Combined Heat and Power in the regions

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Key headlines

The distribution of CHP across the UK continues to reflect each region's economic landscape, prevailing in areas with energy-intensive industries, such as Yorkshire and Humberside.

Reciprocating engines represent almost 90 per cent of CHP technologies, although only 114 gas turbines account for around 61 per cent of qualifying electrical capacity.

CHP generation of heat and power mostly stalled in 2021, although overall electricity and gas demand both increased (by 1.2 and 5.9 per cent respectively) as Covid-19 restrictions were eased.

Combined Heat and Power (CHP), sometimes referred to as cogeneration, is the simultaneous generation of electricity and heat resulting in improved efficiencies when compared to meeting electricity and heat demands separately. This article provides additional regional information on CHP using data produced in support of The Digest of UK Energy Statistics (DUKES), Chapter 7 (https://www.gov.uk/government/statistics/combined-heat-and-power-chapter-7-digest-of-united-kingdom-energy-statistics-dukes

Over the course of 2021, 66 new sites came online in the UK, accounting for around 55 additional MW of electrical capacity. Around a third of the new sites were located in North West and South East.

Figure 1. Number of schemes and capacity by region in 2021[1] (Table 1)

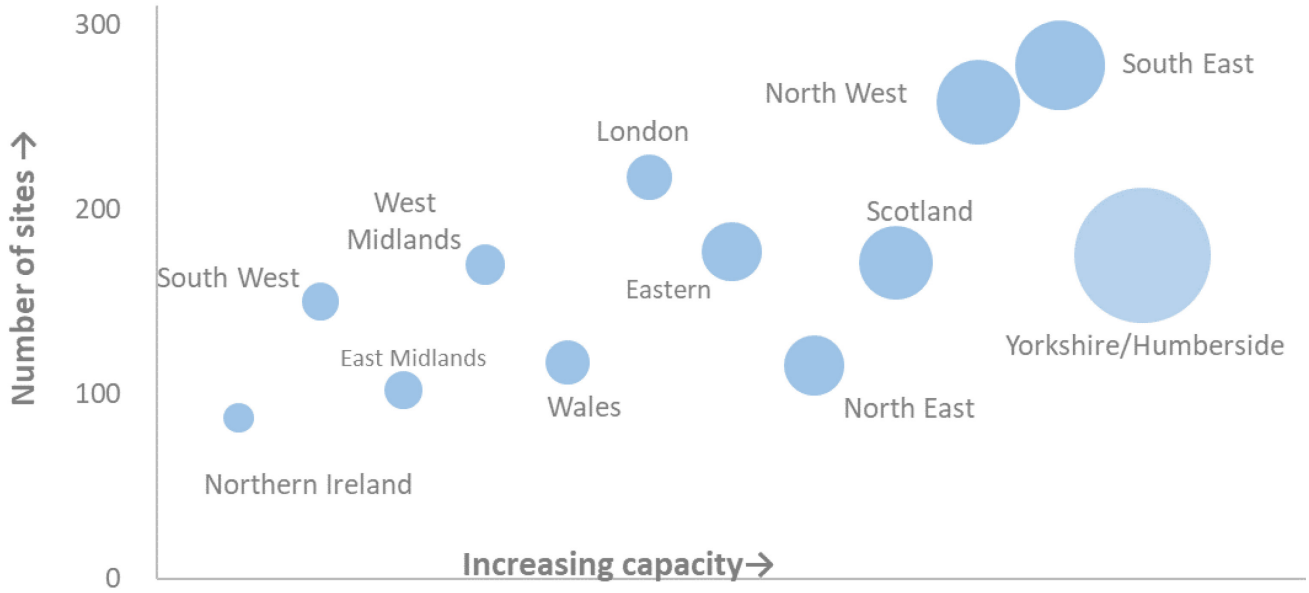
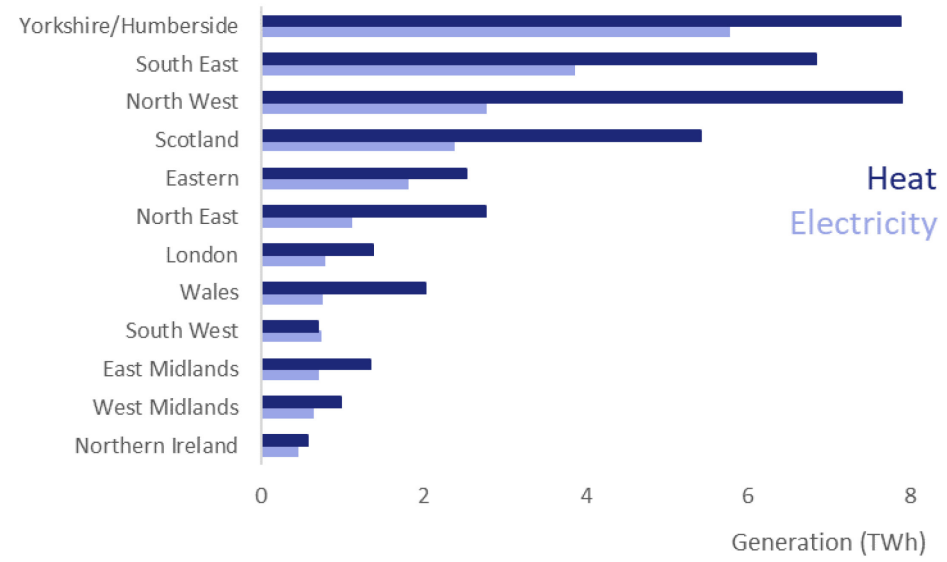


