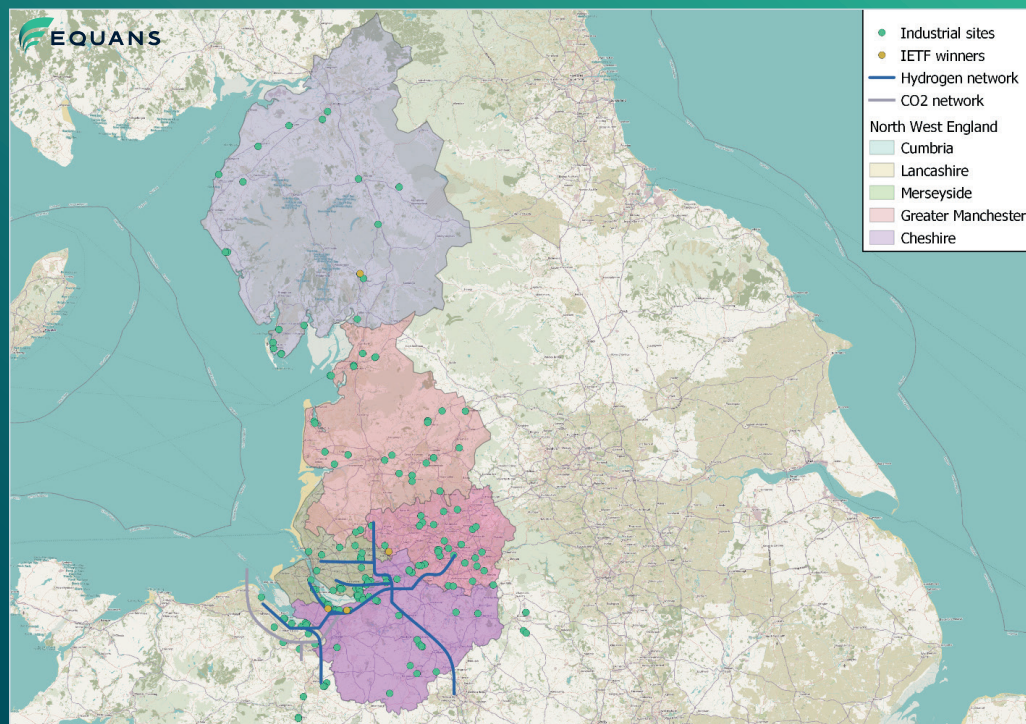


Figure 2 Regional breakdown of the North West and industrial sites

Cumbria and Lancashire lie outside of the proposed Hynet project, with 50 out of the 181 sites within the North West equating to 27% share. Hence, Cumbria and Lancashire regions as well as industrial sites within Merseyside, Greater Manchester and Cheshire that are not able to connect to the hydrogen network will require a different path for decarbonisation of combustion of fossil fuels such as on-site solutions.

In addition to Hynet, there are other enabling projects in the region to replace fossil fuels (2). Leyland CNG fuelling station in Lancashire currently uses 100% renewable certified gas. A pilot project is being carried out in Cheshire to consider the storage of green (renewable derived) hydrogen. Pilkington Glass at St. Helens, Merseyside has successfully manufactured architectural glass using hydrogen power in a world-first trial in 2021. At the same time, Tata Chemicals Europe site at Winnington, Cheshire has implemented the first large-scale carbon capture project of its kind in the UK. The project captures and purifies the CO<sub>2</sub> from the gas-fired CHP plant generation and utilises it as a key raw material in later processes. The project cost £18 million and it was 25% part funded by BEIS. It will save an estimated 40,000 tCO<sub>2</sub>e every year. Several key organisations have already committed to and are undertaking suitable measures to address energy efficiency and low carbon heating for the industrial and commercial sectors in the North West (2).

The creation of Protos, an energy resource hub, near Ellesmere Port further demonstrates the actions taken to decarbonise energy supply in the North West. Protos is being developed by Peel NRE, part of Peel L&P as a cluster of complementary businesses with the aim of providing access to energy, skills, support and resources, and a co-located supply chain in the region. Protos brings together innovative technologies in energy generation and resource management that are leading the way on the clean growth agenda such as energy from waste, timber recycling and plastic to hydrogen facilities and bio-substitute natural gas (BioSNG) plants. They will deliver low carbon energy direct to the industrial and domestic customers through a local energy grid which can result in substantial reduction of cost and carbon emissions (11).

