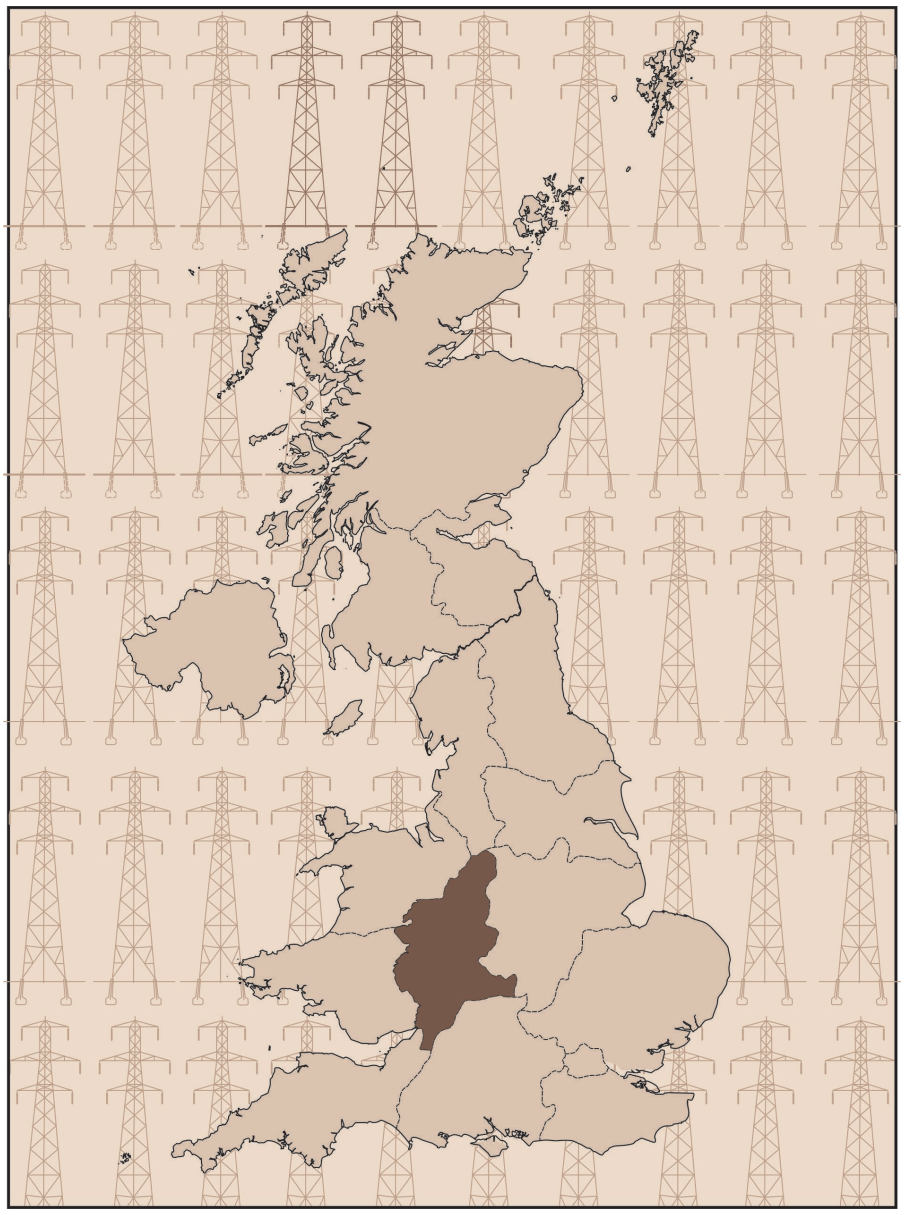

THE MIDLANDS ELECTRICTY BOARD AREA

Regional and Local Electricity Systems in Britain

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Contents

WORCESTER

The Hylton Road power station was only recently completed when the Ordnance Survey revised this map. It had been built with reciprocating steam engines to supplement the earlier municipal hydro-electric plant at Powick (1894). Growing demand in later years required substantial rebuilding when capacity was expanded after 1936 from 14,300kW to 40,500kW.

Ordnance Survey, Six Inch Map Series, Worcestershire, Sheet XXXIII.NE, 1901-02 (National Library of Scotland)

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 Midlands Area.

The Midlands 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 Midlands Area included Herefordshire, Worcestershire and parts of Gloucestershire, Shropshire, Staffordshire and Warwickshire (including Birmingham).[2]

Constituents of the Midlands Electricity Board Area

When the Midlands Electricity Board began operations on 1 April 1948 it incorporated the services and areas of 18 local authorities, two Joint Electricity Authorities and 8 companies.[3] (**Table 1**) The constituent areas varied enormously in size. The Shropshire, Worcestershire & Staffordshire Electric Power Co. covered over 3,500 square miles while the Market Drayton Electric Light & Power Co. occupied an area of just under two square miles. Birmingham Corporation's electricity department served an area of 195 square miles, considerably larger than the County Borough's area (80 square miles). As in many places, electricity service areas did not always coincide with local government areas.

With an area of 5,074 square miles and an estimated population of about 3.3 million, the Midlands Electricity Board Area covered every type of area from the Welsh Border country to densely parts of

[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] Congleton was mistakenly included in the Merseyside and North Wales area and transferred back to the Midlands in 1950. The SWS Co. territory in South Wales was transferred to that Board in 1949.

Birmingham. Industrial sales at 60.6 percent were considerably higher than domestic sales at 29.3 percent.[4]

The head office of the Board was established at Mucklow Hill, Halesowen, previously the headquarters of the Shropshire, Worcestershire & Staffordshire Electric Power Co. (SWS Co.).

Table 1 MIDLANDS ELECTRICITY BOARD AREA CONSTITUENT UNDERTAKINGS 1948.

Map #	Local Authorities
1	Birmingham CB
2	Cannock UD
3	Cheltenham MB
4	Congleton MB
5	Gloucester CB
6	Leek UD
7	Lichfield MB
8	Malvern UD
9	Newcastle-under-Lyme MB
10	Stafford MB
11	Stoke-on-Trent CB
12	Stone UD
13	Sutton Coldfield MB
14	Walsall CB
15	Warmley RD
16	West Bromwich CB
17	Wolverhampton CB
18	Worcester CB
Joint Electricity Authorities	
19	North West Midlands JEA
20	West Midlands JEA
Companies	
21	Chasetown & District Electricity Co.
22	Market Drayton EL&P Co.
23	Midland Electric Corpn for Power Distribution
24	Shropshire, Worcestershire & Staffordshire EP Co. (part)[1]
25	Stroud ES Co.
26	Thornbury & District Electricity Co.
27	Trent Valley & High Peak Electricity Co. (part)[2]
28	West Gloucestershire Power Co. (part)[3]

Key to Abbreviations

CB: County Borough ES Co: Electricity Supply Company
EL&P Co: Electric Light & Power Company MB: Municipal Borough
EP Co: Electric Power Company UD: Urban District

Notes:

[1] The service area in Brecknock and Radnor was transferred to the South Wales Electricity Board in 1949.

[2] The High Peak area was in the North Western Electricity Board area.

[3] The service area in Monmouthshire, including part of Chepstow, was transferred to the South Wales Electricity Board.

[4] 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.