Figure 1 shows Yorkshire and Humberside has the highest CHP capacity including the UK's largest scheme resulting in the highest average capacity (Table 1) across the regions (11.4 MW, markedly higher than the next highest at 3.4 MW for the North East). Northern Ireland has the lowest average capacity (1.0 MW), and the region with the highest number of schemes is the South East (average capacity at 3.2 MW).

[1] Prior to publishing DUKES, BEIS undertook a methodology change for CHP statistics, which is summarised in the methodology annex at the end of the article. These changes entailed removing a number of sites from the tables and can influence some year-on-year trends.

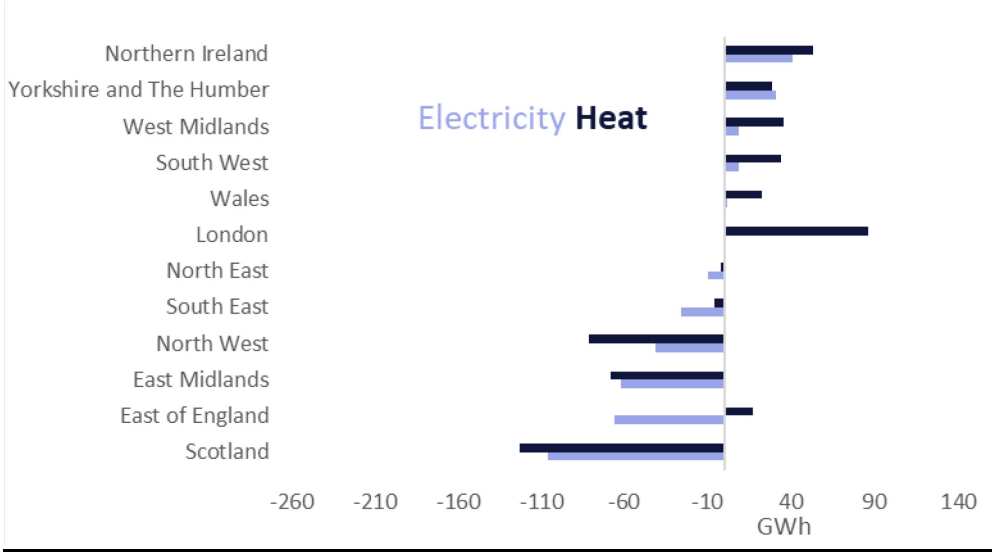
Yorkshire and Humberside represents just over a quarter of total electricity generation though the Northwest accounts for the highest share of heat (20 per cent). (Table 2).