The North West has a substantial potential for, and examples of, renewable energy generation in the region. The high tidal range in Liverpool Bay and the Mersey estuary provides a unique opportunity to reliably generate abundant and predictable long-term renewable energy. Therefore, Mersey tidal power project is seen as an important part of the whole energy system integration of electricity, storage, and hydrogen, providing resilience in the wider regional network (2).

Large scale solar PV application examples in the region include Bentley's factory in Crewe with an installed capacity of 7.7 MW. The panels are installed on the rooftop and carport, and the generation output is able to meet all in house operational demand. Onshore wind in the North West has a significant role to play in decarbonisation. However, the deployment rate needs to be accelerated despite the current challenging planning constraints for new onshore wind farms. The North West should use its links to construction and supply chain for offshore wind farms to sustain a growth for onshore wind farms as well (2).

Figure 2 Regional breakdown of the North West and industrial sites also illustrates the industrial sites which have been awarded grant funding by the Industrial Energy Technology Fund (IETF), managed by BEIS. The UK government announced £315 million of funding in 2018 which will be available until 2025. IETF is aimed to help businesses with high energy use to cut their bills and carbon emissions through investing in energy efficiency and low carbon technologies. It is divided into two phases where Phase 1 supports the development of energy efficiency and decarbonisation studies, and Phase 2 expands the scope to support the deployment of decarbonisation technologies (12).



The four industrial sites featured in the figure have been awarded grant funding as part of IETF Phase 1. The details of the sites are as follows (13):

• **Encirc Ltd – Glass sector**

The project involves the implementation of a new control system for the furnace forming-section which will integrate two separate areas of production processes into one system. This in turn will enable the operators to maximise process efficiency through optimising the energy safety-margin and will result in energy savings. The new control systems will also enable the deployment of future decarbonisation measures such as hydrogen fuels and light-weighting containers. The project has received a £2.5m grant for the total project cost of £6.2m.

• **James Cropper Plc – Paper and pulp sector**

This project entails a feasibility and engineering study into advanced waste heat recovery at the paper mill site. It is aimed to reduce reliance on natural gas through understanding key technologies in recent commercial heat recovery applications. The project has received £74k for the total project cost of £148k.

• **Essar Oil (UK) Ltd – Oil refinery sector**

The project aims to upgrade a major distillation unit with a new, net-zero ready furnace which will be able to deliver energy efficiency improvements through heat recovery, eliminating oil firing and reduction in other pollutants such as NOx. The furnace will also be designed for 100% hydrogen firing and ready to utilise carbon-free hydrogen from the proposed Hynet project. The site is thought to be the first UK oil refinery furnace specifically designed to run on 100% hydrogen. The project has received £7.2m for the total project cost of £24.2m.

• **Rick Bestwick (North West) Ltd – Food and drink sector**

The project aims to maximise energy efficiency opportunities at the site through upgrades and enhancements of equipment. Through this project the next generation of cold storage technology may be applied to the existing building infrastructure. The project will provide a guide to practical implementation for retrofitting energy efficiency measures in this sector. The project has received £250k for the total project cost of £766k.

## 4.1 Sectors represented

The analysis included in this report is based upon EU ETS and NAEI emitters in the North West as mentioned in Section 3. The list of industrial sites is broken down into 27 sectors with 181 industrial sites. The table below outlines the number of sites against each sector.

Sector	Number of Sites
Aerospace	5
Airport	1
Ammonia	1
Asphalt	1
Automotive	6
Cement	6
Ceramics	5
Chemicals	35
Engineering	3
Food and Drink	25
Gas	4
Glass	8
Gypsum and Plasterboard	1
Iron and Steel	1
Lime	1
Non-ferrous metal	2
Oil Refinery	3
Oil and Gas	1
Other mineral industries	12
Panel board	2
Paper and Pulp	21
Pharmaceuticals	7
Power Producers	20
Processing oil	1
Textiles, clothing, leather and footwear	1
Waste Collection, Treatment and Disposal	6
Water and sewerage	2
<b>Total</b>	<b>181</b>

