

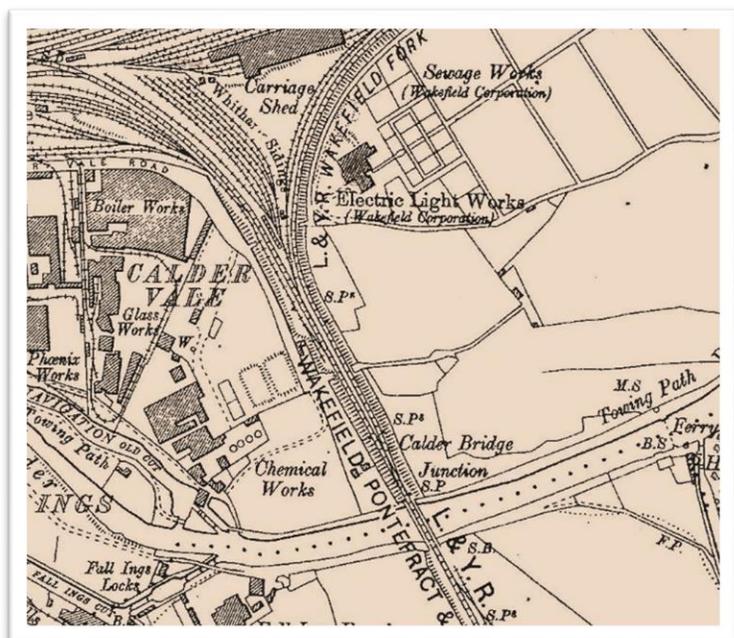
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THE YORKSHIRE ELECTRICITY BOARD AREA

Regional and Local Electricity Systems in Britain

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WAKEFIELD

An early municipal AC system (60Hz) system opened in 1897. Peak capacity of 15,750kW was reached in the mid-1920s. A large substation for the 132kv national grid was built in the open space south of the power station. When Wakefield B station (240,000kW), on the south bank of the River Calder, was completed in 1957, the original plant was shut down.

Ordnance Survey, Six Inch Map Series, Yorkshire, CCXLVIII.NE, 1905 (Author's Collection)

Introduction

Public electricity supplies began in Britain during the 1880s. By 1900 most urban places with over 50,000 population had some form of service, at least in the town centre. Gradually the isolated points on the national map began to coalesce, especially when the national grid helped local organisations to connect small towns, villages, and eventually farms.

In the process of electrification, hundreds of municipal and company organisations developed local and sometimes regional systems. Before nationalisation in 1948, however, there was little consolidation of areas.

The study of British electricity systems is a remarkably daunting task. While there is a rich legacy of detailed annual surveys, these publications have to be tracked down. The user is then faced with immense alphabetical listings of all sorts of enterprises, often in places that no longer have much meaning except to local residents. Since there are few contemporary maps, listing and grouping the electricity organisations geographically is difficult and often time-consuming.

These notes are offered as an outline guide to the pre-1948 local authorities and companies that developed electricity supplies in the Yorkshire Area.

The Yorkshire Electricity Board Area

The area was first defined by the Ministry of Fuel and Power in a White Paper published in January 1947, a month before debate began on the Electricity Bill.¹ Fourteen area boards were to be established for electricity distribution or retailing. Generation and transmission were to be the responsibility of the British Electricity Authority.

Each area board was defined to provide a diversity of load between urban and rural areas and, where possible, avoided cutting across distribution networks. In detail the Yorkshire Area included parts of Derbyshire, Lincolnshire, Nottinghamshire and of the East and West Ridings of Yorkshire.²

Constituents of the Yorkshire Electricity Board Area

When the Yorkshire Electricity Board began operations on 1 April 1948 it incorporated the services and areas of 41 local authorities and 8 companies. The constituent areas varied enormously in size. The Yorkshire Electric Power Co. covered an area of over 2,000 square miles while the Heckmondwike Urban District occupied only 696 acres. Grimsby Corporation's electricity department served an area of about 310 square miles, many times larger than the 8.5 square miles of Grimsby County Borough.

With an area of about 4,094 square miles and an estimated population of about 4.5 million, the Yorkshire Electricity Board Area covered every type of district from industrial towns to seaside resorts. The distinctive economic geography of the region resulted in a high proportion of industrial sales (61.5 percent) and a correspondingly low proportion of domestic sales (26.4 percent).³

¹ Ministry of Fuel and Power, *Electricity Supply Areas*, Cmd 7007. (London: HMSO, 1947).

² Electricity Act 1947, 10 & 11 Geo 6, Ch 54, First Schedule.

³ The averages for the area boards in England and Wales were 34.5 percent domestic and 50.2 percent industrial in 1948/49. Calculated from data in Electricity Council, *Handbook of Electricity Supply Statistics* 1977 edition, pp.64-65.

The head office of the Board was established at Scarcroft Lodge, a former mansion located between Leeds and Wetherby. The property had been bought by the Yorkshire Electric Power Co. in 1945.

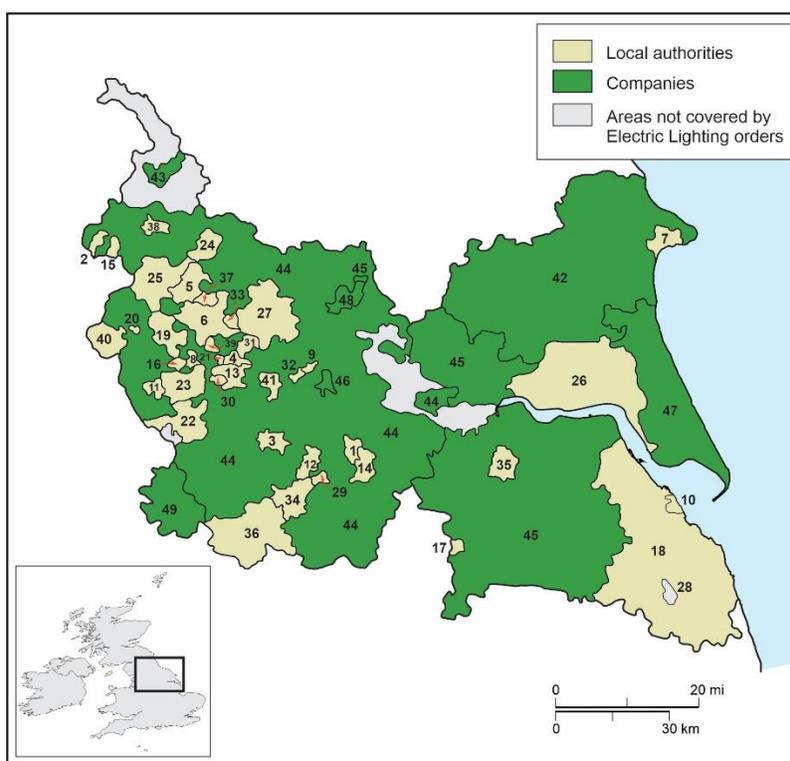


Figure 1 Constituent Areas of the Yorkshire Electricity Board, 1948.

Development of Electricity Supply Areas

The 1948 pattern illustrated in **Figure 1** represented the climax of over 50 years of development. Unusually for an innovation, electricity for public supply was subject to tight national regulations from an early stage. The Electric Lighting Act 1882 required “undertakings” to apply for a licence or provisional order from the Board of Trade.⁴ This requirement followed the precedents for earlier public utilities that had to “break up the streets” to lay mains or tracks. Electric Lighting Orders provided the basic conditions of a franchise to operate within a defined area, limiting the maximum prices that could be charged to consumers and, for private companies, a time limit of 21 years after which the local authority could purchase the system. An amendment in 1888 extended the time period to 42 years. All the Electric Lighting Orders were subject to Parliamentary approval. Major changes such as amalgamation of companies and extension of area required special acts.

Only a few public electricity systems were established under the 1882 Act. By 21 December 1882 the Board of Trade had received 109 applications for Electric Lighting Orders. After scrutiny by the office and Parliament, 69 ELOs were granted to local authorities and companies. Eight of these came to fruition over the next decade, while the others were abandoned as the early optimism waned given the uncertainties of the market for electricity and the limitations of early technology.

⁴ Basic details of this Act and subsequent legislation are outlined in *Electricity Supply in Great Britain: A chronology* (London: Electricity Council, 1977).

Table 1 Yorkshire Electricity Board Area Constituent Undertakings 1948.

Map #	Local Authorities
1	Adwick-le-Street UD
2	Barnoldswick UD
3	Barnsley CB
4	Batley MB
5	Bingley UD
6	Bradford CB
7	Bridlington MB
8	Brighouse MB
9	Castleford UD
10	Cleethorpes MB
11	Colne Valley UD
12	Dearne District EB
13	Dewsbury CB
14	Doncaster CB
15	Earby UD
16	Elland UD
17	Gainsborough UD
18	Grimsby CB
19	Halifax CB
20	Hebden Royd UD
21	Heckmondwike UD
22	Holmfirth UD
23	Huddersfield CB
24	Ilkley UD
25	Keighley MB
26	Kingston-upon-Hull CB
27	Leeds CB
28	Louth MB
29	Mexborough UD
30	Mirfield UD
31	Morley MB
32	Normanton UD
33	Pudsey MB
34	Rotherham CB
35	Scunthorpe MB
36	Sheffield CB
37	Shipley UD
38	Skipton UD
39	Spensborough UD
40	Todmorden MB
41	Wakefield CB
	Companies
42	Buckrose Light & Power Co. Ltd
43	Craven Hydro-Electric Supply Co. Ltd
44	Electrical Distribution of Yorkshire Ltd
45	North Lincolnshire & Howdenshire Electricity Co. Ltd
46	Pontefract Electricity Co. Ltd
47	South East Yorkshire Light & Power Co. Ltd
48	Tadcaster Electricity Co. Ltd
49	Yorkshire Electric Power Co. Ltd

Key to Abbreviations

CB: County Borough

EB: Electricity Board

EL Co: Electric Light Company

ES Co: Electricity Supply Company

MB: Municipal Borough

UD: Urban District

Six of the applications in 1882 came from the Yorkshire Area, three from local authorities and three from companies. Leeds and Sheffield Corporations withdrew their applications while the company proposals for Bradford and Sheffield (Union Electric Light & Power Co.) and Wakefield (Lancashire & Yorkshire Electric Lighting Co.) were, however, "...not considered as the provisions of the Act had not been complied with".⁵ Bradford Corporation was granted an Electric Lighting Order and began a public supply in 1889, the first local authority in Britain to achieve this.⁶

Although general urban electrification failed to take off in the region, private systems began to develop. Private generation provided a market for electrical equipment, helped the training of workers, and gave opportunities to refine details of the new technology.

By 1882 it was noted that in Kitson & company's Airedale Foundry "[t]he electric lighting is largely used in the works, notwithstanding its costliness as compared with the cheap gas of Leeds".⁷ Other early installations included the Leeds municipal buildings and library (1884-85)⁸; Marshall, Sons & Co. Britannia Iron Works, Gainsborough (1885)⁹; and Nostell Priory (1887) where a supply was provided by the adjacent colliery. Nostell Colliery was active in experimental work with electric coal cutting machines in the late 1880s.¹⁰

Unlike neighbouring regions, none of the cities in the Yorkshire area staged a jubilee exhibition. This was left to Saltaire which held the Royal Yorkshire Jubilee Exhibition in 1887.¹¹ Although featuring an electric lighthouse among the displays, it was overshadowed by the much larger exhibition that year in Manchester.