Figure 2. Heat and electricity generation by region in 2021



UK wide, both electricity and heat outputs remained stable between 2020 and 2021, though there were regional variations.

Figure 3. Net change between 2020 and 2021 for heat and electricity outputs



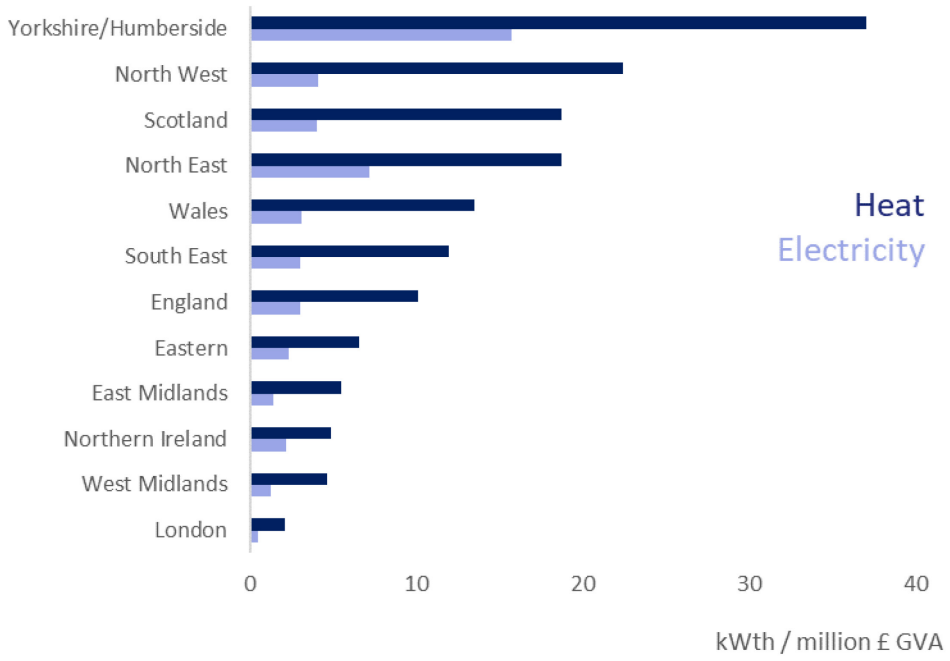
For most regions, heat and electricity generation varied with similar growth rates. Where the trends differ it tends to reflect the nature of the sectors where the CHP schemes are installed. For example, London saw a net increase of 86 GWh in heat generation between 2020 and 2021, the highest among the regions in absolute terms, but electricity generation remained unchanged. This discrepancy can be likely explained by a recovery of sectors with a strong prevalence of community heat schemes (such as hospitality, leisure and office buildings), which make up a considerable proportion of CHP schemes located in urban areas.

Table 5 shows the distribution of capacity across the different sectors and regions with London accounting for almost half of all capacity in the electricity, gas, steam and air conditioning supply sector which includes district and community heating schemes. The chemicals sector which, along with oil refineries, is suitable for CHP, is concentrated in the North East, the North West and Yorkshire and Humberside; taken together these regions account for over 80 per cent of CHP capacity in those sectors.

The large share of capacity employed in vehicle manufacture in the West Midlands is in line with the importance of this region to the automotive sector. More than a third of all capacity in the food and drink sector is in the Eastern region reflecting the large heat demands associated with sugar manufacture. The concentration of large horticultural sites (i.e. Greenhouses) in South East England helps to explain the deployment of 46 per cent of all agricultural capacity in this region. The distribution of capacity serving public administration, mostly hospitals and education, tends to align with population density.