Table 1 EU ETS 2019 and NAEI 2017 sites in the North West Industrial Cluster

Sector	Number of Sites %
Aerospace	2.8%
Airport	0.6%
Ammonia	0.6%
Asphalt	0.6%
Automotive	3.3%
Cement	3.3%
Ceramics	2.8%
Chemicals	19.3%
Engineering	1.7%
Food and Drink	13.8%
Gas	2.2%
Glass	4.4%
Gypsum and Plasterboard	0.6%
Iron and Steel	0.6%
Lime	0.6%
Non-ferrous metal	1.1%
Oil Refinery	1.7%
Oil and Gas	0.6%
Other mineral industries	6.6%
Panel board	1.1%
Paper and Pulp	11.6%
Pharmaceuticals	3.9%
Power Producers	11.0%
Processing oil	0.6%
Textiles, clothing, leather and footwear	0.6%
Water and sewerage	3.3%
Waste collection, treatment and disposal	1.1%
<b>Total</b>	<b>100%</b>

Table 2 ETS 2019 and NAEI 2017 % sites in the North West Industrial Cluster



Figure 3 Sector breakdown of industrial sites in the North West, shows the breakdown of sectors contained within the data set of industrial sites studied in this analysis. Industrial sites are colour coded to illustrate the variety of sectors and their distribution in the North West. Cheshire contains the greatest number of industrial sites whereas, Greater Manchester and Merseyside are the most densely populated areas considering the size of their respective regions. Cumbria contains the least number of industrial sites even though it has the biggest land area.

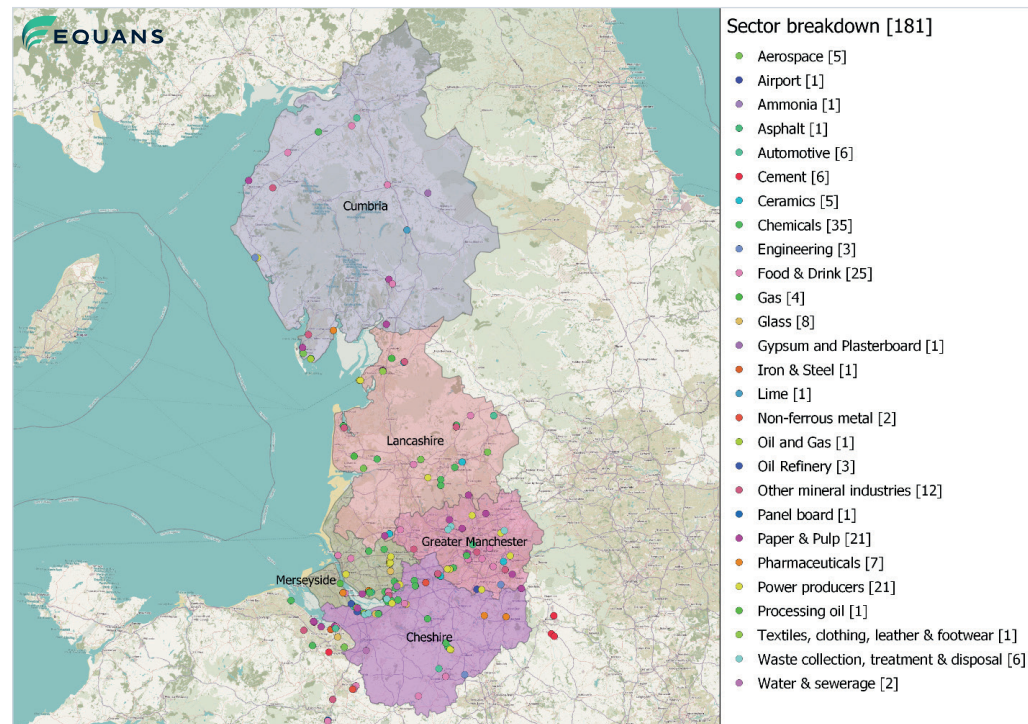


Figure 3 Sector breakdown of industrial sites in the North West

Paper and pulp and the food and drink industry are the most common sectors within Cumbria. Most of the sites in Lancashire are located around Preston and Blackburn and include chemical, power producers and other mineral industries. The main sectors in Greater Manchester are paper and pulp, food and drink, and power producers. Around half of the industrial sites are located within a 5-mile radius of Manchester city centre and the rest are sparsely spread.