Public electricity supply schemes began to take off in 1889-90 when applications for Electric Lighting Orders resumed. Nationally, there were 17 applications in 1889 and 161 in 1890. Seven applications from the Yorkshire Area were submitted to the Board of Trade for the 1890 Parliamentary session.¹² Three Electric Lighting Orders were granted to the Corporations of Barnsley, Huddersfield and Kingston-upon-Hull. All the company applications—one for Dewsbury and three for Leeds—were rejected.

While Bradford had chosen the municipal option for local electricity supply, the Leeds Council was unable to make a decision until, at a meeting on 17 April 1891, it finally agreed to support the application of the Yorkshire House-to-House Electricity Co. Parliament approved the grant of an ELO on 3 July.¹³ Now with the grant of legal power to break up streets for laying mains, the company began raising capital and building a generating and distribution system which opened in 1893. Huddersfield and Hull¹⁴ also completed their systems at this time, while Barnsley delayed work until 1900.

⁵ "Report by the Board of Trade respecting the applications to and Proceedings of, the Board of Trade under the Electric Lighting Act 1882," *Parliamentary Papers* 1883. HC 237.

⁶ J.D. Poulter, *An early history of electricity supply: The story of the electric light in Victorian Leeds* (London: Peter Peregrinus, 1986), pp.95-98.

⁷ Institution of Mechanical Engineers, *Proceedings*, 1888, p.458. In addition to his work in Leeds, Sir James Kitson (1835-1911) served as Liberal MP for Colne Valley 1892-1907. The so-called "Kitson Clause" which safeguarded the rights of existing company and local authority undertakings facilitated the passing of the first group of Power Company Acts in the 1900 Parliamentary Session.

⁸ Poulter (1986), pp.75-80.

⁹ I.Mech.E. *Proceedings*, 1885, p.450.

¹⁰ David Stewart Cross, "Coal mining on a Yorkshire estate: land ownership and personal capitalism 1850-1914". PhD thesis, Sheffield Hallam University, 2015, pp.187-192.

¹¹ Letitia Lawson, "The Royal Yorkshire Jubilee Exhibition 1887", *The Bradford Antiquary* Series 3, Vol.16, 2012.

¹² Board of Trade, Proceedings under the Electric Lighting Acts, *Parliamentary Papers* 1890. HC273.

¹³ Poulter (1986), pp.75-80. The House-to-House company with its regional affiliates was very active between 1889 and 1891 when it promoted applications for 54 Electric Lighting Orders. Only three, in Brompton & Kensington, Leeds and Coatbridge resulted in a local electricity system. Five other ELOs granted were later revoked by the Board of Trade for lack of action.

¹⁴ K.J. Allison, ed. *Victoria County History, Yorkshire, East Riding, Vol.1: The City of Kingston-upon Hull* (London, 1969), p.374.

While the Board of Trade developed regulations for safety, inspected and approved new systems as well as collecting annual returns, the Board provided no guidance on general policy or technical matters. These were left to the operator and consulting engineer to decide. Consequently after 1888 large numbers of fragmented operators developed DC and AC systems with little attempt at co-ordination. AC systems with frequencies varying from 25 cycles (Hz) to 100 cycles were established. The lack of standardisation would be a major problem when interconnection between areas became advantageous.

An outline of development is presented in three phases: local initiatives from the 1880s to World War I, state intervention to the 1940s, and nationalisation from 1948.

I Local Initiatives

Figure 2 and **Table 2**, derived from a rare map of electricity undertakings in the British Isles, provide a snapshot of the development of public supply areas over the previous three decades.

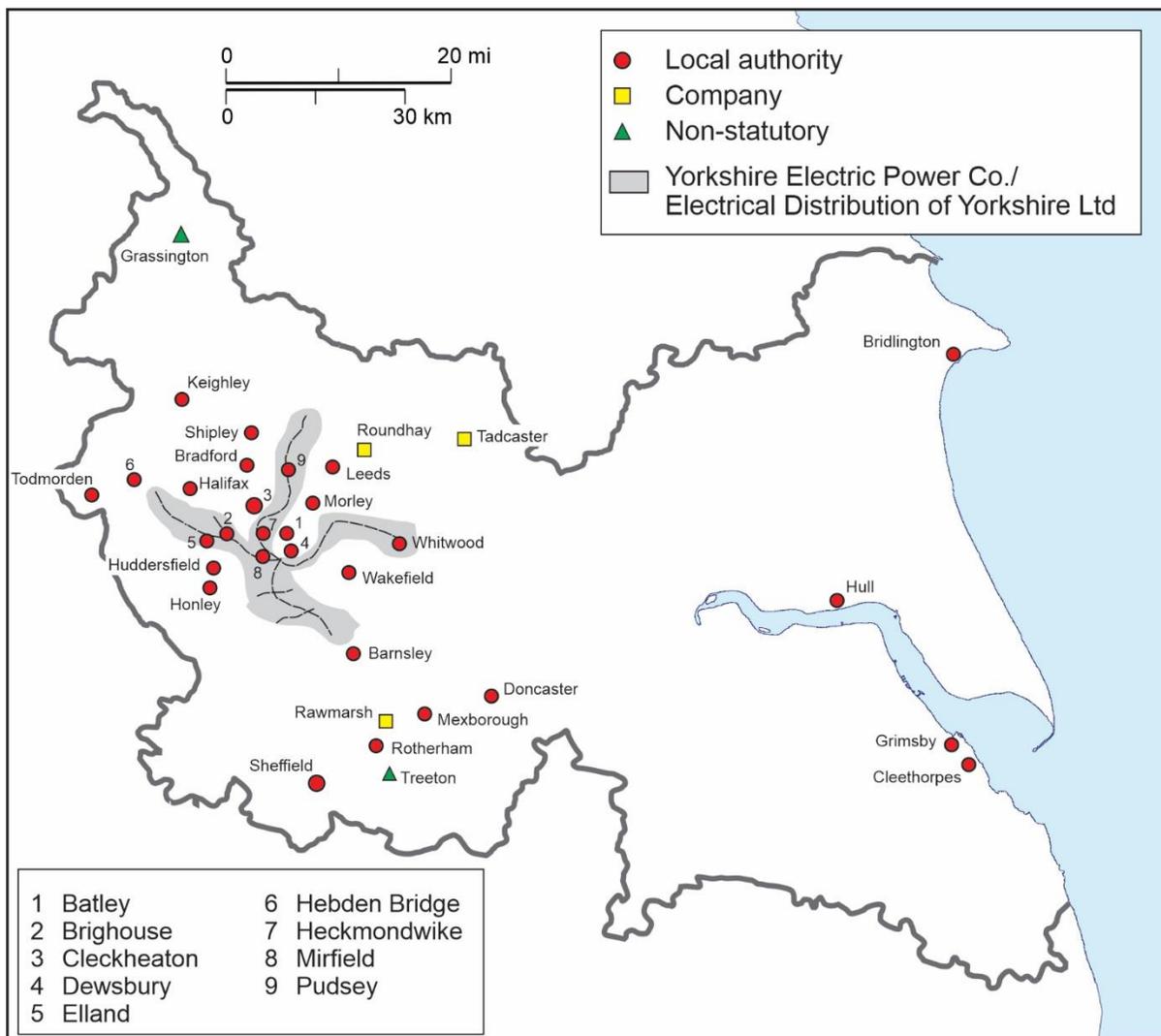


Figure 2 Yorkshire Area: Electricity Undertakings c1912.

Table 2 Yorkshire Electricity Board Area Electricity Supply Undertakings c.1912.

UNDERTAKING	COUNTY	SUPPLY BEGAN
Local Authorities		
Barnsley CB	Yorks, WR	1900
Batley MB	Yorks, WR	1903
Bradford CB	Yorks, WR	1889
Bridlington MB	Yorks, ER	1905
Brighouse MB	Yorks, WR	?
Cleckheaton UD	Yorks, WR	1902
Cleethorpes MB	Lincs, Lindsey	1912
Dewsbury MB	Yorks, WR	1894
Doncaster MB	Yorks, WR	1900
Elland UD	Yorks, WR	1903
Grimsby CB	Lincs, Lindsey	1901
Halifax CB	Yorks, WR	1894
Hebden Bridge UD	Yorks, WR	1904
Heckmondwike UD	Yorks, WR	1901
Honley UD	Yorks, WR	1903
Huddersfield CB	Yorks, WR	1893
Keighley MB	Yorks, WR	1901
Kingston-upon-Hull CB	Yorks, ER	1893
Leeds CB	Yorks, WR	1893
Mexborough UD	Yorks, WR	1902
Mirfield UD	Yorks, WR	1905
Morley MB	Yorks, WR	1898
Pudsey MB	Yorks, WR	1905
Rotherham CB	Yorks, WR	1901
Sheffield CB	Yorks, WR	1893
ShIPLEY UD	Yorks, WR	1901
Todmorden MB	Yorks, WR	1905
Treeton N/S ¹	Yorks, WR	1897
Wakefield MB	Yorks, WR	1897
Whitwood UD	Yorks, WR	1911
Companies		
Electrical Distribution of Yorkshire	Yorks, WR	1906?
Grassington N/S	Yorks, WR	1910
Rawmarsh	Yorks, WR	1907
Roundhay	Yorks, WR	1904
Tadcaster	Yorks, WR	1902
Yorkshire Electric Power Co.	Yorks, WR	1904

Notes:¹Parish Council in Rotherham Rural District

N/S non statutory undertaking (outside 1882/1888 Acts).

Source: "Map showing Electric Lighting, Power and Traction Undertakings in Operation." Supplement to *Garcke's Manual of Electrical Undertakings*. Undated but c 1912. [Copy from National Library of Scotland]

The 30 local authorities were clear examples of local initiative in developing electric light and power. Sheffield Corporation (population 478,939 in 1911) was the largest of the local authorities. Honley Urban District (population 4,639) was the smallest. Bradford was the first local authority in the region to open a system in 1889. Leeds and Sheffield had both begun an electric service with private companies in

1893 and had taken them over five years later. The Treeton non-statutory system was a small public lighting service owned by the parish council.¹⁵

The six companies in the Yorkshire Area were very varied in scale and location. Roundhay & District Electric Light Co. served a suburban area on the northeastern fringes of Leeds, while the Tadcaster company supplied a small country town dominated by two large breweries. Rawmarsh's lighting needs were provided by the Mexborough & Swinton Tramways Co. The Grassington non-statutory system was associated with the local woollen mill.