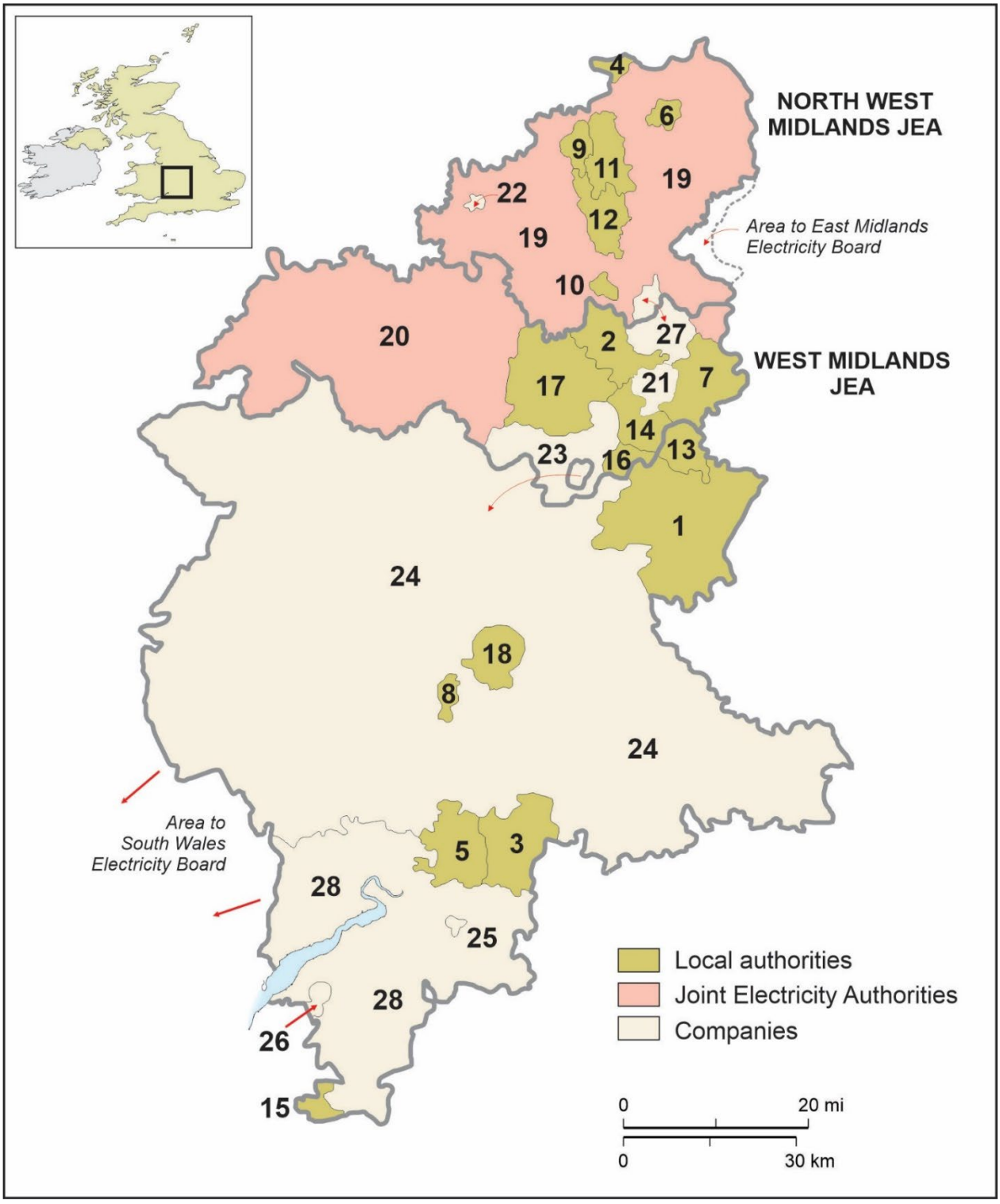

Figure 1 CONTITUENT AREAS OF THE MIDLANDS ELECTRICITY BOARD 1948.

Development of Electricity Supply Areas

The 1948 pattern 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.[5] 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.

Twelve of the applications in 1882 came from the Midlands Area.[6] The South Staffordshire Electric Light Co, made eight applications, for Aston, Balsall Heath, Dudley, Saltley, Walsall, Wednesbury and Darlaston, West Bromwich and Wolverhampton. All but Walsall were successful and ELOs were granted but were subsequently revoked in 1884-85 for lack of action by the promoters. Three of the applications by the Incandescent Electric Lighting Co. for Birmingham, Redditch and Walsall were granted ELOs; the other for Northfield was not proceeded with. A small plant in the neighbourhood of Paradise Street was installed "from which the Town Hall and a few adjoining shops were lighted."[7] The Birmingham system was short-lived and the ELO was revoked in 1886.

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.

Collieries were among the early pioneers of private systems. Trafalgar Colliery, near Cinderford in the Forest of Dean, was using electric power for pumping and ventilation underground in 1882.[8] In the Cannock coalfield, the Chase Colliery Co. introduced electricity for lighting at its No. 2 pit in Chasetown during 1883.[9] A new power station was built in 1908 which also served the surrounding district as a non-statutory undertaking until the late 1920s.

In the transmission of power, especially in large cities, compressed air and hydraulic power were serious competitors for electricity in the 1880s and 1890s. Birmingham, following the example of Paris, introduced a compressed air system in 1886.[10] The Compressed Air Power Works on Artillery Street

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

[6] "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.

[7] Institute of Mechanical Engineers, ***Proceedings***, 1910. "Birmingham Electric Supply Undertaking", p.1311.

[8] D.G. Tucker, "Early electrical systems in collieries: The Trafalgar Colliery in the Forest of Dean and the Brain family", ***Proceedings*** of the IEE weekend meeting on the history of electrical engineering, July 1975.

[9] M.W. Greenslade ed., Victoria County History, ***Staffordshire***, Vol.14 (London, 1990). Burtonwood, Public Services pp.205-220.

[10] B. Pugh, ***The Hydraulic Age: Public power supplies before electricity*** (London: Mechanical Engineering Publications, 1980), pp.32-34.

served for a few years before the company was dissolved.[11] A hydraulic power system was more successful and operated from a central works in Dalton Street from 1891 to c1932. The system was operated by the Corporation Water Department.[12]

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.

Arthur Chamberlain and George Hookham were granted an ELO for the centre of Birmingham in 1889[13] but transferred this to Holmes and Vaudrey of Liverpool.[14] The Birmingham Electric Supply Co. was formed in December1889 and, after building a power station at Dale End, began a public supply in April 1891. An ELO of 1894 extended the supply area to cover the whole of the Borough.

The Midlands Area contributed 13 of the 161 applications submitted to the Board of Trade for the 1890 Parliamentary session.[15] Seven Electric Lighting Orders were granted: six to the local authorities in Cheltenham, Malvern, Stafford, Walsall, Wolverhampton and Worcester and one to the Electric Trust Ltd for Tunstall (revoked in 1892). All the local authorities except for Malvern began work on establishing local systems that were opened in 1894 and 1895. Malvern began a supply only in 1904.

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.

The 20 local authorities were clear examples of local initiative in developing electric light and power. Birmingham Corporation (population 842,238 in 1911) was the largest of the local authorities. Malvern Urban District (population 16,513) was the smallest. Hanley (later part of Stoke-on-Trent from 1910)[16] and Worcester were the first local authorities in the region to open a public supply, in 1894.

[11] The compressed air works are shown on the 25 Inch Map, Warwickshire, Sheet XIV.6, Revised 1887-88.
[12] Pugh (1980), pp.128-130.
[13] Board of Trade, Proceedings under the Electric Lighting Acts, ***Parliamentary Paper***s 1889. HC229. Chamberlain and Hookham had started the electricity supply in Leamington in 1887.
[14] J.C. Vaudrey became managing director and engineer to the company and also served as the first city electrical engineer from 1900 to 1903. He was succeeded by R.A. Chattock (1865-1939) who shaped the Birmingham system until retirement in 1930.
[15] Board of Trade, Proceedings under the Electric Lighting Acts, ***Parliamentary Paper***s 1890. HC273.
[16] Changes in local government areas of the Potteries and West Midlands Conurbation are mapped and described in T.W. Freeman, ***The Conurbations of Great Britain*** (Manchester: Manchester University Press, 1959).

Figure 2 MIDLANDS AREA ELECTRICITY UNDERTAKINGS 1912.

Table 2 MIDLANDS ELECTRICITY BOARD AREA: ELECTRICITY SUPPLY UNTERDTAKINGS c 1912.

UNDERTAKING	*COUNTY*	*SUPPLY BEGAN*
Local Authorities		
Aston Manor MB[1]	Warwicks	1903
Birmingham CB	Warwicks	1891
Cheltenham MB	Gloucs	1895
Dudley CB	Worcs	1899
Gloucester CB	Gloucs	1900
Handsworth UD[1]	Staffs	1905
Hereford MB	Hereford	1899
Leek UD	Staffs	1904
Malvern UD	Worcs	1904
Newcastle-under-Lyme MB	Staffs	1904
Redditch UD	Worcs	1899
Shrewsbury MB	Shropshire	1895
Stafford MB	Staffs	1895
Stoke-on-Trent CB	Staffs	1894[2]
Sutton Coldfield MB	Warwicks	1901
Walsall CB	Staffs	1895
Wednesbury MB	Staffs	1904
West Bromwich CB	Staffs	1901
Wolverhampton CB	Staffs	1895
Worcester CB	Worcs	1894
Companies		
Banbury	Oxon	1903
Church Stretton	Shropshire	1905
Fladbury N/S	Worcs	1900
Kidderminster	Worcs	1900
Leominster	Hereford	1912
Ludlow	Shropshire	1906
Market Drayton	Shropshire	1902
Midland Electric Corpn	Staffs	1902
Ross	Hereford	1902
SWS Electric Power Co.	Worcs/Staffs	1906[3]
Stratford-on-Avon	Warwicks	1907
Tewkesbury	Gloucs	1909

Notes:
[1] Amalgamated with Birmingham CB in 1912.
[2] Hanley CB. The other constituents of Stoke-on-Trent CB were later.
[3] First supply in Smethwick by predecessor tramway company.
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 twelve companies in the Midlands region were very varied in scale and location—from Kidderminster (with a combined tramway and public service for a town of 27,980 people) to Fladbury, a village near Pershore, where the local mill offered a non-statutory supply. Some companies were local in origins; others were part of a national chain. Market Drayton was owned by Edmundson's and Kidderminster by the British Electric Traction Company. Leominster, where a new system was opened in 1912, was part of the Western Electric Distributing Co.'s network directed by J.H. Edwards from Stroud.