Chemicals, glass, and pharmaceuticals are the most common sectors within Merseyside. Liverpool city contains half of the industrial sites whereas St. Helens contain a small cluster. Over 50% of pharmaceuticals sites in the North West are located within Merseyside. Chemicals is the most common sector within Cheshire and 60% of all chemicals sites within the North West are in Cheshire. Food and drink, paper and pulp and power producers also have a strong presence in the region.

## 4.2 Sector based overview

This section provides a broad outline of how each analysed sector operates, what their function is within the UK economy, and statistics reported of their impact on global warming. Further information on all sectors can be found within Section 9.2. The high-level information has been cross-examined against the industrial large emitting sites contained within the EU ETS and NAEI data sets represented in this report and existing in the NZNW. The following section focuses on Scope 1 emissions as the data has been taken from EU ETS and NAEI.

It should be noted that the total output of emissions for the NZNW industrial cluster is 16,687,296 tCO<sub>2</sub>e, equivalent to 0.02% of UK total emissions (2018) (14), with 10,478,876 tCO<sub>2</sub>e for Scope 1 emissions and 6,208,420 for Scope 2 tCO<sub>2</sub>e emissions, excluding power producers.

### 4.2.1 Automotive

The automotive sector is a vital part of the UK industry attributing £15.3 billion value to the economy. More than 30 manufacturers build more than 70 different models in the UK which accounts for 13% of total UK export of goods (15). With the future of EV vehicles on the increase, the automotive industry is needed more than ever to help meet the UK's net zero targets.

From our data set we have identified 6 automotive sites in the North West which makes up 0.6% of total cluster emissions, with 84,836 tCO<sub>2</sub>e.

### 4.2.2 Chemicals

The chemical industry is one of the largest in the UK and is a top manufacturing exporter. It adds almost £25 billion of value to the economy with 3,700 business providing over 500,000 jobs. It also has the one of the highest labour productivity rates of £123k GVA per employee (16).

From our data set we have identified 35 sites associated to the chemical sector in the North West at 1,022,506 tCO<sub>2</sub>e, this sector is the fourth highest contributor to the overall cluster emissions representing a 7.3% contribution.

### 4.2.3 Food and Drink

Food and drink accounts for 20% of total UK manufacturing. The Food and Drink Federation (FDF) organisation has stated that in 2018, the sector contributed almost £29 billion to the UK economy, equivalent to 2.3% national GVA. Over 440,000 people are directly employed by the industry across every region and nation in the UK, and it has a very complex supply chain (17).

From our data set we have identified 25 sites across the North West cluster producing a variety of human and pet food and beverages.

This sector emits 584,761 tCO<sub>2</sub>e, representing 4.2% of total cluster emissions (sixth highest).

### 4.2.4 Cement

Cement is used in construction to bind other materials together. Cement emissions contribute to climate change as approximately 50% of emissions of cement production come from limestone (CaCO<sub>3</sub>) calcination, which happens at high temperatures in a cement kiln to produce lime (CaO). This leads to a release of waste in the form of CO<sub>2</sub>, called process emissions. A further 40% of cement emissions come from burning fossil fuels to heat kilns for the calcination process, and around 10% from fuels needed to mine and transport raw materials.

There are 12 manufacturing and 2 grinding/blending plants in the UK cement industry contributing £1 billion to the UK economy.

From our data set we have identified 6 cement sites in the North West accounting for the second highest sector contributor of CO<sub>2</sub> emissions, 2,734,941 tCO<sub>2</sub>e; 19.6% representative total emissions.

### 4.2.5 Glass

The UK large scale glass manufacturing industry includes 10 companies with 17 sites throughout England, Scotland, and Northern Ireland.

The glass industry employs around 6,000 direct staff and indirectly around 150,000 (18).

The glass industry is split into three categories:

1. **Container** – food and drink and pharmaceutical products.
2. **Flat glass** – used in commercial and residential buildings for glazing.
3. **Fibre** – used in numerous manufacturing applications such as wind turbine blades.

Emissions are reported as 1.5m tCO<sub>2</sub> of Emission Trading Scheme (ETS) (site emissions reported under the ETS).

From our data set we have identified 8 glass sites based in the North West. Collectively they account for 473,258 tCO<sub>2</sub>e, equivalent to 3.92% total cluster emissions, which is the ninth highest.