In contrast to these small-scale operations the Yorkshire Electric Power Co. covered an extensive territory in the West Riding. The Act of 1901 empowered the company to provide supply to large industrial customers and bulk supply to authorised undertakings. Unlike the usual 42-year franchises granted to companies under the Electric Lighting Act 1888, the power company Acts had no time limits. Generation began at the Thornhill power station (6,000kW) in December 1904 and a second station at Barugh Green near Barnsley was in service by 1912. A subsidiary company, Electrical Distribution of Yorkshire was formed in 1905 to hold Electric Lighting Orders and therefore be able to provide local service to all types of customers. By 1912 the company held ten ELOs and the Power Co. was also providing bulk supply to the local authorities in Brighouse, Mirfield, Pudsey and Ranthorpe. The company founders were mainly from the Leeds business elite, including Arthur G. Lupton who served as chairman until 1930. W.G. Woodhouse (1873-1940) provided long-term continuity as general manager and chief engineer from 1903 until 1940.¹⁶

Electrification in the region around 1912 was still incomplete, with only a small part covered by Electric Lighting Orders. Some towns still unserved included Gainsborough (population 20,557 in 1911), Scunthorpe & Frodingham (19,360), Beverley (13,654), Skipton (12,977) and Holmfirth (10,575). Goole (20,332) and Pontefract (15,949) were in process of development and a system in each town was opened in 1914. Electrical Distribution of Yorkshire provided the service in Goole while the Yorkshire (West Riding) Tramways owned the system in Pontefract and took a bulk supply from the Yorkshire Electric Power Co.

Lighting was still the dominant use for electricity until the late 1890s. The most profitable demand was in shops, offices, hotels, theatres (and later cinemas) and public buildings. Residential sales were more limited by the expense of installation and the high retail prices. With lighting, much of the load on generating equipment was confined to the evening hours, a feature that also contributed to the high prices. Diversification of the load, especially in the daytime, was essential if electricity was to become a viable alternative to gas. Such diversification began with the electrification of tramways and the substitution of electric motors for small steam engines and manual power.

The limitations of DC supply systems became apparent to larger undertakings after 1900 and in the search for economies of scale the introduction of more efficient prime movers became a priority. Bradford, for example, began AC generation in 1907 and two years later began installing turbines which gradually replaced the reciprocating steam engines.¹⁷ Mixed AC/DC systems became increasingly common from this time. Conversion to a full AC system was, however, a long process; Bradford and Hull still had some DC customers as late as 1957.

¹⁵ *The Engineer*, Vol.84, 1897, p.423. The local colliery supplied the electricity.

¹⁶ "William Bradley Woodhouse obituary", *The Engineer* Vol.169, 1940, p.337.

¹⁷ "Bradford power station extensions and jubilee", *The Engineer* Vol.184, 1947, p.291.

Neepsend power station of the Sheffield Corporation (capacity 3,000kW), opened in 1904, was the first all-turbine AC plant in the region.¹⁸ Unlike earlier power stations built in city centres, Neepsend was located on the urban edge with immediate access to the railway and River Don for cooling water. The Thornhill power station, built by the Yorkshire Electric Power Co. and opened in December 1904, followed a similar location pattern. Both stations worked at a frequency of 50Hz which was becoming the national standard.

The 1912 data do not cover private generation which was very important at the time, not only in isolated establishments but also in urban centres where there was already a public supply. Some examples are outlined here to give a sense of the scale and scope of private generation otherwise absent in most accounts of electrification.

Engineering and metal-working industries frequently generated their own power requirements. This was evident at the Leeds Steel Works, a major producer of tram rails, as well as at the Leeds Copper Works, Stourton on the southern outskirts of the city. With a capacity of 8,000kW, the copper works was very similar in size to the Whitehall Road generating station owned by Leeds Corporation.¹⁹ In Scunthorpe the iron and steel plants used some of the waste heat from blast furnace gas and exhaust steam from blowing engines for generating their own electricity needs.

Railway companies adopted electricity for station lighting as well as yards and warehouses. The Midland Railway for example had small installations at Bradford, Hunslet (Leeds) and Sheffield by 1898.²⁰ Doncaster locomotive and carriage works in the centre of the town generated all its lighting and power requirements onsite. Immingham Dock, opened in 1912, had the largest railway-owned power station in the region. The initial capacity of 2,500kW was raised to 6,500kW by 1936.²¹

Hotels were early in adopting electric lighting as one of the amenities of high-class hospitality. The resorts and spas of the region were however slow in developing public supply systems. Bridlington Corporation opened a system in 1905, Cleethorpes in 1912 and Ilkley in 1915. Some of the larger establishments in Ilkley may have been generating their own power by 1900.

Other large institutions of a different type were also introducing electricity. The West Riding Asylum at Menston electrified the branch line serving the hospital with coal and supplies in 1897. When opened in 1903, the Hunslet Union Workhouse at Rothwell, Leeds had its own electric lighting station with a capacity of 82kW. Other workhouses in the region were slow to adopt; Bridlington and Pontefract were still without electricity when the Boards of Guardians were abolished in 1930.²²

Throughout the region, country houses, estates and large farms added electricity. Harewood House began generating its own light and power in 1900-01 using a combination of a hydro-electric turbine and an oil engine. The estate switched to mains supply from Electrical Distribution of Yorkshire in 1931.²³

¹⁸ Frank C. Perkins, "Neepsend (Sheffield) turbo-electric station", *Western Electrician* [Chicago], Vol.XXXV, 1904, pp.167-168.

¹⁹ I.Mech.E. *Proceedings*, 1903, p.600.

²⁰ I.Mech.E. *Proceedings*, 1898, pp.562-563.

²¹ *The Engineer*, Vol.113, 1912, p.601; I.Mech.E. *Proceedings*, 1936, p.207.

²² Peter Higginbotham, *The workhouse encyclopedia* (Stroud: The History Press, 2012), p.92.

²³ Michael Kay and Graeme Gooday, "From hydro-electricity to the National Grid: Harewood House and the history of electrification in Britain", *History of Retailing and Consumption* Vol.4(1), 2018, pp.43-63.

As the centre of armaments production in Britain, Sheffield industry expanded on a massive scale in World War I.²⁴ This was reflected in the Corporation's electricity sales which increased from 26.5million kWh in 1914 to 177.5m kWh in 1918.²⁵ The widespread adoption of electric arc furnaces for steel making was an important factor in this dramatic increase. To cope with the demand, generating capacity at the Neepsend station was expanded and a new station was built at Blackburn Meadows. Rotherham also experienced heavy demand for power, especially from the Templeborough milling shop and rolling mill which required 10,000kW. Generating capacity in Rotherham, only 5,150kW in 1914, was increased to 15,500kW in 1916 and construction of a new power station began later but was not commissioned until after the war.²⁶

Problems of electricity supply were recognised by the Ministry of Munitions which created an Electric Power Supply Department in June 1916. In addition to coping with day-to-day issues the Department examined some larger regional-scale issues including a scheme for linking the Don Valley and Lincolnshire steel-making centres with a power station on the Trent. A joint report from Sir John Snell and C.H. Merz was commissioned²⁷ which formed the basis for designation of the North East Midlands Electricity District in 1920 and the building of Keadby power station thirty years later.

ELECTRIC TRAMWAY SYSTEMS IN THE YORKSHIRE REGION¹			
	YEARS OPERATING	ROUTE MILES	MAX NO. OF CARS
<i>Barnsley & District Co.</i>	1902-1930	3.06	14
<i>Batley Corporation²</i>	1903-1934	6.15	8
<i>Bradford Corporation</i>	1898-1950	63.52	412
<i>Dearne District Tramways Board</i>	1924-1933	14.18	30
<i>Dewsbury, Ossett & Soothill Nether Co.</i>	1908-1933	3.14	12
<i>Doncaster Corporation</i>	1902-1935	14.70	47
<i>Great Grimsby Tramways Co.</i>	1901-1936	6.30	59
<i>Grimsby Corporation³</i>	1925-1937	4.39	38
<i>Grimsby & Immingham Electric Railway Co.⁴</i>	1912-1961	7.75	36
<i>Halifax Corporation</i>	1898-1939	39.07	142
<i>Huddersfield Corporation</i>	1901-1940	39.12	144
<i>City Of Hull Tramways</i>	1899-1945	20.48	182
<i>Keighley Corporation</i>	1904-1924	3.44	12
<i>Leeds City Tramways</i>	1891-1959	72.05	879
<i>Mexborough & Swinton Tramways Co.</i>	1907-1929	6.48	20
<i>Rotherham Corporation</i>	1903-1949	11.55	86
<i>Sheffield Corporation</i>	1899-1960	52.05	889
<i>Shipley: Mid-Yorkshire Tramways Co.</i>	1903-1904 ⁵	3.3	10
<i>Yorkshire (West Riding) Tramways Co.⁶</i>	1904-1932	24.69	83
<i>Yorkshire (Woollen District) Tramways Co.</i>	1903-1934	22.92	81

(continued on page 11)

²⁴ Geoffrey Tweedale, *Steel City: Entrepreneurship, strategy and technology in Sheffield 1743-1993* (Oxford: Oxford University Press, 1999), pp.188-210.

²⁵ Arnold B. Gridley and Arnold H. Human, "Electric power supply during the Great War", *Journal of the Institution of Electrical Engineers*, Vol.57, 1919, p.407.

²⁶ I.Mech.E. *Proceedings* Vol.16, 1953. Works visits. [Grace's Guide]. The first unit of 12,500kW was commissioned in 1920 and the large 30,000kW turbine began work in 1923 at the formal opening of the power station by the Prince of Wales.

²⁷ Gridley and Human (1919), pp.412-413.

(Continued from page 10)

Twenty electric tramway systems were developed in the region, eleven by local authorities, one by a joint board and eight by companies. Leeds was a pioneer in the use of overhead current collection beginning in 1891 and built a large municipal system from 1897.⁷ The other systems were opened between 1898 and 1908. Grimsby & Immingham Electric Railway had more in common with North American interurban lines than with British street tramways. It was designed to carry workers to the isolated dock complex at Immingham. The Dearne District system opened in 1924 was the last tramway development in Britain.

Seven of the systems had independent power stations. The largest was at Kelham Island (5,725kW in 1910) for the Sheffield system, closely followed by Crown Point, Leeds (6,150kW in 1920). Other substantial generating stations were in Hull (3,000kW in 1920), Huddersfield (2,200kW) and Wakefield (1,200kW). The remaining stations at Rawmarsh and Grimsby were around 500kW in capacity. The Castleford power station (400kW) was driven by diesel engines in contrast to the steam power used elsewhere.

Tramway power supply as a proportion of total sales was very important in the early years and ensured the viability of many public supply systems. In 1909, for example, tramway power supply in Halifax represented 65.6 percent of all electricity sales in the town. Tramway power sales were still significant in 1925/26—in Doncaster 27.3 percent of total sales, Halifax 26.6 percent, Huddersfield 25.4 percent, Bradford 23.4 percent. The Leeds City Tramways power station generated 14.20million kWh in 1927-28, a little more than the total output of the Wakefield municipal station at the time.

Electric tramways provided fast, efficient and cheap urban transport and were very profitable before 1914. Motor bus competition after the war quickly ended the viability of the smaller systems. Leeds and Sheffield which continue to invest in new track and rolling stock were among the last places to abandon their electric tramways.