ELECTRIC TRAMWAY SYSTEMS IN THE MIDLANDS[1]

	YEARS OPERATING	*ROUTE MILES*	*MAX. NO. OF CARS*
Birmingham Corporation	1904-1953	80.42	843
Birmingham & Midlands Tramways Co.	1903-1904[2]	9.00	58
City of Birmingham Tramways Co.	1904-1912[3]	36.65	106
Dudley, Stourbridge & District Co.	1899-1904[2]	21.25	57
Gloucester Corporation	1904-1933	9.75	30
Kidderminster & Stourport Co.	1898-1929	4.60	28?
Kinver Light Railway Co.	1901-1930	4.18	21
Potteries Electric Traction Co.	1899-1928	31.73	121
South Staffordshire Tramways Co.	1893-1904[2]	23.07	46
Walsall Corporation	1901-1933	13.51	49
Wolverhampton Corporation	1901-1928	13.85	69
Wolverhampton District Co.	1902-1904[2]	14.69	38
Worcester Electric Tramways Co.	1904-1928	5.86	17

Thirteen electric tramway systems were developed in the region, four by local authorities and nine by companies. The South Staffordshire Co. was a pioneer of electric traction, beginning a service in 1893, several years ahead of Walsall and Wolverhampton which began the early municipal operations in 1901. Birmingham Corporation began operating its own electric trams in January 1904. Before electrification, tramways in the city had used almost all types of motive power—horse, steam, cable and accumulators (batteries). A new power station was built at Summer Lane to supply the tramway system with DC current and AC (at 25Hz)[4] to substations in outer parts of the city for tramway and public supply.

Five of the systems had independent power stations. The largest was at Smethwick where the Birmingham & Midlands Tramways Co. Joint Committee completed a station in 1906. AC at 25Hz frequency was also adopted here. General supply to the town and later Oldbury began at an early stage and the power station was transferred to the associated Shropshire, Worcestershire & Staffordshire Electric Power Co. in 1913. At this time the capacity had been increased from 2,500kW to 6,500kW.

Smaller stations were located at Kidderminster (1,500kW in 1910)[5]; Harts Hill at Brierley Hill (400kW in 1907), and Pleck, Walsall (270kW in 1903). Potteries Electric Traction had power stations at Newcastle-under-Lyme (1,300kW in 1910) and Stoke-upon-Trent (955kW).

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. Such power sales were still significant in 1925/26, amounting to 15.6 percent of total electricity sales in Birmingham and 13.4 percent in West Bromwich. In 1927/28 the power stations of the Potteries Electric Traction Co. generated 3.28million kWh.

Electric tramways provided fast, efficient and cheap urban transport and were very profitable before 1914. Motor bus competition after the war quickly undermined the viability of the smaller systems. As the Midland tramway networks of British Electric Traction retreated, its regional subsidiary the Birmingham & Midland Motor Omnibus Co. expanded to serve much of the area.

Notes

[1] Compiled from Keith Turner, ***Directory of British Tramways***, Vol.2 (Stroud: The History Press, 2009).

[2] The holdings of British Electric Traction were consolidated under the management of the Birmingham & Midland Tramways Joint Committee from 1904 to 1930 when local authorities took over the remaining tramways. The Kidderminster, Stourport & Kinver Light Railway became part of the Joint Committee after 1919.

[3] The City of Birmingham Tramways Co. was taken over by Birmingham Corporation between 1906 and 1912, as the leases on various lines expired.

[4] Birmingham followed Glasgow in adopting 25Hz AC. The frequency was favoured at the time since it was readily converted to DC.

[5] The Kidderminster system also provided a public supply to the town.

The Midland Electric Corporation for Power Distribution was the largest company operating in the Midlands, serving about 17 Urban Districts from a power station at Ocker Hill, Tipton. First registered in June 1897, the company was unusual in promoting an Electric Lighting Order covering several Urban Districts. Local support ensured its successful passage through Parliament, unlike the Warsop (East Midlands) project that had failed to gather local support. With substantial investment, partly from outside the region, the company began a public service in 1902.[17]

The Shropshire, Worcestershire & Staffordshire Electric Power Co. was just beginning to emerge as a regional power company in 1912. Ambitious plans for a large territory in these three counties were embodied in the Acts of 1903, 1905 and 1906. Little development took place, however, until the company was taken over by the Birmingham & Midland Tramways Co. (a subsidiary of British Electric Traction). By 1912 about half the tramways company's revenue came from the sale of electricity.[18] Some reorganisation took place about this time with the Smethwick power station (capacity 6,500kW) being transferred to the SWS Co. With the ELOs for Oldbury and Smethwick, together with Dudley Corporation's electricity system acquired in 1914, the SWS Co. now had a viable base for expansion.

Electrification in the region around 1912 was still incomplete, with only a small part covered by Electric Lighting Orders. Some towns still unserved included Cannock (population 28,586 in 1911), Oakengates (11,744), Congleton (11,309), Bromsgrove (8,926), Kidsgrove (8,862), Stroud (8,767), Lichfield (8,618) and Evesham (8,340). Ledbury (3,358) where a small company was trying to develop a system, began service in 1913. Halesowen, then a Rural District, received a supply from the SWS Co. in 1915.

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 price. 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. (See tramways box)

The limitations of DC supply systems became apparent to larger undertakings by 1907 and in the search for economies of scale the introduction of more efficient prime movers became a priority. Birmingham Corporation added AC when its Summer Lane generating station was opened in 1906.[19] There were only two small Parson's turbines (500kW) at this time. An all-turbine station at Nechells was completed in late 1915. Mixed AC/DC systems became increasingly common from this time. Conversion to a full AC system was, however, a long process. There were still some DC customers in Birmingham and Gloucester as late as 1957.

Amalgamation of six contiguous towns in the Potteries as the new County Borough of Stoke-on-Trent in 1910 highlighted the issues of fragmented local authorities and electricity undertakings. (**Figure 3**). Hanley had introduced an AC system (100Hz) in 1894 but three other towns—Longton (1901), Stoke (1904) and Burslem (1905)--had all adopted DC (at slightly different voltages). In contrast to the varied

[17] ***Engineering*** Vol.74, 1902, pp.201-202. See also: Malcolm R. Richards, Black Country Power: the story of Ocker Hill Power Station—the men and the machinery (Black Country Society, 2001).
[18] Birmingham & Midland Tramways Ltd—Annual Meeting, ***The Times***, 12 June 1912, p.22.
[19] The power station had four distinct systems: a) Local DC supply; b) DC to the Dale End and Water Street stations for local distribution; c) DC for tramways in the vicinity; d) AC (25Hz) to substations in distant parts of the city for conversion to DC for tramway and local supply. ***Engineering***, Vol.82, 1906, p.438.

electricity systems, the Potteries Electric Traction Co. provided an integrated service throughout the six towns and the neighbouring borough of Newcastle-under-Lyme.