#### 4.2.6 Iron and Steel

In 2020, the UK steel industry contributed £2 billion to the UK economy in terms of GVA. This was equivalent to 0.1% of total UK economic output and 1.2% of manufacturing output. There are 1,100 businesses in the UK steel industry and in 2019 they produced 7 million tonnes of steel.

The steel industry is a significant contributor and is responsible for 13.5% of GHG emissions from manufacturing and 2% of total UK GHG emissions (19).

From our data set we have only identified one site in the North West which manufactures approximately 500,000 tonnes of metallic coated and pre-finished steel per year. This site emits 54,913 tCO<sub>2</sub>e, equivalent to 0.4% of total cluster emissions.

#### 4.2.7 Paper and Pulp

The paper and pulp industry comprises of companies that use wood as raw material and produce pulp, paper, paperboard, and other cellulose-based products.

BEIS has projected that the paper, pulp and print industry will reduce emissions from 1.4 MtCO<sub>2</sub>e in 2020 to 1.3 MtCO<sub>2</sub>e by 2040 (20).

From our data set we identified 21 sites operated by 15 businesses in the North West providing a variety of pulp, paper, and paperboard. Collectively they account for 555,131 tCO<sub>2</sub>e, equivalent to 4% of total cluster emissions (eighth highest).

#### 4.2.8 Pharmaceuticals

The pharmaceutical industry plays a pivotal role in the health of all lives. In 2019, the annual turnover of pharmaceutical wholesalers in the UK was over £51 billion. The UK pharmaceutical market is among the global top 10 national markets, holding 2.5% of the global pharmaceutical market (21).

The pharmaceutical industry has its own unique decarbonisation challenges: a new drug can take significant time and resources to develop, test and take to market. In addition, the varying number of chemical components means they have complicated supply chains. There is inconclusive evidence at this time to demonstrate whether the pharmaceutical industry understood its UK impact on climate change in the form of tonnes (t) or Mega tonnes (Mt) CO<sub>2</sub>e from any baseline year, as findings indicate emission tools have been developed and rolled out but returned no high-level figure. Results indicate that this industry is greater than that of the automotive industry. The NHS estimates medicines account for 25% of total emissions from the health service, currently equivalent to 4% of England's total carbon footprint (22).

From our data set we identified 5 companies operating across 7 sites in the North West, collectively they emit 139,120 tCO<sub>2</sub>e, equivalent to 1% of total cluster emissions.

#### 4.2.9 Power Producers

There are several operational power stations in the UK categorised by generation type. The following graph is cited from [www.statista.com](http://www.statista.com):

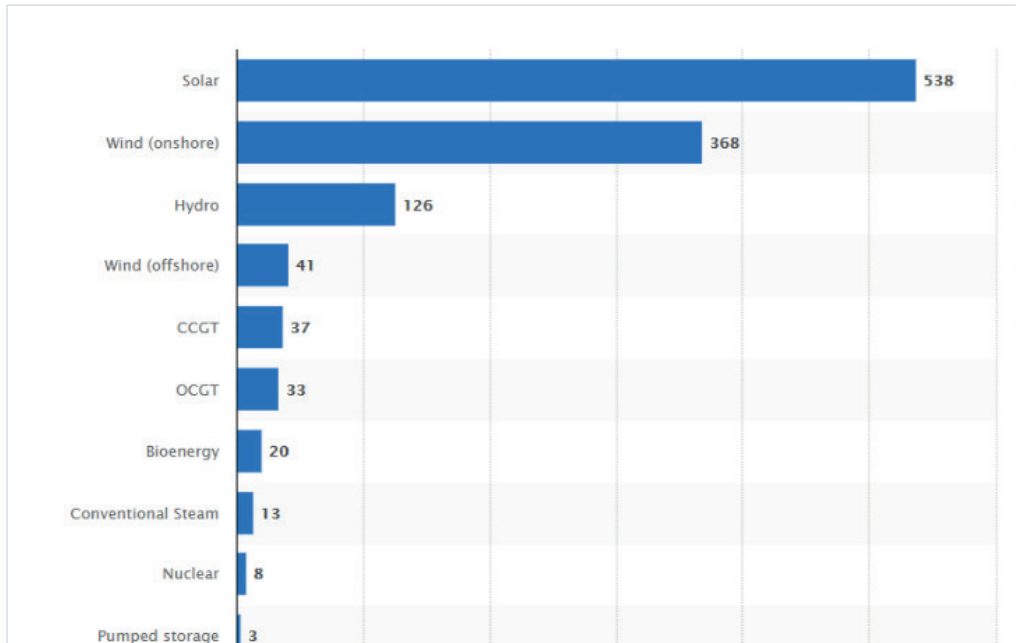


Figure 4 Number of operational power stations in the United Kingdom (UK) as of May 2020, by generation type (21)