Railway electrification in the Yorkshire region was limited to the Manchester-Sheffield-Wath line opened in 1954. The heavy coal traffic from the Wath yards and the difficult gradients such as the Worsborough bank made electric traction an ideal choice. Work on the overhead 1,500-volt DC system had begun in 1936 but was delayed by the war and the need to build a new tunnel at Woodhead. Power for the eastern section of the system was supplied from the Yorkshire Electricity Board at the Aldam and Neepsend substations.⁸

Notes

¹ Compiled from Keith Turner, *Directory of British Tramways*, Vol.3 (Stroud: The History Press, 2009, 2010).

² Operated by Yorkshire (Woollen District) Tramways Co.

³ Grimsby Corporation took over the company assets within the County Borough. The remaining company lines mainly served Cleethorpes after 1925.

⁴ Owned by the Great Central Railway and London & North Eastern Railway after 1923.

⁵ Sold to Bradford Corporation.

⁶ The Yorkshire (West Riding) Tramways Co, owned two systems, one centred on Wakefield with lines to Leeds and Ossett, the other in Normanton-Castleford-Pontefract. The two systems were never connected. Each system had a power station.

⁷ J.D. Poulter, *An early history of electricity supply: The story of the electric light in Victorian Leeds* (1986), chapter 15, pp.139-142.

⁸ E.M. Johnson, *Woodhead: The Electric Railway* (Bredbury: Foxline Books, 2001), pp.172-180.

II State Intervention

Difficulties of interconnection, differences in AC frequencies, and the need for coal conservation by the use of larger- scale plant became major issues in World War I when electricity usage nearly doubled. The Electricity (Supply) Act 1919 created a new organisation, the Electricity Commissioners, to replace the role of the Board of Trade.

A key mandate of the Commissioners was the restructuring of generation and transmission, by voluntary means since the earlier compulsory powers had been deleted from the legislation. The first stage of the procedure for establishing Joint Electricity Authorities was the definition of a series of Electricity Districts covering parts of the country where reorganisation was most needed. All electricity undertakings in the defined area were then invited to submit proposals for reorganisation schemes emphasising the technical, administrative and financial aspects of a JEA.

Two Electricity Districts were defined in 1920 covering parts of the Yorkshire Area.: West Riding (Aire & Calder) and North East Midlands (**Figure 3**). The long deliberations that followed illustrate the difficulties faced by the Electricity Commissioners in attempting to create Joint Electricity Authorities that would consolidate generation in a single regional entity.

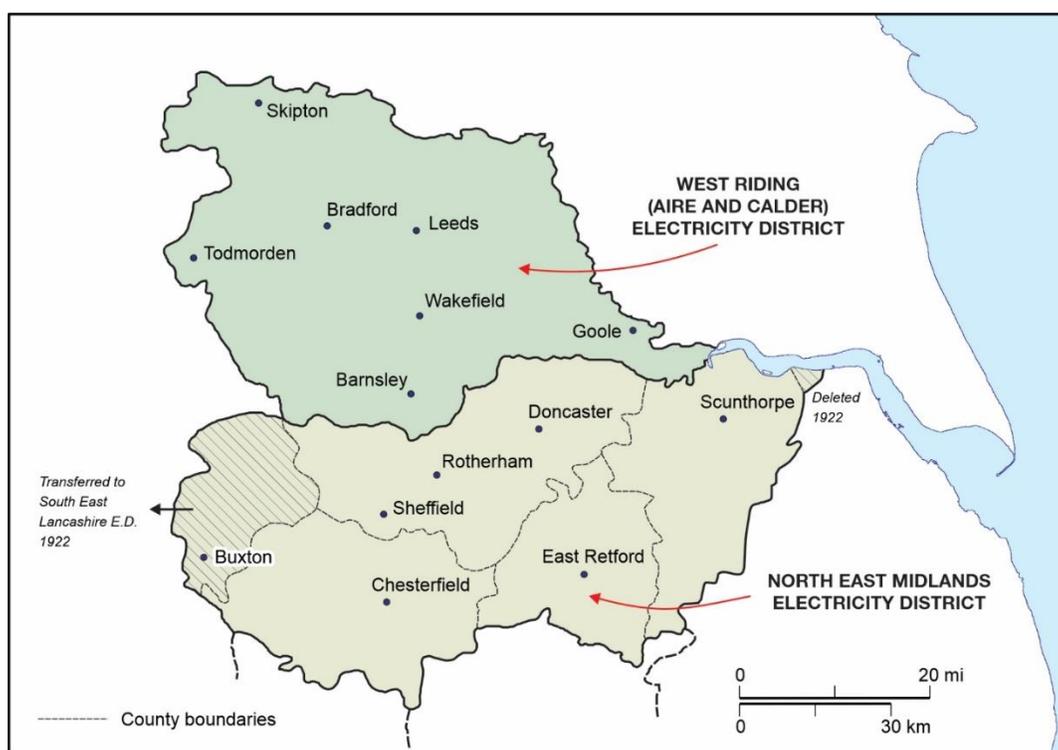


Figure 3 Electricity Districts 1920.

A local inquiry held in Leeds during May 1921 considered two schemes for a JEA—one by Leeds Corporation, the other by a Conferences of West Riding Local Authorities. The Yorkshire Electric Power Co. submitted proposals for some improvement of supply in the District. After a long period of negotiation, a draft scheme was agreed and a second inquiry was held in Bradford during February 1924. More discussion followed but the Power Company was not reassured by the terms of the agreement and concluded in May 1925 “...that the directors had reluctantly come to the conclusion that no useful purpose would be served by pressing the matter further”.²⁸

Sheffield Corporation prepared a scheme for a JEA in the North East Midlands Electricity District. This was considered by a local inquiry in Sheffield during December 1922. One result of this meeting was to redefine the boundaries of the District-to exclude Buxton and northwest Derbyshire which had chosen

²⁸ Electricity Commissioners, *Fifth Annual Report 1924-25* (London: HMSO, 1925), p.23.

to be part of the South East Lancashire District. Barton-upon-Humber was also excluded from the District. More deliberations followed and a draft report to form a JEA, but by 1925 it was clear that “...the cooperation of the Corporations of Sheffield and Rotherham would not be forthcoming for the establishment of a joint authority”. Consequently, the Commissioners “...decided to defer consideration pending a decision by the Government as to their policy with regard to electrical development generally.”²⁹

While discussions about the formation of JEAs dragged on without any positive results, the Electricity Commissioners were also busy with applications for Special Orders, consents for new power stations and extensions of existing plant. One major decision in November 1921 was the approval of the Ferrybridge power station for the Yorkshire Electric Power Co. Implementation was delayed by uncertainties of plans for a JEA in the Aire & Calder District. By March 1925 the foundation work had been completed and the structural steel work of the engine room section had already been erected.³⁰ The first turbo-alternator entered service in January 1927.

Seven new local authority electricity undertakings were established in the early 1920s:

- 1923 Dearne District Electricity Board,³¹ Skipton UD
- 1924 New Mill UD, Normanton UD, Scunthorpe & Frodingham UD, Slaithwaite UD
- 1925 Adwick-le-Street UD

These systems took bulk supplies from neighbouring undertakings or from the Yorkshire Electric Power Co. Local iron and steel works provided the supply to Scunthorpe, and the Brodsworth and Bullcroft collieries to Adwick-le-Street.

There were no new company formations at this time, but Electrical Distribution of Yorkshire was active in extending its areas of service with seven Electricity Special Orders. The South Yorkshire Orders of 1924 and 1926 covered most of the territory south and east of Pontefract and reached the southern boundary of the West Riding in the Kiveton Park Rural District.

The 43 undertakings in 1925/26 (**Table 3**) operated a variety of systems. Seventeen were AC and an equal number were mixed AC/DC, reflecting the shift away from Direct Current (DC) that had been popular in the early years of electrification. With an economic operating radius of 1-1.5 miles from the generating plant, DC was suitable only for city centres or small towns and villages. Bridlington, Heckmondwike and Tadcaster were among the four places with wholly DC systems. All the AC systems worked at what had become the national standard of 50 cycles (Hz). Parts of Wakefield still had 60Hz and Huddersfield 100Hz as well as the standard frequency.

Data on generating capacity show a huge range in size from Sheffield Corporation with 170,000kW to Ilkley with 170kW. Steam turbines were dominant in the larger stations and varied in scale from a 300kW machine in Bridlington to the largest turbine of 30,000kW in the new Prince of Wales station in Rotherham. Older reciprocating steam engines were still common in DC generation such as the Kelham plant used by Sheffield tramways. Gas engines were employed at Barton-on-Humber, diesel at Hebden Bridge and two hydro-electric turbines at Tadcaster on the River Wharfe. Further upstream at Grassington, Linton Mills, a non-statutory operation also generated electricity with water turbines.

²⁹ Fifth Annual Report 1924-25, p.24.

³⁰ Fifth Annual Report 1924-25, p.28.

³¹ A joint board for the Urban Districts of Wath-upon-Deerne, Bolton-upon-Deerne and Thurscoe.

Table 3 Yorkshire Electricity Board Area Electricity Supply Undertakings 1925/26

Undertaking	County	System	Generating capacity kW	Per capita consumption kWh
Local Authorities				
<i>Adwick-le-Street UD</i>	Yorks, WR	AC	-	16.4
<i>Barnsley CB</i>	Yorks, WR	AC/DC	7,500	98.7
<i>Batley MB</i>	Yorks, WR	AC/DC	1,850	83.1
<i>Bingley UD</i>	Yorks, WR	AC	-	69.6
<i>Bradford CB</i>	Yorks, WR	AC/DC	69,500	237.3
<i>Bridlington MB</i>	Yorks, ER	DC	1,950	48.5
<i>Brighouse MB</i>	Yorks, WR	AC/DC	-	39.5
<i>Cleethorpes MB</i>	Lincs, Lindsey	DC	-	43.9
<i>Dearne District EB</i>	Yorks, WR	AC	-	4.4
<i>Dewsbury CB</i>	Yorks, WR	AC/DC	2,300	64.9
<i>Doncaster CB</i>	Yorks, WR	AC/DC	7,650	87.7
<i>Elland UD</i>	Yorks, WR	AC/DC	-	106.4
<i>Grimsby CB</i>	Lincs, Lindsey	AC/DC	7,920	126.9
<i>Halifax CB</i>	Yorks, WR	AC/DC	37,200	248.4
<i>Hebden Bridge UD</i>	Yorks, WR	DC	225	162.5
<i>Heckmondwike UD</i>	Yorks, WR	DC	-	141.6
<i>Holmfirth UD</i>	Yorks, WR	AC	-	140.8
<i>Honley UD</i>	Yorks, WR	AC	-	56.9
<i>Huddersfield CB</i>	Yorks, WR	AC	19,500	197.9
<i>Ilkley UD</i>	Yorks, WR	AC/DC	170	90.3
<i>Keighley MB</i>	Yorks, WR	AC/DC	14,300	151.4
<i>Kingston-upon-Hull CB</i>	Yorks, ER	AC/DC	25,920	200.3
<i>Leeds CB</i>	Yorks, WR	AC	82,000	208.5
<i>Mexborough UD</i>	Yorks, WR	DC	700	122.5
<i>Mirfield UD</i>	Yorks, WR	AC	-	25.2
<i>Morley MB</i>	Yorks, WR	AC	-	25.9
<i>New Mill UD</i>	Yorks, WR	AC	-	37.4
<i>Normanton UD</i>	Yorks, WR	AC	-	7.7
<i>Pudsey MB</i>	Yorks, WR	AC	-	15.9
<i>Rotherham CB</i>	Yorks, WR	AC/DC	68,500	522.1
<i>Scunthorpe & Frodingham UD</i>	Lincs, Lindsey	AC	-	27.8
<i>Sheffield CB</i>	Yorks, WR	AC/DC	107,500	314.5
<i>Shiplay UD</i>	Yorks, WR	AC/DC	2,400	146.1
<i>Skipton UD</i>	Yorks, WR	AC	-	17.2
<i>Slaithwaite UD</i>	Yorks, WR	AC	-	17.0
<i>Spenborough UD¹</i>	Yorks, WR	AC/DC	-	214.5
<i>Todmorden MB</i>	Yorks, WR	AC/DC	-	150.5
<i>Wakefield CB</i>	Yorks, WR	AC	15,750	147.9
<i>Whitwood UD</i>	Yorks, WR	AC	-	19.2
Companies				
<i>Barton-upon-Humber ES</i>	Lincs, Lindsey	DC	198	20.6
<i>Electrical Distribution of Yorkshire</i>	Yorks, WR	AC	-	..
<i>Pontefract²</i>	Yorks, WR	AC	-	41.4
<i>Tadcaster Electricity</i>	Yorks, WR	DC	435	184.5
<i>Yorkshire Electric Power Co.</i>	Yorks, WR	AC	58,500	..