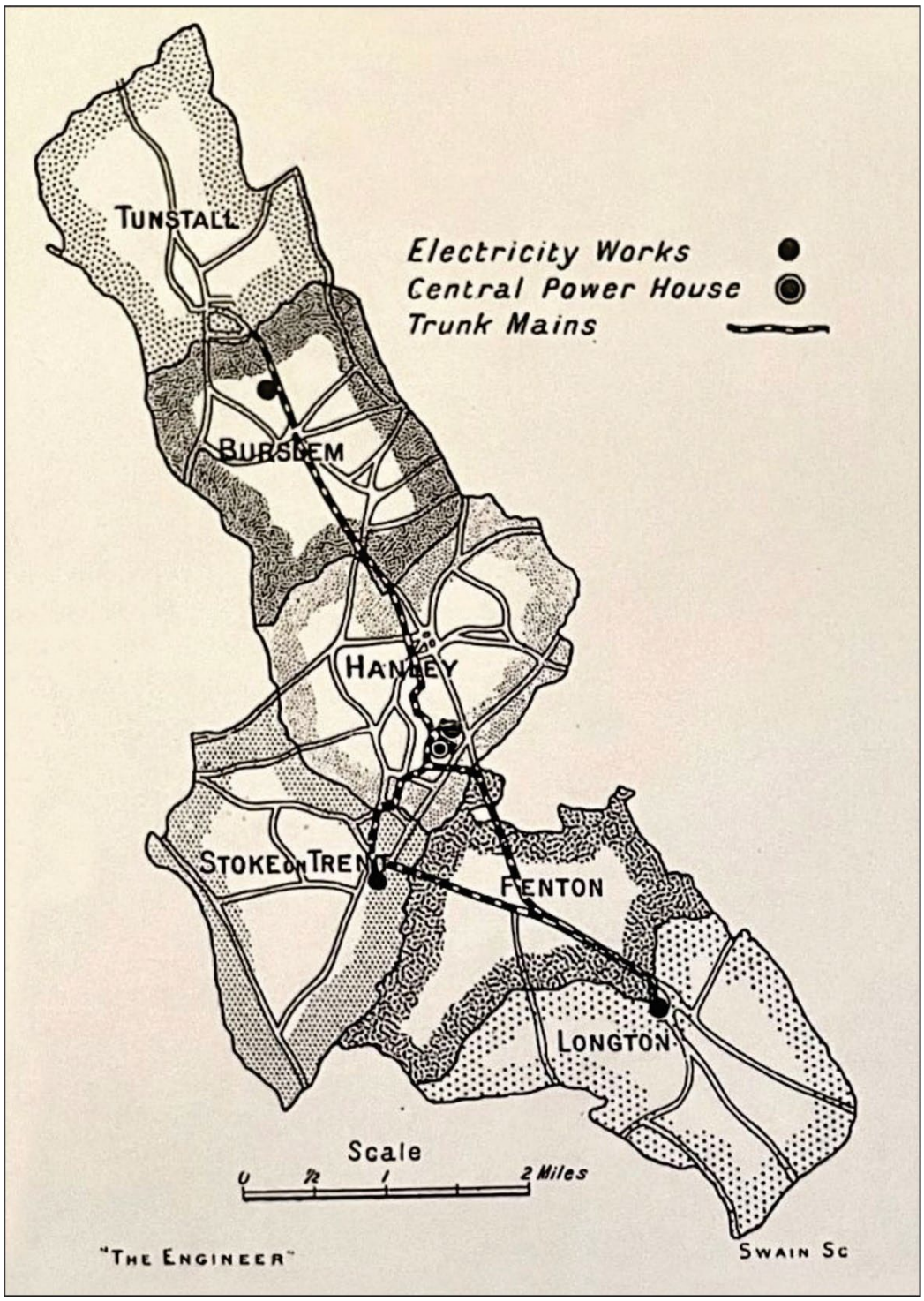

Figure 3 STOKE-ON-TRENT ELECTRICITY SYSTEMS 1913.

Since none of the power stations were suitable for expansion and complete replacement of the systems was not an option, the new electricity department prepared a compromise plan adopted in mid-1911. A new powerhouse at Hanley would generate AC current at 50Hz and supply the existing stations via a system of trunk mains (**Figure 3**). Rotary converters at Burslem, Stoke and Longton would produce DC current for local distribution, while motor generators at Hanley would convert the frequency from 50Hz to 100Hz. The new powerhouse with two 1,550kW turbines was opened in 1913[20] and the system continued to operate well into the 1920s. Full integration of the whole city at 50Hz was achieved by 1938.

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.

Many large industrial plants in Birmingham had independent generating facilities. The Birmingham Small Arms Co. (BSA) employed six gas-engined generators with a capacity of 1,100kW at the Small Heath works. At Saltley the Metropolitan Amalgamated Railway Carriage & Wagon Co. (capacity 1,200kW) generated 2.5 million kWh in 1909.[21] This output was equivalent to about one quarter of the total Corporation sales. Other Birmingham firms with significant electricity output included the Austin Motor Co. at Longbridge[22]; Kynoch's Lion Works, Witton[23]; and Cadbury Brothers, Bournville. The large tyre factory at Fort Dunlop, opened in 1916, also generated all its power and lighting needs.[24] In the Potteries area, the North Staffordshire Railway Co. had at least four generating stations for supplying the railway stations, hotel at Stoke and workshop as well as the Harecastle tunnel of the Trent & Mersey Canal.[25]

Hotels were early in adopting electric lighting as one of the amenities of high-class hospitality. The Sanford House Hotel in Church Stretton ("a coming health resort") featured electric lighting in its promotion.[26] A small local non-statutory company had begun a local supply there in 1905. Hotels in Droitwich such as the Worcestershire Brine Baths Hotel (150 rooms) had to wait another decade before a public supply became available.

Other large institutions of a different type were also introducing electricity. The large Staffordshire County Asylum at Cheddleton near Leek included a power station when opened in 1899. An electric railway for carrying coal and passengers was added later to connect the hospital with the North Staffordshire Railway.

The first building to be erected on the Edgbaston site of the University of Birmingham was the power station. Completed in 1904, it included many types of boilers and generators and was designed not only to serve the campus but also for research and training in engineering.[27] Gisbert Kapp (1852-1922) was

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[20] "New electric power house for Stoke-on-Trent", ***The Engineer***, Vol.115, 1913, pp.407-409.

[21] I.Mech.E, ***Proceedings***, 1910. Birmingham works visits.

[22] I.Mech.E, ***Proceedings***, 1927. The Austin works powerhouse had 4,500kW capacity together with a frequency changer for access to Corporation supplies.

[23] Capacity 6,200kW in 1927.

[24] Capacity 16,000kW in 1927.

[25] The four power stations at Chatterley, Hanley, Longton and Stoke were still working in 1928. Electric tugs were used to propel the boats in the tunnel.

[26] ***Bradshaw's April 1910 Railway Guide*** (reprinted Newton Abbot: David & Charles, 1968), p.1047

[27] ***Engineering***, Vol.80, 1905, pp.342-346.

appointed the following year as the first Professor of Electrical Engineering.[28] By this time electrical engineering was part of the engineering curriculum at most British universities.

Throughout the region, country houses, estates and large farms added electricity. In the absence of a public supply in towns a few larger residences installed a private system. The Bishop of Lichfield's palace had its own supply from a dynamo under the north-west tower of the Close.[29]

War demand for munitions and supplies affected most parts of the region. Companies such as the Wolseley Motor Co. (a subsidiary of Vickers) extended production to aero engines and aircraft. New works such as the National Projectile Factory in Dudley were established by Ministry of Munitions. The scale of expansion during the war may be illustrated by the Austin motor works where the labour force grew from 2,300 to about 20,000 by 1918.[30] Multiple powerhouses were needed to serve the extended factory buildings and the adjacent housing area.

Electricity undertakings struggled to meet the demand. Sales of electricity by the SWS Co., for example, rose from 16.7m kWh in 1914 to 62.2m kWh in 1918. The Smethwick power station was extended to increase supplies and plans were being made to build a new station at Stourport.

In the southern part of the region where large National Filling Factories were built by the Ministry of Munitions, local supplies were stretched to the limit. The Quedgeley complex south of Gloucester built an independent generating station.[31] The others at Rotherwas near Hereford and at Banbury depended on local electricity supplies.

The No.2 National Shipyard, developed at Beachley in the River Wye estuary (1917-1919), included a 7,000kW power station. After a very limited period of use, the powerhouse and the shipyard were scrapped.[32]

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.

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[28] D.G. Tucker, ***Gisbert Kapp 1852-1922*** (University of Birmingham, 1973), 36pp.
[29] M.W. Greenslade, ed. Victoria County History. ***Staffordshire*** Vol.14 (London, 1990), p.102
[30] Roy Church, ***Herbert Austin: The British motor car industry to 1941*** (London: Europa Publications, 1979), p.34.
[31] Wayne D. Cocroft, Dangerous Energy: the archaeology of gunpowder and military explosives manufacture (Swindon: English Heritage, 2000), p.179.
[32] Carol and Richard Clammer, ***Beachley and the First World War: The story of a shipyard, a railway and the transformation of a rural parish*** (Lydney: Lightmoor Press & Tidenham Historical Group, 2017), 192pp. The shipyard never completed a vessel.