#### According to the 2019 UK GHG Emissions, Final Figures, the report states:

*"[this sector] is estimated to have been responsible for 21% of UK greenhouse gas emissions in 2019, with carbon dioxide being by far the most prominent gas for this sector (94%)". (23)*

For comparison purposes, it should be noted that this categorisation includes emissions from electricity generation and other energy production activities such as mining, refining, and manufacturing fuels.

From our data set we identified 20 power producers based in the North West, collectively these sites emit 3,502,338 tCO<sub>2</sub>e, equivalent to 25% of total cluster emissions – the highest emitting sector. Aforementioned emissions for power producers in North West also include emissions from Fiddlers Ferry power station which closed in 2020. Total emissions have not been adjusted to take into account the closure of Fiddlers Ferry power station as this report does not investigate the net zero strategy for power producers (as this has been covered in the WP6 report).



### 4.3 Emissions Ranking

The below table ranks the highest emitters in the North West industrial cluster. The table illustrates that power producers, the cement industry and the oil refinery industry emit a total of 60% of the total industrial emissions within the North West. Therefore measures implemented across these sectors will have the largest impact to the overall cluster.

Sector	Scope 1 tCO <sub>2</sub> e	Proportion %
Major power producers	3,467,587	24.80%
Cement	2,734,941	19.56%
Oil refinery	2,201,520	15.75%
Chemicals	1,022,506	7.31%
Ammonia	710,047	5.08%
Food and drink	584,761	4.18%
Waste collection, treatment and disposal	570,783	4.08%
Paper and pulp	555,131	3.97%
Glass	473,258	3.38%
Gas	258,793	1.85%
Public administration	198,464	1.42%
Lime	184,116	1.32%
Pharmaceuticals	139,120	1.00%
Panel board	136,959	0.98%
Other industries	136,152	0.97%
Oil and Gas	99,095	0.71%
Automotive	84,836	0.61%
Ceramics	77,501	0.55%
Non-ferrous metal	59,012	0.42%
Other mineral industries	56,319	0.40%
Iron and steel	54,913	0.39%
Aerospace	53,968	0.39%
Gypsum and plasterboard	38,414	0.27%
Minor power producers	34,751	0.25%
Mechanical engineering	11,836	0.08%
Textiles, clothing, leather and footwear	11,450	0.08%
Commercial	7,664	0.05%
Airport	6,648	0.05%
Asphalt	4,824	0.03%
Processing oil	3,930	0.03%
Water and sewerage	1,916	0.01%

Table 3 NZNW Emissions Ranking

As can be seen from the references section and throughout this report, an extensive research exercise has been carried out to gather as much evidence to support the comparison study across the industrial sectors in North West England and North East Wales and the UK's emissions.

From investigative research, it is clear there is disparity between nationwide emissions data collection and transparency of reporting. In some circumstances, inconclusive evidence has been drawn due to several assumed factors:

- Emissions calculation methodology – different sectors require bespoke scientific applications.
- Reporting method of emissions – a sector may not have its own SIC code(s), and/or may be grouped by a wider categorical name.
- Consensus is that SMEs are behind in emissions reporting based on compliance activities such as SECR, ESOS, etc. where mandatory reporting is required for large organisations as defined by Companies Act 2006 (24).

## 4.4 Emissions Benchmark Assessment

This report assesses the extent in which companies in North West England and North East Wales produce emissions from Scope 1 and Scope 2. The following tables and figures illustrate the CO<sub>2</sub> emissions for the North West industrial sector and uses ETS 2019 data (25) and NAEI 2017 data (26).

The 'Other Industries' sector (in the tables below) is a combined figure of sectors not analysed within the report, whilst they contribute to 29.4%, individually these sectors have the least impact within the North West.