Notes:¹ Previously Cleckheaton UD. Amalgamated with Gomersal UD and Liversedge UD in 1915.² Owned by Yorkshire (West Riding) Tramways Co.**Source:** Compiled from Electricity Commissioners, *Engineering and Financial Statistics 1925/26*

Statistics on electricity consumption per head of population reveal major contrasts among electricity undertakings. Nineteen places exceeded 100.0kWh per person. Each place had a distinctive market profile reflecting the local economic and social geography. Huddersfield's profile in 1925/26 consisted of 25.1 percent of sales in the lighting segment, 1.3 percent in public lighting, 25.4 percent for the tramways and 48.2 percent in power. Two small towns, Heckmondwike and Ilkley with similar-sized populations (around 9,000) had very different market profiles. Heckmondwike was dominated by power sales at 51 percent while Ilkley showed 89.3 percent of sales in the lighting segment. Annual per capita sales in Heckmondwike amounted to 141.6kWh while sales in Ilkley had reached 90.3kWh though a public electricity supply had been available there for only about ten years.

Electrification and extension of supply areas were given a new impetus following the Weir Report (1925),³² the Electricity (Supply) Act 1926 and the formation of the Central Electricity Board in 1927. Even before the detailed regional plans for the National Grid were announced, there was a quickening of interest in the formation of new companies and applications for Special Orders. Over the next decade almost all the empty areas of the map were covered by new or extended supply areas.

Five new local authority undertakings began an electricity service:

1927 Gainsborough UD, Haworth UD

1928 Barnoldswick UD, Earby UD

1929 Louth MB

Grimsby, Hull and Sheffield all extended their service areas between 1927 and 1931. Beverley which had failed to implement an Electric Lighting Order of 1901 finally received an electricity supply in 1930 after it had become part of the Hull system.³³

Three new company formations covered a large territory in the East Riding and north Lincolnshire. The South East Yorkshire Light & Power Co. brought electricity to Withernsea in December 1929 and Hornsea in September 1930. Buckrose Light & Power Co. supplied Great Driffield from September 1931 and Pocklington and Market Weighton from December 1933. North Lincolnshire and Howdenshire Electricity was granted a Special Order in May 1932. A Special Order of May 1928 also "legitimised" the earlier non-statutory service to Grassington under the new name of Craven Electric Supply Co.

Yorkshire Electric Power and its associated company continue to extend their service areas in the late 1920s. These areas also included part of northeast Derbyshire where the Hope cement works (opened in 1929) required a major power supply.³⁴ Electrical Distribution of Yorkshire not only extended northwards to supply most of the Wharfedale Rural District but also added part of north Nottinghamshire in the Blyth district.

A few areas in the region remained unserved by Electricity Special Orders in the district north of Skipton as well as along the south bank of the River Ouse from Selby to east of Goole.

³² Ministry of Transport, Report of the Committee appointed to review the National Problem of the Supply of Electrical Energy (London: HMSO, 1927), 39 pp.

³³ K.J. Allison, ed. Victoria County History, Yorkshire, East Riding, Vol.6: The Borough and Liberties of Beverley (London, 1989), p.224.

³⁴ "The new Hope Cement Works of G. & T. Earle Ltd", *Cement & Concrete* Vol.III, 1930, pp.55-68. Reproduced as part of the Hope Works entry on the website www.cementkilns.co.uk

Transmission lines supported by tall steel towers became the most visible effect of state intervention as they appeared in the landscape during the early 1930s.³⁵ Construction of a national grid was authorised by the Electricity (Supply) Act 1926. Plans were prepared by the Electricity Commissioners and consulting engineers for implementation by the Central Electricity Board.³⁶ The Mid-East England Electricity Scheme was adopted by the CEB in March 1929, tenders were advertised, contracts made, and construction begun. S.E. Fedden (c1867-1942), formerly chief engineer and manager of the Sheffield municipal system, was appointed manager of the Mid-East England scheme in 1929.

The national grid was designed to connect “selected” power stations. These were generally the largest and most efficient generating plants which also had some potential for expansion. Sixteen power stations received this designation:

Local Authorities	
Barnsley	Leeds (Kirkstall)
Bradford	Lincoln**
Halifax	Rotherham
Harrogate*	Sheffield (Blackburn Meadows, Neepsend)
Huddersfield	Wakefield
Hull	York (Foss Island)*
COMPANY: Yorkshire Electric Power Co. (Barugh, Ferrybridge, Thornhill)	

*Transferred to North Eastern Area 1948

**Transferred to East Midlands Area 1948

Grimsby became a selected station in September 1936.

About 323 route miles of 132kv transmission lines and 202 route miles of lower-voltage lines were built. Major engineering projects were limited to the crossing of the River Ouse at Ousefleet east of Goole. **Figure 4** shows details of the grid network.

Power stations at Barton-upon-Humber, Bridlington, Dewsbury, Hebden Bridge, Ilkley, Sheffield (Kelham) and Shipley were closed between 1925/26 and 1935/36.

When trading began on 1 January 1933, the grid had added a new layer to the complex of undertakings that operated the electricity supply system. The St Mary’s Road (in Chapeltown, Leeds) grid control office of the CEB now managed the flows of power on the transmission lines and directed the hour-by-hour operations of the selected power stations. These stations, such as Sculcoates in Hull, remained in the ownership and management of the Corporation but the daily operation was directed from Leeds. Planning for the future became increasingly centralised, particularly from London.

Table 4 shows the situation in 1935/36 when 52 undertakings were in operation. Over the previous decade many changes had taken place. Wholly DC systems declined from seven to four. The number of AC systems had grown from 19 to 30 as new undertakings were added or earlier systems converted. Hebden Bridge had added AC while Bridlington had converted its whole system from DC to AC.

Generating technology emphasised economies of scale with larger units which brought significant reductions in coal consumption. The Kirkstall, Leeds station (opened in 1930) with 25,000kW turbo-alternators consumed 1.35lbs of coal for each kilowatt-hour generated, compared with 2.55lbs a decade

³⁵ The Yorkshire Electric Power Co. had already used steel towers for some of the transmission lines (66kv) from the Ferrybridge station.

³⁶ *Ninth Annual Report of the Electricity Commissioners 1928-1929* (London: HMSO, 1929), pp.9-11. Merz & McLellan were the consulting engineers for the scheme.

earlier in the Whitehall Road station. In 1935/36 the best performance in the region was by Blackburn Meadows, Sheffield which burned only 1.18lbs per kWh.

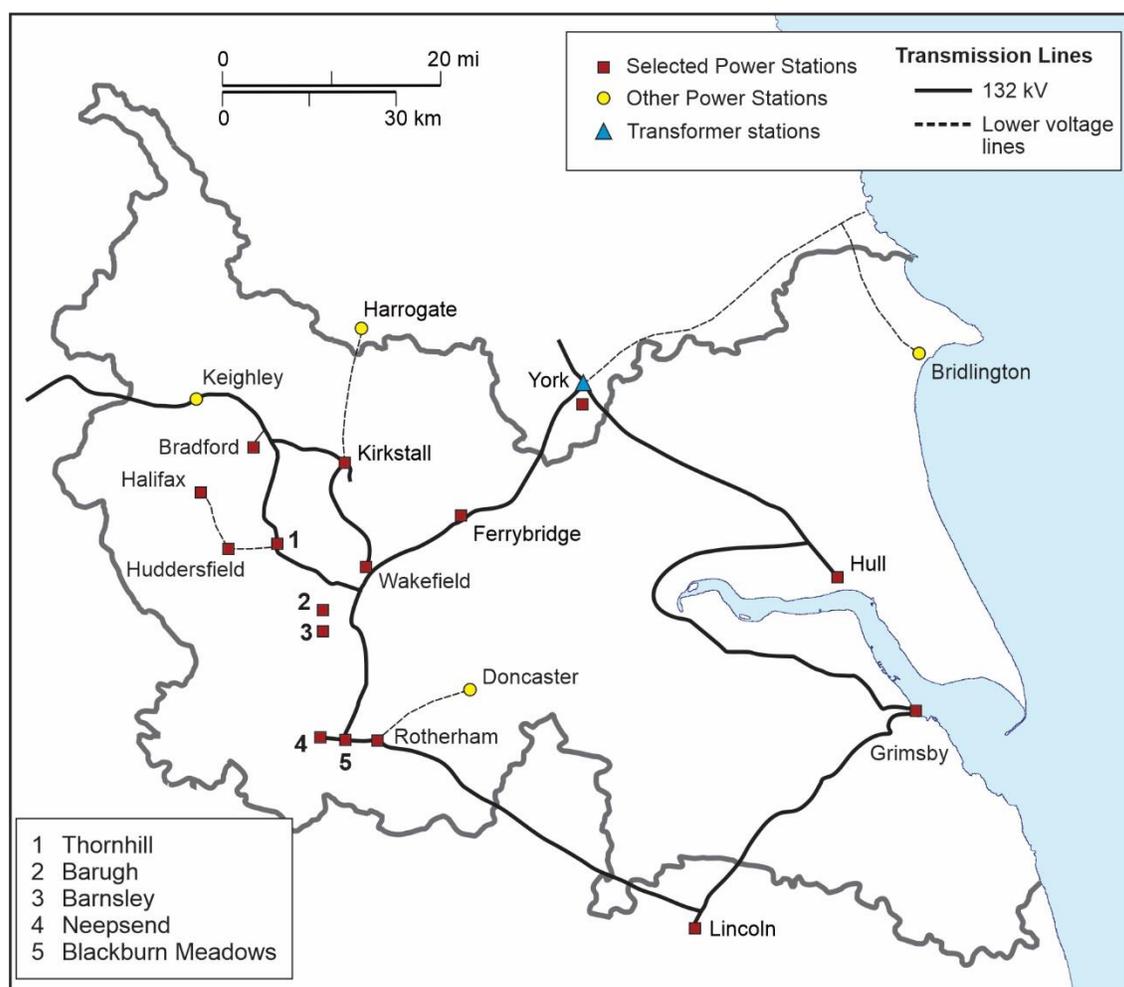


Figure 4 Yorkshire Area: National Grid 1933.