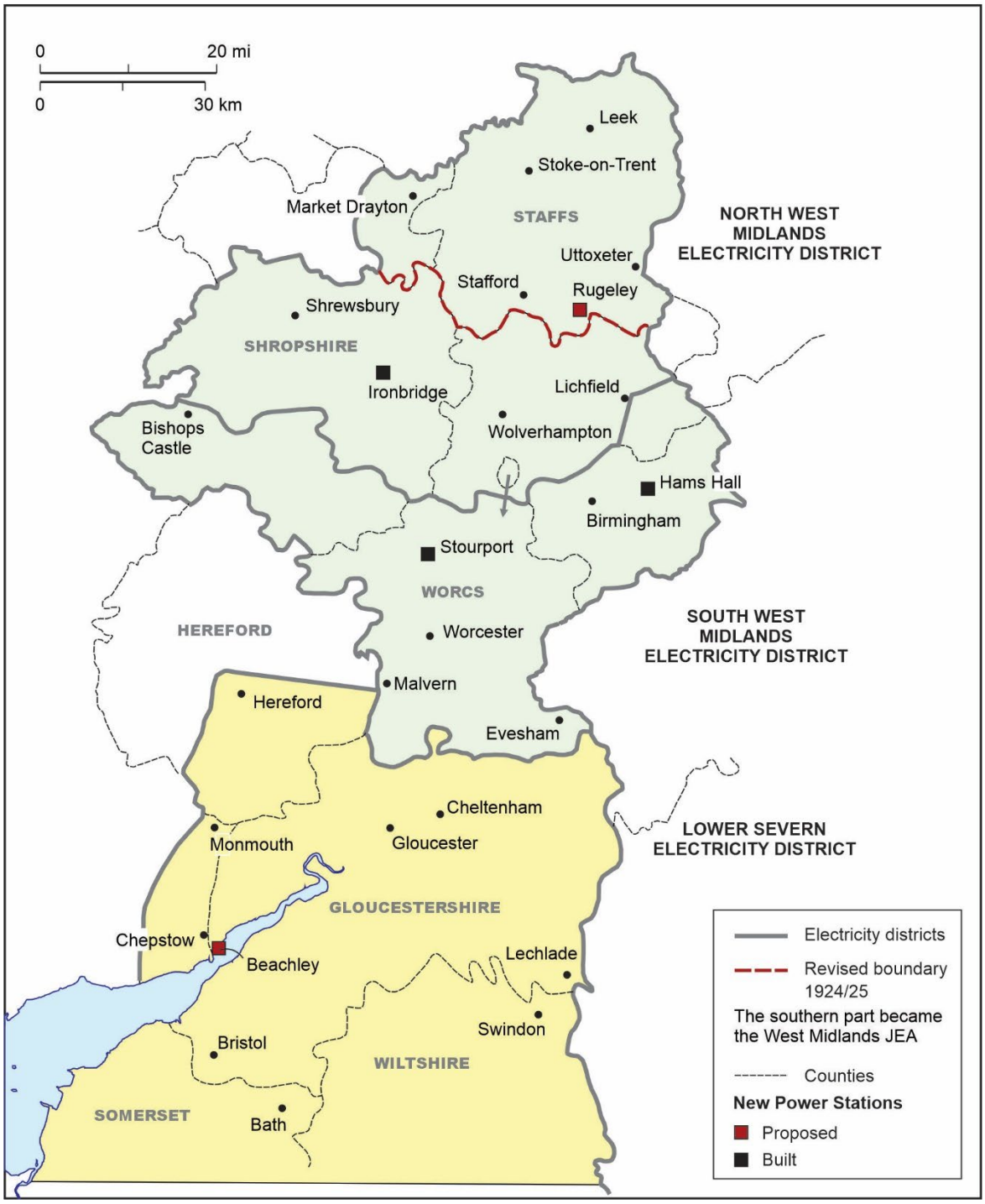

Figure 4 ELECTRICITY DISTRICTS 1921.

Three Electricity Districts were defined for the Midlands region (**Figure 4**) and another was established later in 1924/25:

a) The Lower Severn Electricity District was the first to be defined and covered a very extensive district from Chepstow to Taunton. An organising committee proposed that a Joint Electricity Authority should acquire the generating station at Beachley (built during the war for the

National Shipyards) and build transmission lines to some collieries in the Forest of Dean and other parts of the District. The local inquiry on 11 January 1921 at Bristol was adjourned after an inconclusive meeting and the organising committee decided by May that there was no further interest in the formation of a JEA.[33]

A conceptual proposal for a Severn Barrage published by the Ministry of Transport in November 1920 was quickly dismissed at the time as too ambitious and expensive.[34] The barrage that included a road and railway bridge followed a similar alignment to the 1880s railway tunnel. In addition to the electricity generated at the barrage, the proposal included a novel pumped storage scheme. Tidal water from the River Wye would be pumped from Tintern Abbey to a high-level reservoir in the Angigy River valley. Power from the release of the water at low tide would help to maintain the flow of electric power.[35] Later more detailed reviews of the 600,000kW scheme found that costs outweighed the potential benefits.[36]

b) The South West Midlands Electricity District covered the whole of Worcestershire, southwest Shropshire, Birmingham and northwest Warwickshire. Dominated to two large undertakings, Birmingham Corporation and the Shropshire, Worcestershire and Staffordshire Electric Power Co., the northern limits were defined by the 25Hz frequency adopted two decades earlier. A proposal for a Joint Advisory Committee of the two undertakings was adopted at a Local Inquiry held in Birmingham in March 1922. A draft Order by the Electricity Commissioners was published in June, approved by a further inquiry at the end of the month and a final Order published in October. This was confirmed the Minister of Transport in March 1923 and the Joint Advisory Committee Order was approved by Parliament in June.[37] The first meeting of the new committee was held on 12 July 1923.

c) The North West Midlands Electricity District extended over most of Staffordshire (except for Burton-on-Trent and Smethwick), most of Shropshire and initially part of Cheshire. Local authorities were generally in favour of the formation of a JEA at a Local Inquiry in Wolverhampton in February 1922. A regional power station to serve the District was proposed for a site in Rugeley, but by March 1924 a site in Ironbridge had taken precedence. The provisional committee, recognizing the differences between the northern and southern parts of the District, was recommending the formation of two JEAs. Further meetings and a local inquiry in December 1924 confirmed these decisions and an Order was made by the Electricity Commissioners for a West Midlands JEA. Parliamentary approval was delayed until December and the inaugural meeting of the JEA was held in Wolverhampton Town Hall on 10 March 1926.[38]

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[33] First Annual Report of the Electricity Commissioners 1920-21 (London: HMSO, 1921), p.17.
[34] "Harnessing Severn Tides: Huge Power Scheme, Years of Work for an Army of Men." ***The Times*** 26 November 1920, pp.9,13. See also: 29 November, p.7 and 14 December when the third interim report of the Water Resources Committee was "…unable to recommend the Severn scheme as a practical proposition".
[35] "Severn Barrage scheme", ***The Engineer*** Vol.130, 1920, pp.562-563.
[36] See: D.G. Tucker. "Tidal Power: from tide mill to Severn Barrage", ***Wind and Water Mills*** Vol.9, 1989, pp.15-39.
[37] For the final scheme see: ***Third Annual Report of the Electricity Commissioners 1922-23*** (London: HMSO, 1923), pp.17-20 with detailed map. A summary report for the Electricity District was published as Appendix B for 1923-24.
[38] For the final scheme see: ***Sixth Annual Report of the Electricity Commissioners 1925-26*** (London: HMSO, 1926), pp.18-19 with detailed map. A summary report for the Electricity District was published as Appendix H for 1925-26.

d) A new North West Midlands Electricity District was defined in December 1924 comprising the northern parts of Staffordshire, northeast Shropshire and the Congleton area in Cheshire. By August 1925 a Conference of Authorised Undertakers had drawn up a scheme for a JEA and a local inquiry in Stoke-on-Trent during February 1926 approved the plans. The preparation and publication of a draft Order was delayed by work on the Central England and other grid schemes until April 1928.Another local inquiry in May was followed by a long delay in the confirmation of the Order by the Minister of Transport and the affirmation by both Houses of Parliament. The JEA became a reality on 26 February 1929 when the House of Commons passed an affirmative resolution, and the first meeting of the Authority was held in Stoke-on-Trent on 17 June 1929.[39]

After nearly a decade of discussion and preparation of documents, the Midlands region now had two Joint Electricity Authorities and a joint Advisory Committee. In the creation of these entities the Electricity Commissioners had shown a great deal of patience which was sustained by co-operative attitudes by the electricity undertakings. Co-operation was fairly rare in other parts of the country. Although some of the intentions of the 1919 Act were superseded by the grid interconnection schemes from 1927, the new organisations created in the Midlands were helpful in promoting orderly development and widespread electrification.