### 4.4.1 Scope 1

Most of the Scope 1 emissions come from power producing sites.

Sector	Scope 1 Emissions (tCO <sub>2</sub> e)	Scope 1 Emissions (%)
Automotive	84,836	0.6%
Cement	2,734,941	19.6%
Chemicals	1,022,506	7.3%
Food and Drink	584,761	4.2%
Glass	473,258	3.4%
Iron and Steel	54,913	0.4%
Paper and Pulp	555,131	4.0%
Pharmaceuticals	139,120	1.0%
Power producers	3,502,338	25.0%
Other industries	4,829,410	34.5%
Public administration	198,464	1.42%
Lime	184,116	1.32%
Pharmaceuticals	139,120	1.00%
Panel board	136,959	0.98%
Other industries	136,152	0.97%
Oil and Gas	99,095	0.71%
Automotive	84,836	0.61%
Ceramics	77,501	0.55%
Non-ferrous metal	59,012	0.42%
Other mineral industries	56,319	0.40%
<b>Total</b>	<b>13,981,214</b>	<b>100%</b>

Table 4 Scope 1 Emissions per Energy Intensive Sector

#### 4.4.2 Scope 2

In Table 5, the 'Other industries' sector produces most of the Scope 2 emissions in the North West England and North East Wales industrial sector, while no Scope 2 emissions are produced by both the major and minor power producing sectors.

Sector	Extrapolated Scope 2 Emissions (tCO <sub>2</sub> e)	Extrapolated Scope 2 Emissions (%)
Automotive	68,420	1.1%
Cement	322,708	5.2%
Chemicals	80,594	1.3%
Food and Drink	387,170	6.2%
Glass	86,637	1.4%
Iron and Steel	9,039	0.1%
Paper and Pulp	371,681	6.0%
Pharmaceuticals	137,152	2.2%
Power producers	00	0.0%
Other industries	4,745,018	76.4%
<b>Total</b>	<b>6,208,421</b>	<b>100%</b>

Table 5 Scope 2 Emissions per Energy Intensive Sector

#### 4.4.3 Total Emissions

Table 6 below shows that the 'Other industries' sector is responsible for most of the total CO<sub>2</sub> emissions, with the cement and power producing sectors also contributing a large amount of the remaining emissions.

Sector	Extrapolated Scope 2 Emissions (tCO <sub>2</sub> e)	Extrapolated Scope 2 Emissions (%)
Automotive	153,256	0.8%
Cement	3,057,649	15.1%
Chemicals	1,103,100	5.5%
Food and Drink	971,931	4.8%
Glass	559,895	2.8%
Iron and Steel	63,952	0.3%
Paper and Pulp	926,812	4.6%
Pharmaceuticals	276,272	1.4%
Power producers	3,502,338	17.4%
Other industries	9,574,429	47.4%
<b>Total</b>	<b>20,189,634</b>	<b>100%</b>

Table 6 Total emissions across industry

#### 4.4.4 Sample

A representative sample of sectors from the ETS and NAEI list were selected to build an energy saving dedicated plan for those respective sectors. The sectors below represent 58% of the total number of EII sites in the North West, around 58.3% of the emissions and provide a good reflective range of manufacturing processes and auxiliary equipment in the North West England and North East Wales industrial cluster. The selected sectors are listed in Table 7 below.

Sector	% Represented in the NW	N. Of sites	% of emissions in the NW	Total Emissions (teCO <sub>2</sub> e)
Automotive	3.91%	5	0.8%	153,256
Cement	4.69%	6	12.8%	2,579,166
Chemicals	27.34%	35	4.7%	957,762
Food and Drink	19.53%	25	4.8%	971,931
Glass	6.25%	8	2.8%	559,895
Iron and Steel	0.78%	1	0.3%	63,952
Paper and Pulp	16.41%	21	4.6%	926,812
Pharmaceuticals	5.47%	7	1.4%	276,272
Power producers	15.63%	20	17.3%	3,502,338
<b>Total Analysed Sectors</b>	<b>62.1%</b>	<b>128</b>	<b>49.5%</b>	<b>9,991,385</b>
<b>Total North West</b>	<b>100.0%</b>	<b>206</b>	<b>100.0%</b>	<b>20,189,634</b>

Table 7 Representative sample of the ETS and NAEI list