Rationalisation of generation and interconnection of undertakings all contributed to reducing the cost of electricity. Other factors such as the growth of radio broadcasting and lower prices for small appliances helped to boost electricity consumption. By 1935/36 there were 36 places in the region with per capita consumption levels above 100kWh. Rotherham Corporation continued in the lead at 1,177.5 kWh per person, a reflection of the heavy usage of electricity in the steel industry.

The growth of electrification, especially in the lighting segment, may be illustrated by the case of Huddersfield. Total electricity sales grew from 26.39million kWh in 1925/26 to 68.46m kWh a decade later. The lighting segment that included domestic uses expanded from 6.26m kWh to 28.88m kWh.³⁷ Over the same period, per capita consumption in the town rose from 197.9kWh to 497.5kWh.

³⁷ The number of consumers in Huddersfield increased from 7,294 in 1919 to 36,393 in 1936.

The eight companies in the region were controlled by a variety of interests (**Table 5**). Only the recently established Buckrose and South East Yorkshire companies were owned by outside interests, in this case the General Electric Company. The Yorkshire Electric Power Co. controlled Electrical Distribution of Yorkshire and the recently formed North Lincolnshire and Howdenshire Co. The three independent companies--Craven Hydro-Electricity, Tadcaster Electricity and the West Riding Automobile Co.³⁸ Wakefield (which held the Pontefract franchise) were all locally owned.

Table 4 Yorkshire Electricity Board Area Electricity Supply Undertakings 1935/36.

Undertaking	System	Generating capacity kW	Per capita consumption kWh
Local Authorities			
<i>Adwick-le-Street UD</i>	AC	-	46.6
<i>Barnoldswick UD</i>	AC	-	47.6
<i>Barnsley CB</i>	AC/DC	7,000	252.1
<i>Batley MB</i>	AC/DC	1,200	181.3
<i>Bingley UD</i>	AC/DC	-	189.9
<i>Bradford CB</i>	AC/DC	102,000	475.9
<i>Bridlington MB</i>	AC	-	152.6
<i>Brighouse MB</i>	AC/DC	-	143.1
<i>Cleethorpes UD</i>	AC	-	104.8
<i>Dearne District EB</i>	AC	-	24.6
<i>Dewsbury CB</i>	AC/DC	-	133.4
<i>Doncaster CB</i>	AC/DC	13,500	344.4
<i>Earby UD</i>	AC	-	119.5
<i>Elland UD</i>	AC/DC	-	334.3
<i>Gainsborough UD</i>	AC	350	242.6
<i>Grimsby CB</i>	AC/DC	25,500	301.9
<i>Halifax CB</i>	AC/DC	40,800	489.6
<i>Haworth UD</i>	AC	-	59.7
<i>Hebden Bridge UD</i>	AC/DC	-	327.5
<i>Heckmondwike UD</i>	DC	-	248.5
<i>Holmfirth UD</i>	AC	-	266.4
<i>Honley UD</i>	AC	-	227.0
<i>Huddersfield CB</i>	AC/DC	26,500	497.5
<i>Ilkley UD</i>	AC	-	327.2
<i>Keighley MB</i>	AC/DC	12,000	351.7
<i>Kingston-upon-Hull CB</i>	AC/DC	77,000	457.3
<i>Leeds CB</i>	AC/DC	117,000	467.4
<i>Louth MB</i>	AC	-	90.7
<i>Mexborough UD</i>	DC	600	211.7
<i>Mirfield UD</i>	AC	-	86.4
<i>Morley MB</i>	AC	-	122.1
<i>New Mill UD</i>	AC	-	155.0
<i>Normanton UD</i>	AC	-	56.1
<i>Pudsey MB</i>	AC	-	205.9
<i>Rotherham CB</i>	AC/DC	66,000	1,117.5
<i>Scunthorpe & Frodingham</i>	AC	-	141.4
<i>Sheffield CB</i>	AC/DC	159,000	753.3
<i>ShIPLEY UD</i>	AC/DC	-	355.0
<i>Skipton UD</i>	AC	-	193.0
<i>Slaithwaite UD</i>	AC	-	109.5

³⁸ The renamed former tramways company.

<i>Undertaking</i>	<i>System</i>	<i>Generating capacity kW</i>	<i>Per capita consumption kWh</i>
<i>Spenborough UD</i>	AC	-	272.3
<i>Todmorden MB</i>	AC	-	263.8
<i>Wakefield CB</i>	AC	13,500	345.2
<i>Whitwood UD</i>	AC	-	43.2
<i>Companies</i>			
<i>Buckrose L & P Co.</i>	AC	-	36.9
<i>Craven Hydro-Electric Supply Co.¹</i>	DC	305	119.0
<i>Electrical Distribution of Yorkshire</i>	AC	-	50.2
<i>North Lincs & Howdenshire</i>	AC	-	25.0
<i>Pontefract²</i>	AC	-	94.6
<i>South East Yorks L & P Co.</i>	AC	-	92.7
<i>Tadcaster Electricity</i>	DC	727	446.8
<i>Yorkshire Electric Power Co.</i>	AC	118,500	..

Notes:

¹ Previously a non-statutory undertaking.

² Franchise owned by West Riding Automobile Co. previously Yorkshire (West Riding) Tramways Co.

Source: Compiled from Electricity Commissioners, *Engineering and Financial Statistics 1935/36*

Although state intervention had begun to rationalise electricity generation, the efforts of the Electricity Commissioners to reduce the very large numbers of distributors had been unsuccessful. The McGowan Report published in May 1936³⁹ and the subsequent government proposals were strongly opposed by many sections of the electricity supply industry. A recommendation in the McGowan Report, that all undertakings with annual sales of less than 10 million kWh should be amalgamated, was particularly controversial. Only 14 of the 44 local authorities were above this limit and many small towns objected to the idea of amalgamation with larger authorities or companies. The government's Outline of Proposals published in April 1937⁴⁰ was met with strong opposition and more pressing issues of the time meant that reorganisation of distribution was set aside.

Table 5 Yorkshire Electricity Board Area Corporate Structure of Electricity Holding Companies 1934/35

<i>1. General Electric Co. Ltd</i>	1.1 Buckrose Light & Power Co. 1.2 South East Yorkshire L&P Co.
<i>2. Yorkshire Electric Power Co.</i>	2.1 Barton-upon-the Humber ES Co. 2.2 Electrical Distribution of Yorkshire Ltd 2.3 North Lincolnshire and Howdenshire Electricity 2.4 Yorkshire Electric Power Co. ¹
<i>Other Companies</i>	3. Craven Hydro-Electric Supply Co. 4. Pontefract (West Riding Automobile Co.) ² 5. Tadcaster Electricity Ltd

Notes:

¹ Direct distribution in North East Derbyshire.

² Previously Yorkshire (West Riding) Tramways. Name changed c1932.

Source: Political and Economic Planning, *Report on the Supply of Electricity in Great Britain* (London: PEP, 1936), pp.140-141.

³⁹ Ministry of Transport, *Report of the Committee on Electricity Distribution*, May 1936 (London: HMSO, 1936). The report noted that there were no fewer than 635 separate authorised undertakings in Great Britain in 1934, comprising the Central Electricity Board, 3 Joint Electricity Authorities, 5 Joint Boards, 373 Local Authorities and 253 Companies and persons.

⁴⁰ Ministry of Transport, *Electricity Distribution: Outline of Proposals* (London: HMSO, 1937).

Although private generation tended to peak around 1920 some establishments continued to invest in new generation facilities especially in northern and eastern parts of the region. Carlton Main Colliery Co. built a central powerhouse (22,500kW) at Frickley colliery near Hemsworth in 1925. The plant served five collieries and many of the hundreds of houses owned by the company were lit by electricity.⁴¹ Marshall, Sons & Co. opened a new power station (3,000kW) in Gainsborough in 1918-19.⁴² The new glass works built by Pilkington Brothers in Kirk Sandall near Doncaster 1920-21 included a self-contained power station (capacity 6,750kW in 1936).⁴³ Blackburn Aeroplane & Motor co. which had relocated to Brough from Leeds also generated its own electricity at this time.

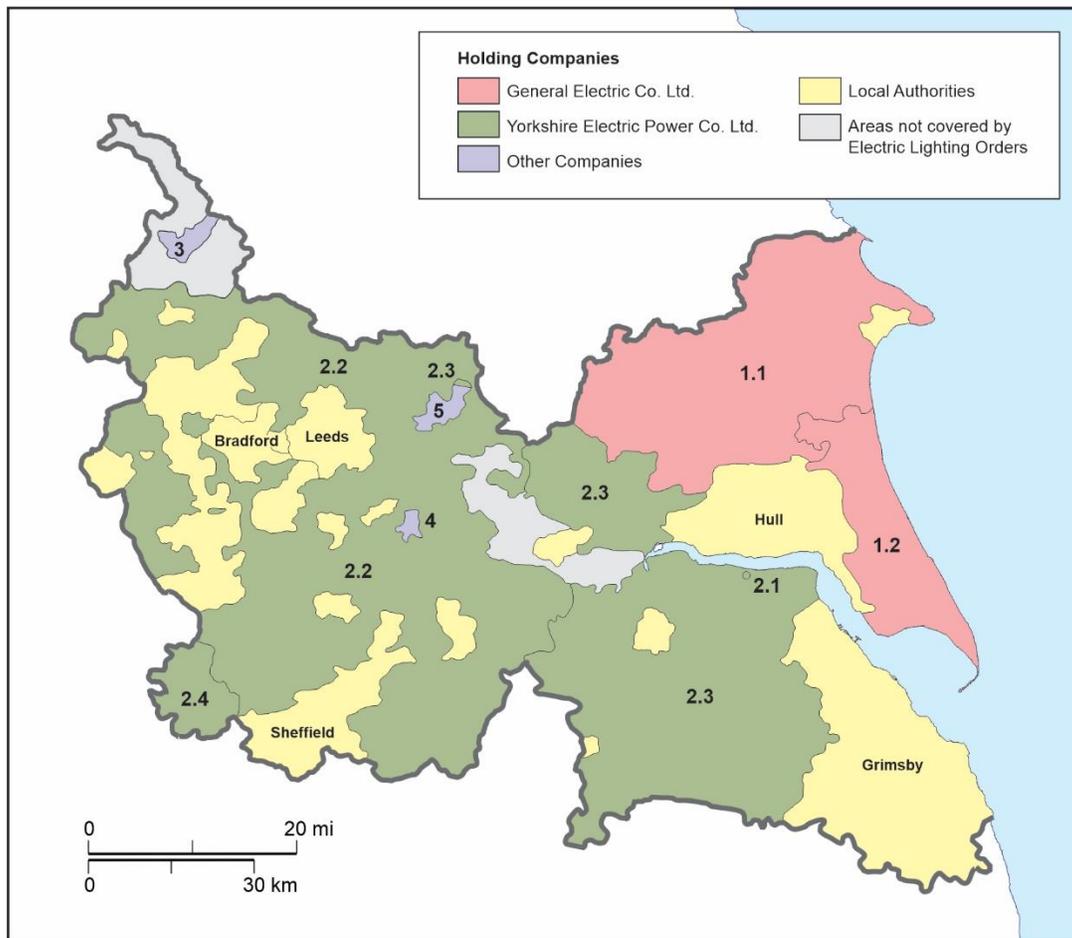


Figure 5 Electricity Holding Companies 1934-35.