While the negotiations over the formation of JEAs continued, a few new electricity undertakings were being formed in the early 1920s. Cannock Urban District began a public supply in 1922, and the Cannock Chase Colliery Co. (legitimised by Special Order in 1924) extended its service area.

The West Gloucestershire Power Co. was the most important of these new formations. A non-statutory power station (10,000kW) promoted by the Norchard Syndicate Ltd had been approved by the Electricity Commissioners in August 1922. Construction began at Lydney and a new company, West Gloucestershire Power Co., applied for a Special Order in March 1923 for a distribution area covering the Forest of Dean and extending eastwards to Stroud. The Order was granted in May 1924 and the new company had full legal standing as an electricity distributor. Later extensions included districts in Monmouthshire.

With its status assured by the South West Midlands Electricity District Order, the SWS Co. began expansion southwards with construction of a power station at Stourport (commissioned in 1925) and acquisition of the Redditch Urban District Council's system.

The 32 undertakings in 1925/26 (**Table 3**) operated a variety of systems. Twelve were DC and thirteen were mixed AC/DC, reflecting a 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. While most AC systems operated at what had become the national standard of 50cycles (Hz), the two largest undertakings, Birmingham Corporation and the SWS Co. operated at 25Hz. Stoke-on-Trent had an area of 100Hz and Redditch worked at 70Hz.

Data on generating capacity show a wide range in size from Birmingham Corporation with 156,000kW to the Ledbury Electric Supply Co. with 70kW. Steam turbines were dominant in all the larger stations and varied in scale from a 650kW machine in Banbury to 18,000kW units installed in the new Prince's power

[39] For the final scheme see: ***Ninth Annual Report of the Electricity Commissioners 1928-29*** (London: HMSO, 1929), pp.45-46 with detailed map. A summary report for the Electricity District was published as Appendix I for 1929-30.

station at Nechells, of Birmingham Corporation. Older reciprocating steam engines were still common in DC generation such as at Malvern and Shrewsbury. Gas engines were employed in many smaller country power stations such as Church Stretton and Ludlow.

Table 3 MIDLANDS ELECTRICITY BOARD AREA ELECTRICITY UNDERTAKINDS 1925/26.

UNDERTAKING	COUNTY	SYSTEM	GENERATING CAPACITY kW	PER CAPITA CONSUMPTION kWh
Local Authorities				
Birmingham CB	Warwicks	AC/DC	156,000	233.6
Cannock UD	Staffs	AC	-	101.3
Cheltenham MB	Gloucs	AC	5,650	84.1
Gloucester CB	Gloucs	DC	6,250	105.2
Hereford MB	Hereford	AC/DC	4,000	40.3
Leek UD	Staffs	DC	1,150	99.3
Malvern UD	Worcs	AC	400	28.4
Newcastle-Under-Lyme MB	Staffs	AC/DC	400	27.4
Shrewsbury MB	Shropshire	DC	1,109	47.9
Stafford MB	Staffs	AC/DC	6,600	199.0
Stoke-On-Trent CB	Staffs	AC/DC	19,450	60.9
Sutton Coldfield MB	Warwicks	DC	875	68.9
Walsall CB	Staffs	AC/DC	13,000	143.3
West Bromwich CB	Staffs	AC/DC	9,100	141.9
Wolverhampton CB	Staffs	AC/DC	31,000	294.2
Worcester CB	Worcs	AC/DC	7,770	135.7
Companies				
Banbury & Dist ES Co.	Oxon	DC	1,215	88.5
Cannock Chase Colliery Co.	Staffs	AC	-	8.7
Church Stretton ES Co.	Shropshire	DC	100	32.3
Halesowen L&T Co.	Worcs	AC	-	62.8
Kidderminster & Dist EL&T Co.	Worcs	AC/DC	-	84.3
Ledbury ES Co.	Hereford	DC	70	15.6
Leominster ES Co.	Hereford	AC	-	15.9
Ludlow EL Co.	Shropshire	DC	85	15.2
Market Drayton EL&P Co.	Shropshire	DC	260	36.2
Midland Electric Corpn	Staffs	AC/DC	33,500	176.4
Ross EL&P Co.	Hereford	DC	90	16.0
SWS Co.	Worcs/Staffs	AC/DC	55,275	..
Stratford-On-Avon E Co.	Warwicks	DC	485	40.0
Stroud ES Co.	Gloucs	AC/DC	-	30.4
Tewkesbury EL Co.	Gloucs	DC	142	20.2
West Gloucestershire Power Co.	Gloucs	AC	10,000	62.4

Source: Electricity Commissioners, ***Engineering and Financial Statistics 1925/26.***

Statistics on electricity consumption per head of population reveal major contrasts among electricity undertakings. Nine places exceeded 100.0kWh per person. Each place had a distinctive market profile reflecting the local economic and social geography. Worcester had a balanced profile in 1925/26 consisting of 24.3 percent of sales in the lighting segment, 3.8 percent in public lighting, 3.5 percent tramway supply and 68.4 percent in power. Two towns, Shrewsbury and Stafford with similar-sized

populations (around 30,000), had very different market profiles. Shrewsbury's profile was dominated by lighting at 55.1 percent with power sales at 34.6 percent. Stafford, in contrast, was dominated by power sales at 89.1 percent. Annual per capital sales in Stafford reached 199.0kWh while Shrewsbury's consumption amounted to only 47.9kWh.

Electrification and extension of supply areas were given a new impetus following the Weir Report (1925),[40] 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.

New municipal undertakings formed after 1926 included Lichfield, Stone, Congleton (1931)[41] and the Warmley Rural District Council (1932).[42] Two new companies appeared, at Thornbury in Gloucestershire and the Trent Valley and High Peak Co. covering the Rugeley district.

The West Midlands Joint Electricity Authority completed the purchase of the power stations at Ocker Hill, Walsall and Wolverhampton in December 1927 and began laying mains to connect the power stations. Land for the new generating station at Ironbridge was being purchased at this time and the first unit was commissioned in 1932.[43]

The benefits of interconnected power stations and economies of scale in generation allowed the West Midlands JEA to reduce the wholesale price by one-third between 1930 and 1936.[44] From an early stage the JEA also began a distribution network, first in the Wellington area and then the Shrewsbury district with the acquisition of the Corporation system in 1938.[45]

The North West Midlands JEA bought the power stations at Stafford and Stoke from the local authorities in 1930 and began an active programme of electrification in the rural areas of the district.

In the southern part of the region the Shropshire, Worcestershire and Staffordshire Electric Power Co. was extending its transmission lines. Bridgnorth was added in 1927, and Hereford Corporation's system[46] and the Banbury Company shortly afterwards. A bulk supply to Cheltenham was inaugurated in 1931. The company was also planning to expand into Wales and had taken over the South Wales Power Co.

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. 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.

Two grid schemes covered the Midlands area. The Central England Electricity Scheme was adopted by the Central Electricity Board in May 1928. Tenders were advertised, contracts made, and construction begun, directed from an office in Birmingham. S.T. Allen (1873-1949) was appointed manager of the

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

[41] "Electricity comes to Congleton!". Article in the ***Congleton Museum Newsletter*** Jan-April 2013.

[42] Warmley RDC supported the undertaking with a one-shilling rate for the first five years of operation. See Gordon E, Payne, ***Gloucestershire: A physical, social and economic survey and plan*** (Gloucester, c.1946), p.204.

[43] Michael Stratton, ***Ironbridge and the electric revolution*** (London: John Murray in association with National Power, 1994) p.39.

[44] Sixteenth Annual Report of the Electricity Commissioners 1935-36 (London: HMSO, 1936), Appendix G, p.134.

[45] Charles Jones, "Electricity Supply in Shropshire before nationalisation", ***Industrial Archaeology Review*** Vol.XVIII (2), 1986, pp.201-221.

[46] D.G. Tucker, "Rural electrification: the pioneering scheme of Hereford Corporation, 1918-1928", ***Transactions of the Newcomen Society*** Vol.51, 1979-80, pp.111-128.

scheme. He had previously been chief engineer of the West Midlands JEA and earlier manager and chief engineer of the Wolverhampton municipal system.