To determine CHP's contribution relative to how much a sector contributes to the regional economy as a whole, capacity per unit of GVA is compared in Table 4 and Figure 4 below. Yorkshire and Humberside represents the highest proportion reflecting not only the concentration of favourable CHP sectors in that region (particularly oil refining on the Humber Estuary) but also its high share of the regional economy. Conversely, although CHP capacity in the vehicle sector is concentrated in the West Midlands (58 per cent), vehicle manufacturing represents a comparatively lower share of the regional economy.

Figure 4. Relative importance of CHP in the regional economies in 2021



Tables 6 and 7 show the regional split of installed qualifying electrical capacity by prime mover (Table 6) and by size range (Table 7). At this level of disaggregation, some regions show only the totals to prevent disclosure due to the small number of sites.

Gas turbines, whether on their own or as part of Combined Cycle Gas Turbines (CCGT), continue to account for the bulk of CHP capacity. In 2021, just 114 schemes of the CCGT and Open Cycle Gas Turbine (OCGT) technologies accounted for 61 per cent of total qualifying CHP capacity.

Reciprocating Engines represent 89 per cent of all schemes, but only 28 per cent of qualifying capacity. London, the South East and the North West account for 38 per cent of these schemes, specifically in high population density areas with high heat demand from leisure centres, hotels and retail outlets, suited to the capacity range and heat grade offered by reciprocating engines.

Future plans

This article is based on data produced for Chapter 7 of DUKES, and in the interests of timeliness, BEIS is planning to bring forward publishing the regional data tables accompanying this article to align with DUKES commencing 2023.The intention is that the tables will form an additional regional Excel workbook, and the article text will be condensed and will either form a short section of Chapter 7 or be contained in a 'Highlights' tab within the workbook.

Methodology Annex: Removal of legacy schemes.

For the current publication cycle, BEIS has taken a decision to remove old ("legacy") schemes from the database if no new data has been received in the preceding nine years. Prior to this decision, schemes that no longer submitted data were carried forward indefinitely, and generation was estimated using the most recent submission available.

These changes were implemented in the 2022 edition of DUKES resulting in some step changes and an artificial downward trend in the data. The changes were applied on a rolling basis from reference year 2019 only, meaning that a first large step change occurs between 2018 and 2019. Moreover, as the nine-years cut-off window rolls forward every year, there are revisions for the following years too. Another step change is apparent between 2020 and 2021, the result of a large number of schemes being added in 2012. As the nine-year limit has now passed with no new data being received, these have now been removed.

A total of 734 schemes has been identified whose last submission pre-dates 2012, with most of them being rolled over as estimates. Although numerous, these sites are mostly fairly small in terms of capacity and generation, so the observed impact is less apparent. Table A below shows the impact on the number of schemes and associated capacity by region. London represented over a third of the schemes removed, while Northern Ireland was the only region which saw a net increase in the number of schemes in 2021. Combining Table A with Table 1 in the accompanying spreadsheet, the artificial trends introduced can be isolated to reveal the underlying trends in the data.

Table A. Breakdown of number and capacity of schemes removed.

	Number of schemes removed			Capacity removed (MWe)		
	2019	2020	2021	2019	2020	2021
East Midlands	25	3	17	9.3	0.6	2.7
East of England	25	13	9	2.8	1.3	1.5
London	53	7	107	9.8	0.7	32.7
North East	11	2	16	0.8	0.2	2.0
North West	51	6	32	5.1	0.8	8.3
South East	45	18	24	5.9	1.7	4.0
South West	26	5	16	4.4	0.8	5.4
West Midlands	37	6	25	2.6	0.8	6.6
Yorkshire and The Humber	26	7	24	22.5	1.0	15.9
Scotland	22	4	13	3.1	1.5	2.2
Wales	21	6	11	1.7	0.4	1.8
Northern Ireland	17	2	2	6.7	1.4	0.2
Total removed	**359**	**79**	**296**	**74.6**	**11.2**	**83.3**
% of current	**16.2%**	**3.5%**	**14.7%**	**1.2%**	**0.2%**	**1.4%**

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