Demand for electricity, especially by industrial users, grew rapidly after 1936 with rearmament and then the war effort. The Yorkshire Electric Power Co. was well placed to supply the large Avro aircraft factory at Yeadon and the Blackburn works at Sherburn-in-Elmet, as well as the Thorp Arch factory near

⁴¹ Carlton Main Colliery Co. Ltd, Prospectus, *The Times* 10 March 1927, p.24. The size of the plant may be compared with the 5,000kW private generation at Park Gate Iron & Steel Co. works near Rotherham. *The Engineer* Vol.134, 1922, p.217. Frickley colliery power station was also much larger than the public supply stations in Barnsley, Doncaster and Wakefield (see Table 3).

⁴² I.Mech.E. *Proceedings*, 1920, Leicester summer meeting, pp.765ff.

⁴³ I.Mech.E. *Proceedings*, 1936, York summer meeting, pp.198-202.

Wetherby. A new power station at Mexborough to reinforce capacity in the Don valley was being planned in 1938 but the first 60,000kW unit entered service only in 1945.

Major extensions added capacity to all the larger power stations in the region after 1935/36. Leeds Corporation extended Kirkstall power station to accommodate five 30,000kW turbo-alternators. Blackburn Meadows power station was also enlarged with two 50,000 machines. One feature of many of these extensions was the construction of reinforced concrete cooling towers to avoid overheating the rivers especially the Aire and the Don.⁴⁴ Over the next two decades the tall hyperbolic cooling tower became a common feature of most new or extended power stations in the region. Three power stations, at Batley, Keighley and Mexborough, were closed after 1935/36.

Table 6 Yorkshire Electricity Board Area Consolidations to 1948

<i>Undertaking</i>	<i>Years In Operation</i>	<i>New Owner</i>
<i>Ravensthorpe UD</i>	1906-1910	Dewsbury Corporation
<i>Roundhay & District El Co.</i>	1904-1914	Leeds Corporation
<i>Rawmarsh¹</i>	1907-1917	Rotherham Corporation
<i>Barton-Upon-Humber</i>	1913-1936	North Lincolnshire & Howdenshire Co.
<i>Haworth UD</i>	1927-1938	Keighley Corporation
<i>Honley UD</i>	1903-1938	Holmfirth UD
<i>New Mill UD</i>	1924-1938	Holmfirth UD
<i>Whitwood UD</i>	1911-1938	Castleford UD

Notes:

¹ The power station of the Mexborough & Swinton Tramways Co. was closed down on 1 October 1917 and the Electric Lighting Orders for Rawmarsh and Swinton were transferred to Rotherham Corporation.

Table 6 shows the very limited consolidation of undertakings in the region. Most resulted from local authority amalgamations starting with the absorption of Roundhay into Leeds in 1912.⁴⁵

III Nationalisation

After three decades of discussion, the whole organisation of electricity was restructured following the Electricity Act 1947. From 1 April 1948, the Yorkshire Electricity Board took over the assets of 49 local authorities, boards and companies (**Figure 1**). The generating stations and transmission lines of the Central Electricity Board were transferred to the British Electricity Authority.

Electricity Distribution

The Yorkshire Electricity Board was responsible for integrating all the undertakings. Systems had to be standardised and the multiplicity of tariffs reduced. For administrative purposes, the Board area was subdivided into seven sub-areas and 23 districts. Initially many of the districts tended to reflect the pre-nationalisation company and municipal areas.

⁴⁴ The first concrete cooling tower was erected at Blackburn Meadows in 1934-35 to supplement the earlier wooden cooling towers. Two additional towers were built in 1937 and 1938. Later known to travellers on the M1 as the Tinsley Towers, these structures were demolished in August 2008.

⁴⁵ T.W. Freeman, *The conurbations of Great Britain* (Manchester: Manchester University Press, 1959), pp.168-171.

Figure 6 shows the geographical organisation in 1957 when there were seven sub-areas and 20 districts. One notable feature is the network of 78 service centres where consumers could pay their bills and purchase appliances.⁴⁶ These service centres were an important and profitable part of the Board's business.



Figure 6

Postwar economic development brought new demands for industrial supply in expanded industries such as aircraft in Brough, cars in Bradford and agricultural tractors in Meltham and Doncaster. Suburban growth throughout the region contributed to the rising demand for electricity. Some private generation continued at the larger steelworks in the region. The National Coal Board completed a new power station at Grimethorpe (60,000kW) in 1957, replacing the earlier plant at Frickley colliery.

Over the decade 1948/9 to 1958/9, total sales of electricity in the region grew from 4,125m kWh to 8,285m kWh. The number of consumers expanded from 1,119,000 to 1,493,000. Employees of the Board increased from 9,139 in March 1949 to 13,130 in 1958.

Electricity Generation and Transmission

The Yorkshire Division of the British Electricity Authority covered the same area as the distribution board. It was an amalgamation of the 132kv transmission system developed by the Central Electricity Board and the power stations previously owned by the local authorities and companies. The main tasks from 1948 were to integrate the various generating stations and their workforces, to modernise and standardise operations, and to expand capacity to meet the rapidly growing demand.

⁴⁶ *Electricity Supply Handbook 1958* (London: Electrical Times, 1958), pp.145-152.

Table 7 lists the 20 power stations in the new organisation. They varied in size from large turbine-powered stations at the top to small diesel-engined and hydro-electric units at the bottom. After 1948 there were major extensions to the power stations at Ferrybridge, Huddersfield, Mexborough, Neepsend, Rotherham and Thornhill. Six stations--at Barnsley, Craven Hydro, Doncaster, Gainsborough, Tadcaster and Wakefield--were closed.

Table 7 British Electricity Authority: Power Stations in the Yorkshire Division 1948/49

Power Station	Generating Capacity kW	Type¹
<i>Kirkstall</i>	200,000	S
<i>Blackburn Meadows</i>	197,000	S
<i>Bradford</i>	127,000	S
<i>Ferrybridge</i>	125,000	S
<i>Sculcoates</i>	124,000	S
<i>Neepsend</i>	110,000	S
<i>Thornhill</i>	82,500	S
<i>Rotherham</i>	80,000	S
<i>Huddersfield</i>	60,000	S
<i>Mexborough</i>	60,000	S
<i>Halifax</i>	49,800	S
<i>Grimsby</i>	38,000	S
<i>Whitehall Road</i>	37,000	S
<i>Doncaster</i>	13,500	S
<i>Wakefield</i>	13,500	S
<i>Barugh</i>	10,000	S
<i>Barnsley</i>	6,000	S
<i>Tadcaster</i>	355	I,H
<i>Gainsborough</i>	350	I
<i>Craven Hydro</i>	294	I,H
	1,334,799	

Notes:

¹ S – Steam; H—Hydro-electric; I--Internal combustion (diesel).

Source: Compiled from British Electricity Authority, *Annual Report 1948-49*, Appendix 15.

Five new stations were commissioned: Skelton Grange (April 1951), Keadby (April 1952), Doncaster (September 1953), Wakefield (December 1955) and Ferrybridge B (December 1957). All these stations were larger than their pre-war counterparts, operated at higher steam pressures and used pulverised fuel-firing technology. These features gave higher thermal efficiencies and lower coal consumption.

Ferrybridge B began a new trend of power stations with much larger generating units (100,00kW) working at higher steam pressures (1,500psi). These stations were designed to serve national as well as regional demand and were linked to the new Supergrid with its higher capacity for long-distance transmission. The lowcost resources of the Yorkshire coalfield had already encouraged further power station development and at the of 1959 two further large generating plants were under construction at Skelton Grange B and Thorpe Marsh near Doncaster.

Figure 7 shows the development of the regional grid system which had served with only a few changes since 1933. The main changes made to the 132kv grid were the wartime line from Hartshead to Neepsend and the addition of a substation at Scunthorpe. Both were in response to the demands of the steel industry. A postwar extension of the network to Driffild enhanced the power supply to this part of the East Riding.