The national grid was designed to connect “selected” power stations. These were generally the largest and most efficient generating plants with potential for expansion. Eleven power stations in the region received this designation.

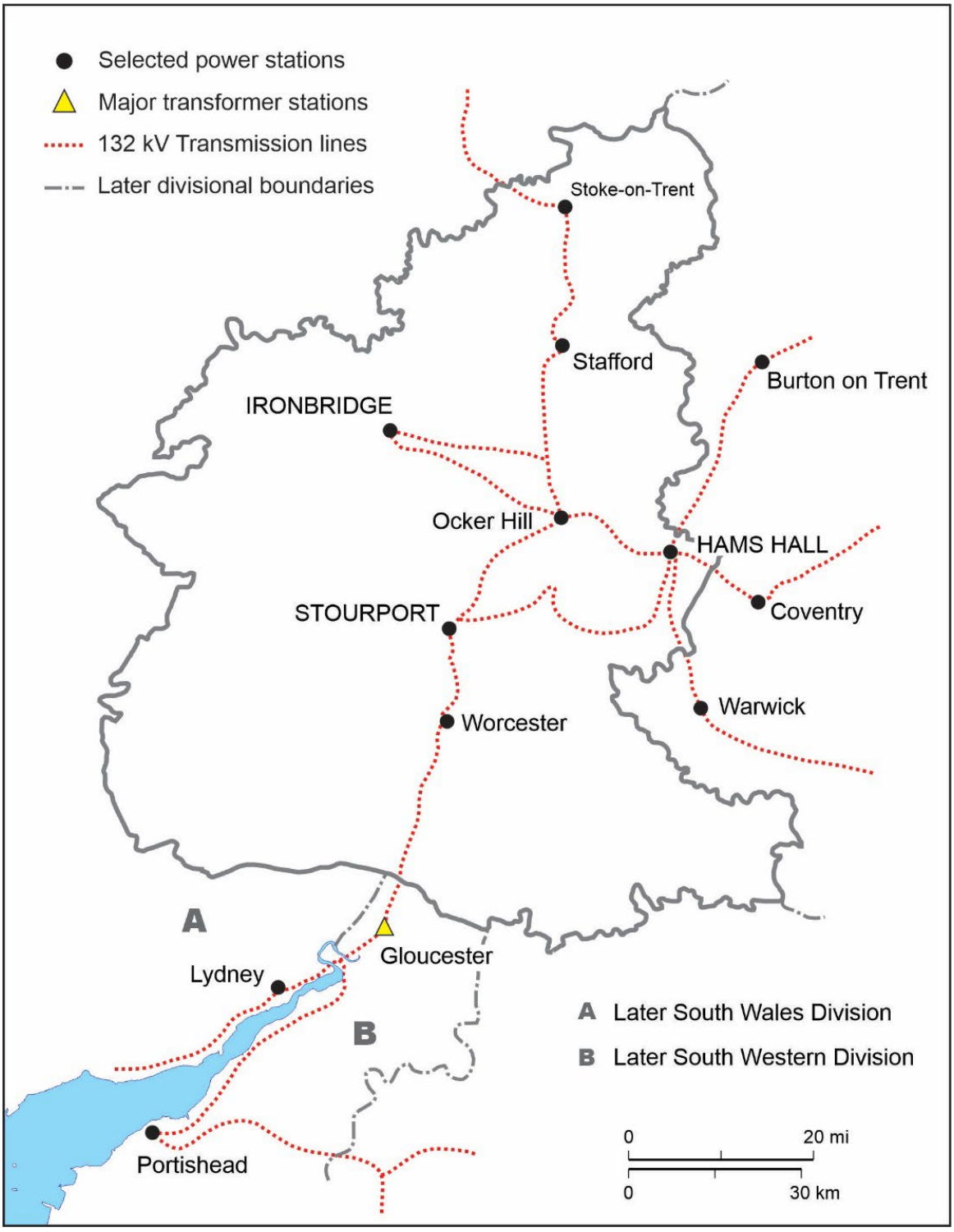


Figure 5 MIDLANDS AREA: NATIONAL GRID 1933.

The selected power stations were linked together by the 132kv transmission grid (**Figure 5**). Nine generating stations in the core of the region were connected including the three new plants at Hams Hall, Ironbridge and Stourport. Stoke-on-Trent and Worcester were linked by a north-south line that also connected with the neighbouring North West England and North Wales, South West England and South Wales schemes. In addition to building the transmission lines and transformer stations, the grid scheme also included the tasks of converting the Birmingham and SWS Co. systems from the 25Hz frequency to the national standard of 50Hz. This involved rebuilding or replacing all the generating equipment in the power stations and similar work on all the equipment owned by consumers.

Gloucestershire and Hereford were part of the South West England and South Wales scheme which was adopted by the CEB in June 1930. Directed from Bristol, the scheme included Lydney as a selected power station and transmission lines to South Wales and the new plant at Portishead near Bristol. The original scheme proposals involved crossing the Severn at Chepstow, but more detailed surveys showed that a much cheaper crossing could be built near Gloucester at Arlingham.

Securing wayleaves for the siting of transmission towers could be challenging when issues of amenity arose. The detailed plan to route part of the line from Arlingham along the banks of the Severn to a crossing of the Gloucester and Berkeley Canal beside the church at Frampton-on-Severn raised strong opposition. The Bishop of Gloucester wrote in a letter to ***The Times***: "I have been asked to intervene by the people of the village and gladly do so, for the whole proposal seems to be as indefensible as it is unnecessary".[47] He was supported by the Chairman of the Rural District Council and the President of the Bristol and Gloucestershire Archaeological Society.[48] The CEB apparently agreed and relocated the transmission line inland to avoid the village.

When trading began on 1 April 1934 in the Central England scheme area, the grid added a new layer to the complex of undertakings that operated the electricity supply system. The Birmingham grid control office of the Central Electricity Board now managed the flows of power on the transmission lines and directed the hour-by-hour operations of the selected power stations. The Stoke-on-Trent power station remained in the ownership and management of the North West Midlands JEA but the daily operation was directed from Birmingham. Planning for the future became increasingly centralised, particularly from London.

Lydney power station was directed from the Bristol grid control office when trading began in the South West England and South Wales scheme area on 1 January 1935.

Table 4 shows the situation in 1935/36 when 35 undertakings were in operation. Over the previous decade many changes had taken place. The number of AC and AC/DC systems had grown while wholly DC systems had shrunk to two (in Shrewsbury and Market Drayton).

Generating technology emphasised economies of scale with larger units that brought significant reductions in coal consumption. The Hams Hall station of Birmingham Corporation (opened in 1929) with 30,000kW turbo-alternators consumed 1.47lbs of coal for each kilowatt hour generated. This was a significant improvement over the performance a decade earlier when the average for the three Corporation power stations was 2.93lbs. In 1935/36 the best regional performance was at Ironbridge

[47] "Pylons in a Saxon village?" ***The Times*** 15 August 1931, p.13.
[48] ***The Times*** 18 August 1931, p.6; 21 August 1931, p.6.

which used 1.44lbs per kWh. This station had the largest generators in the region with a capacity of 50,000kW.

Rationalisation of generation and interconnection of undertakings all contributed to reducing the cost of electricity. Other factors such as the growth of radio broadcasting[49] and lower prices for small appliances helped to boost electricity consumption. By 1935/36 there were 25 places in the region with per capita consumption levels above 100kWh.

Table 4 MIDLANDS ELECTRICITY BOARD AREA ELECTRICITY SUPPLY UNDERTAKINGS 1935/36.