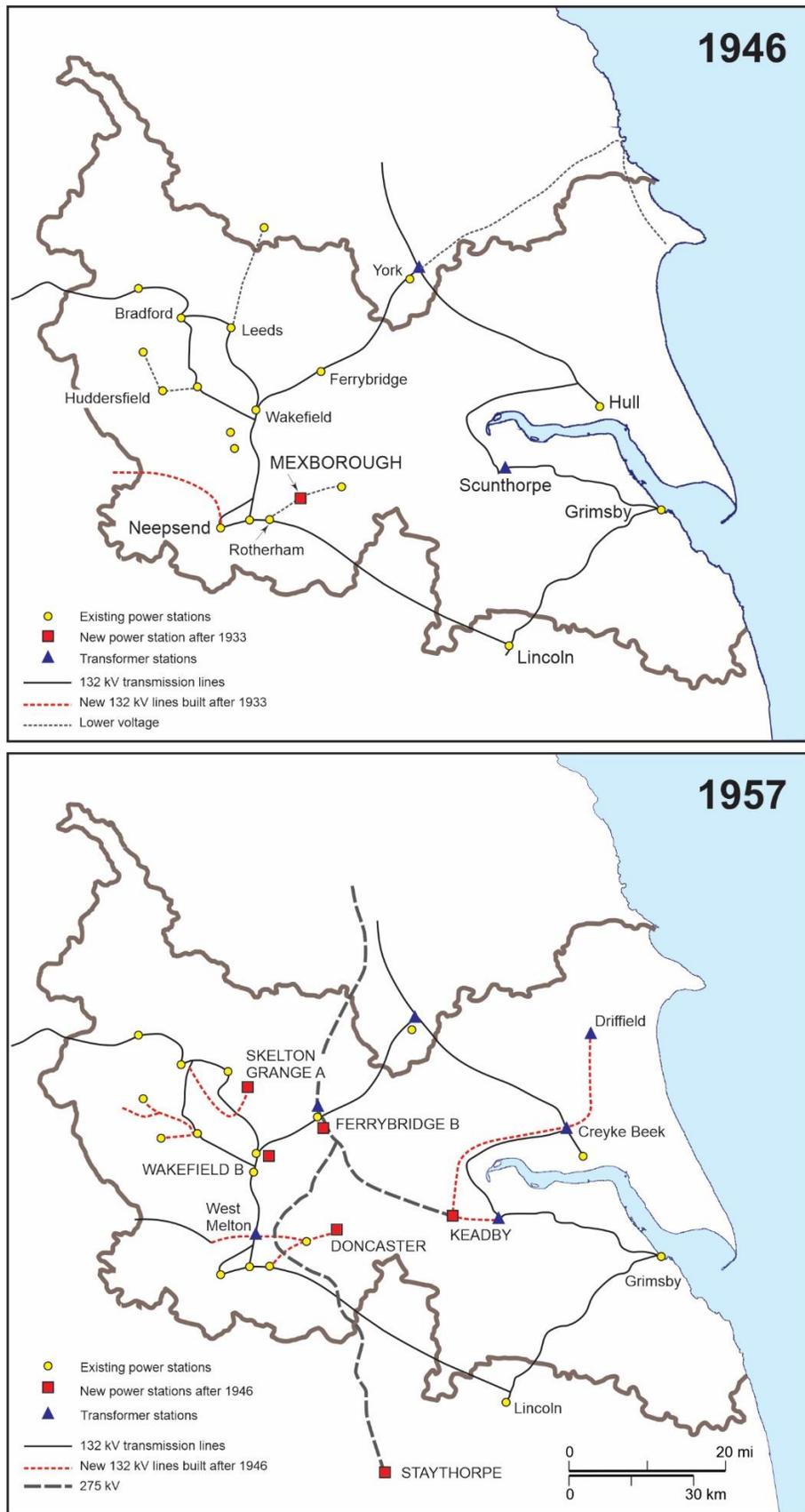


Figure 7 Development of the National Grid.

Plans for a high-voltage (275kv) grid, superimposed on the 132kv network, were approved by the British Electricity Authority in 1950.⁴⁷ The first section, from Staythorpe near Newark to West Melton near Wath-upon-Deerne, was commissioned in 1953. Other sections of the Supergrid were built shortly afterwards, northwards to Stella on the Tyne and Penwortham near Preston. The trans-Pennine link was designed to transmit bulk supplies to the North West where coal resources were too limited and costly for future expansion of power stations.

Table 8 Central Electricity Generating Board: Power Stations in the Yorkshire Division 1958/59

POWER STATION	GENERATING CAPACITY kW	TYPE¹
Keadby	378,000	S
Skelton Grange	360,000	S
Wakefield	240,000	S
Ferrybridge B	200,000	S
Kirkstall	200,000	S
Thornhill	195,000	S
Blackburn Meadows	185,000	S
Ferrybridge A	170,000	S
Neepsend	160,000	S
Rotherham	160,000	S
Bradford	125,000	S
Sculcoates	122,000	S
Mexborough	120,000	S
Doncaster	120,000	S
Huddersfield	100,000	S
Halifax	48,300	S
Grimsby	38,000	S
Whitehall Road	37,000	S
Barugh	4,000	I
	2,962,300	

Notes:

¹ S – Steam; I – Internal combustion (diesel).

Source: Compiled from Central Electricity Generating Board, *Annual Report 1958-9*, Appendix 1.

During the first decade of operation the Yorkshire Division built five new power stations and raised generating capacity from 1,334,799kW to 2,962,300kW. The transmission line capacity was increased to 551 route miles; of which 132 route miles were part of the 275kv Supergrid. Over the period the numbers employed rose from 4,045 to 5,085.

From January 1958 when the Central Electricity Generating Board took over from the Central Electricity Authority there were changes in the administrative structure. A new North Eastern Region was established incorporating the North Eastern and Yorkshire Divisions. Under the new arrangements the regional director at Becca Hall, Aberford near Leeds, became responsible for the higher-order planning and administration of 34 power stations, 912 route miles of transmission lines and 7,840 employees. Design work on new power stations was transferred to the Northern Projects Group at Agecroft Power Station, Manchester and transmission development was centralised in Guildford.

⁴⁷ W.J.A. Painter, "Changing influences in the planning of the grid system", *Proceedings of the Institution of Electrical Engineers* Vol.109, pt A, 1962, pp.309-320.

Summary

Table 9 shows various indicators of the growth of electrification from 1900. All 11 of the undertakings in that year were local authorities, a point that illustrates the strong municipal role in the region. Although local authorities were dominant, the maps illustrate the role of the Yorkshire Electric Power company in widening the coverage of electricity supply in the core of the Yorkshire area.

Table 9 Summary of Development in the Yorkshire Electricity Board Area.

<i>Year</i>	<i>Number of Undertakings¹</i>	<i>Local Authority Undertakings</i>	<i>Number of Power Stations</i>	<i>Generating Capacity (kW)</i>	<i>Per Capita Consumption (kWh)²</i>
1900	11	11	11	..	.. (4)
1912	34	29	29	..	.. (36)
1925/6	44	39	26	531,968	184 (133)
1935/6	52	44	22	784,632	401 (374)
1948/9	..	..	20	1,334,799	935 (821)
1958/9	..	..	19	2,962,300	1,950 (1,765)

Notes:

¹ Excluding all non-statutory undertakings.

² Calculated from data in Electricity Council, *Handbook of Electrical Supply Statistics 1977*, p.63 and census returns. Great Britain 1900-1948/9 from Leslie Hannah, *Electricity Before Nationalisation: a study of the electricity supply industry in Britain to 1948* (London: Macmillan, 1979), pp.427-8.

A sense of the rapid growth of demand from the mid-1920s is illustrated by the two final columns in the table. Economies of scale are reflected in the increasing size of power stations. Blackburn Meadows was the earliest to adopt 50,000kW turbines in the late 1930s. Twenty years later 100,000kW machines were being installed at the Ferrybridge B station.

Per capita consumption in the Yorkshire Area (with Great Britain in parentheses) shows substantial rates of growth. From the mid-1920s regional consumption levels were above the national average. The demands of the steel industry especially in the Don valley were an important factor in the high levels of regional demand.

Electrification was a much slower process than the enthusiastic promoters of the 1880s expected. Much effort and expenditure were needed to create viable electricity undertakings even in the larger urban centres. This point of viability was reached about 1900 but extending the benefits of electricity over wider areas took much longer and universal electricity was probably not achieved until the 1950s.

Note on Sources

For the period before state intervention, *Garcke's Manual of Electricity Undertakings*, first published in 1896, is the indispensable source. This annual volume lists all municipal and company electricity and tramway systems in comprehensive detail. Technical information on the generating and distribution systems is noted for each undertaking, as well as statistics on sales, revenue and expenditure. There are full details of personnel and company directors. Garcke also covers many of the non-statutory companies which were often significant in rural areas.

The contents of the **Annual Reports** of the Electricity Commissioners (1st, 1920-21 – 23rd, 1947-48) highlight the role of state intervention during this period and reflect the power of the Electricity (Supply) Act 1919. Under this legislation all power station and transmission line construction required consent of the Commissioners. Loans for local authority electricity undertakings, extensions of areas and transfers of ownership all required approval from London. Even the payment of subscriptions to associations such as the British Electrical Development Association and the Incorporated Municipal Electrical Association had to have the Commissioners' consent. The detailed supervision of expenditure also included the purchase of proceedings of conferences or meetings and the expenses of members and officers attending such meetings.

The **Engineering and Financial Statistics**, also published by the Electricity Commissioners, were equally detailed. Local authorities and companies are separately listed with detailed tabulations of generating equipment, fuel consumption, output as well as sales (by type). Such data provide effective evidence on the scale and depth of electrification. The financial statistics cover revenue, expenditure and capital investment.

The Electricity Commissioners also published more specialised reports on plans for integrating local systems which formed the basis for the 132kv grid developed from 1927. All the publications of the Electricity Commissioners were issued under the authority of the Minister of Transport.⁴⁸ They were, however, Non-Parliamentary Publications of HMSO and consequently were not always acquired by libraries at the time.

The **Annual Reports** of the Central Electricity Board from 1929 to 1947 contain, especially in the earlier years, comprehensive details of the progress of constructing the transmission grid. CEB reports were privately published and are rare items in library collections.

After nationalisation, details of the electricity supply industry become more accessible, although in some points less comprehensive. For the generating and transmission sector, the Annual Reports and Accounts of the British Electricity Authority (1948-1954), Central Electricity Authority (1955-57)⁴⁹ and the Central Electricity Generating Board (1958-1989) contain useful data. These reports were all published as House of Commons sessional papers until 1971-72. Thereafter they were no longer published by HMSO and became increasingly glossy in appearance and content. From 1964 many details, previously available in the Annual Reports were published in the CEGB **Statistical Yearbook**. This was not published by HMSO and is comparatively rare.

The Yorkshire Electricity Board annual reports and accounts were also published as House of Commons sessional papers until 1971-72. After this time the reports were no longer published by HMSO.

From 1958-59 the Electricity Council, created to provide more linkages and coordination beyond the national and regional bodies, also published annual reports and statistical compilations. The **Handbook of Electricity Supply Statistics**, published at intervals between 1966 and 1989, includes helpful summaries. **Electricity Supply in Great Britain: A Chronology**, also published in various editions, is especially useful for details of legislation and major events, especially technical changes from Michael Faraday's fundamental discoveries of 1831.

⁴⁸ See **Annual catalogues of British government publications 1920-1970** (Bishop's Stortford: Chadwyck-Healey, 1974).

⁴⁹ The change of title from British Electricity Authority resulted from the formation of the autonomous South of Scotland Electricity Board from 1 April 1955.

In the postwar period the *Electricity Supply Handbook* (published annually by the *Electrical Times* from 1947) is a very useful compendium of facts, figures and personnel in the industry. The detailed maps of the grid system are especially important. Like many annual reference works of its type, these volumes are quite scarce.

The difficulties faced by local authorities and companies in the early development of urban electricity supply is very effectively reviewed in J.D. Poulter, *An early history of electricity supply: The story of the electric light in Victorian Leeds* (London: Peter Peregrinus, 1986).

Two collections have material relevant to the Yorkshire Area:

The West Yorkshire Archives Service in Wakefield has some 365 boxes in the collection “Yorkshire Electricity, Records 1892-1960” (Catalogue C550). Records of the Yorkshire Electric Power Co. and Electrical Distribution of Yorkshire Ltd offer many possibilities for research on these important regional companies.

The Museum of Science and Industry in Manchester holds the records of the former Electricity Council. These include reports of the Electricity Commissioners, the Central Electricity Board and all the organisations after 1948. The archives also has an accessible set of Garcke’s *Manual*.

FERRYBRIDGE

This station, opened in 1927 by the Yorkshire Electric Power Co., had reached its full capacity of 170,000kW by the time this map was published. Later development of the riverside site, with access to coal supplies by canal boat, railway and road, added two more power stations which had a capacity of 2,300,000kW by 1970. A new colliery at Kellingly to the east was also opened by this time.

Ordnance Survey 1:25,000 series, Sheet SE42, 1954 (National Library of Scotland)