UNDERTAKING	SYSTEM	GENERATING CAPACITY kW	PER CAPITA CONSUMPTION kWh
Local Authorities			
Birmingham CB	AC/DC	314,250	556.9
Cannock UD	AC	-	182.1
Cheltenham MB	AC	-	188.2
Congleton MB	AC	-	118.6
Gloucester CB	AC/DC	4,050	249.2
Leek UD	AC/DC	1,200	292.4
Lichfield MB	AC	-	110.1
Malvern UD	AC	400	68.2
Newcastle-Under-Lyme MB	AC/DC	400	103.0
Shrewsbury MB	DC	2,076	152.7
Stafford MB	AC/DC	-	464.7
Stoke-On-Trent CB	AC/DC	-	259.4
Stone UD	AC	-	114.9
Sutton Coldfield MB	AC/DC	1,000	244.3
Walsall CB	AC/DC	-	247.1
Warmley Rd	AC	-	88.7
West Bromwich CB	AC/DC	-	417.6
Wolverhampton CB	AC/DC	-	843.3
Worcester CB	AC	14,620	377.0
Joint Electricity Authorities			
North West Midlands JEA	AC/DC	46,100	..
West Midlands JEA	AC/DC?	205,300	..
Companies			
Banbury & Dist ES CO.	AC/DC	-	190.8
Chasetown & Dist ES CO.	AC	-	30.3
Kidderminster &Dist ES CO.	AC/DC	-	139.1
Ledbury ES CO.	AC	-	61.2
Leominster ES CO.	AC	-	59.0
Market Drayton EL&P CO.	DC	88	73.4
Midland Electric Corpn	AC	-	345.4
SWS CO.	AC/DC	119,325	..
Stratford-On-Avon E CO.	AC/DC		233.7
Stroud ES CO.	AC		112.1
Tewkesbury EL CO.	AC		106.4
Thornbury & District EL CO.	AC		99.7
Trent Valley & High Peak	AC		125.4
West Gloucestershire Power CO.	AC	17,500	215.9

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

[49] The BBC regional transmitting station at Droitwich, opened in 1934, included a diesel-engined powerhouse (1,880kW capacity). ***The Engineer*** Vol. 158, 1934, p.257. From 1922 to 1927 the BBC had used the chimneys at Summer Lane power station for the regional transmitter. See Edward Pawley, ***BBC Engineering 1922-1972*** (London: BBC, 1972), p.39.

The growth of electricity sales, especially in the lighting segment, may be illustrated by the case of Worcester. Total electricity sales grew from 8.01million kWh in 1925/26 to 23.44m kWh a decade later. The lighting segment that included domestic uses expanded from 1.95m kWh to 12.13m kWh. Over the same period, per capita consumption in the city rose from 135.7kWh to 377.0kWh.

The South West Midlands Joint Advisory Committee also used per capita sales to illustrate the progress of electrification. Per capita sales in the District that included Birmingham rose from 191kWh in 1927 to 458kWh in 1936.[50] Coal consumption per kWh generated was reduced from 3.26lbs to 1.81lbs in the same period.

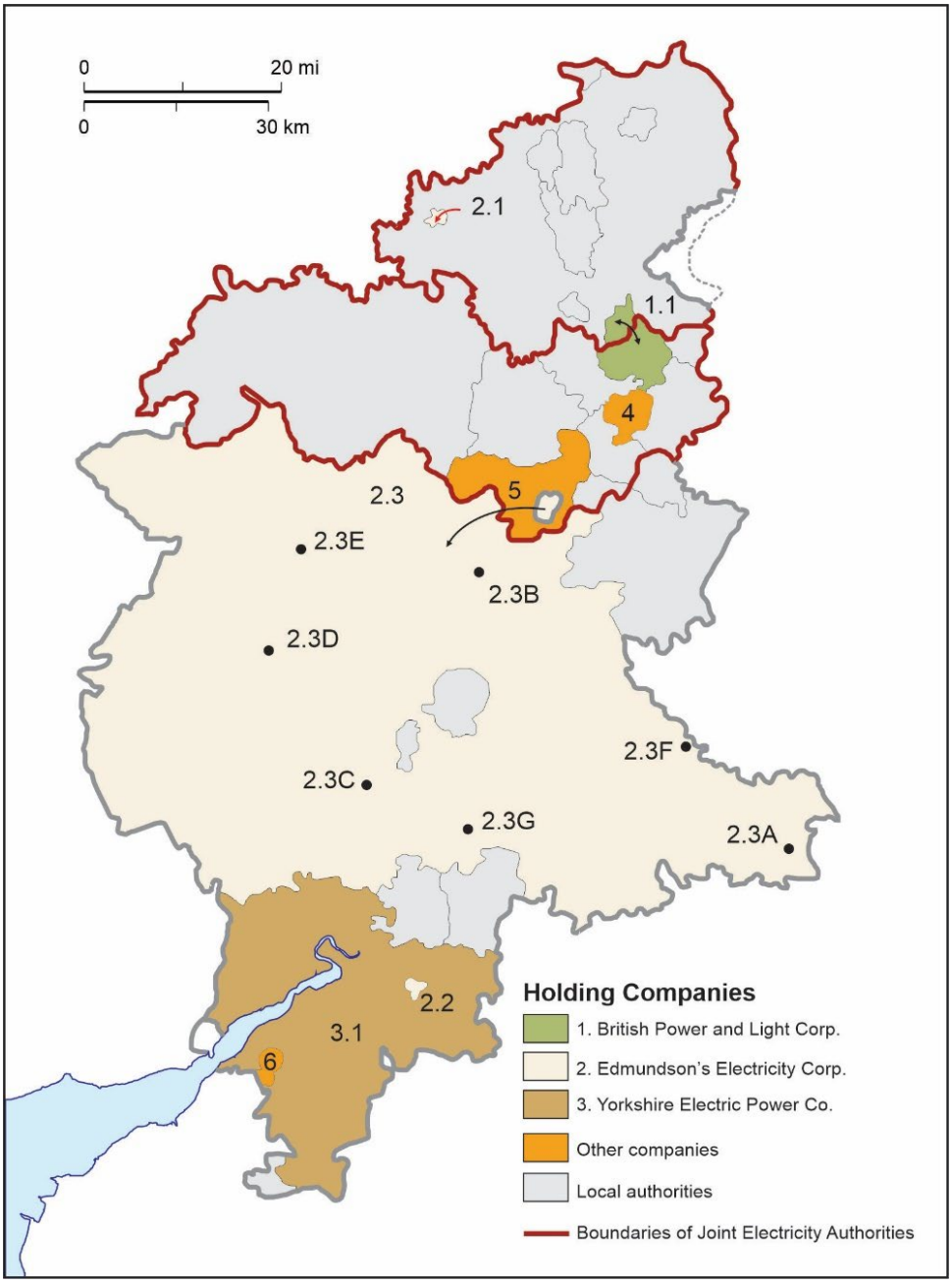


Figure 6 ELECTRICITY HOLDING COMPANIES 1934-35.

[50] Sixteenth Annual Report of the Electricity Commissioners 1935-36 (London: HMSO, 1936), Appendix A, p.106.

Table 5 MIDLANDS ELECTRICITY BOARD AREA CORPORATE STRUCTURE OF ELECTRICITY HOLDING COMPANIES 1934/35.

1. British Power & Light Corporation Ltd	1.1 Trent Valley & High Peak E Co.
2. Edmundson's Electricity Corporation Ltd	2.1 Market Drayton EL&P Co. 2.2 Stroud ES Co. 2.3 Shropshire, Worcestershire & Staffordshire EP Co. A Banbury & District ES Co. B Kidderminster & District ES Co. C Ledbury ES Co. D Leominster ES Co. E Ludlow EL Co. F Stratford-on-Avon E Co. G Tewkesbury EL Co.
3. Yorkshire Electric Power Co. Ltd	3.1 West Gloucestershire Power Co.
Other Companies	4. Chasetown & District ES Co. 5. Midland Electric Corporation 6. Thornbury & District EL Co.

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

The 14 companies in the region were controlled by a variety of interests (**Figure 6** and **Table 5**). Edmundson's Electricity Corporation was the largest holding company with nine subsidiaries. Although the company had been an early developer of local systems, beginning with Shrewsbury in 1895 and followed later with Market Drayton, the real expansion took place only from 1929. The British Electric Traction Co. that had controlled the SWS Co. for two decades decided to sell its Midlands electricity interests to the Greater London and Counties Trust that had acquired Edmundson's a year earlier.[51] SWS Co. as a large and profitable enterprise became an important part of the Edmundson's group. Two other companies in the region were also owned by outside interests. The Trent Valley and High Peak Company was owned by British Light & Power that also had control of North Wales Power. Gloucestershire Power was owned by the Yorkshire Electric Power Co. Three companies in the Midlands region remained outside the control of the large holding companies.

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 1936[52] 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 nine of the 19 local authorities were above this threshold and many small towns objected to the idea of amalgamation with larger authorities or companies. The government's Outline of

[51] The Greater London and Counties Trust was the British subsidiary of the Utilities Power & Light Corporation based in the United States. See: William J. Hausman, Peter Hertner and Mira Wilkins, ***Global Electrification: multinational enterprise and international finance in the history of light and power 1878-2007*** (New York: Cambridge University Press, 2008), pp.181-182. A full-page advertisement in ***The Times***, "Faraday Number", 23 September 1931, p.lv, included a detailed map of the Greater London and Counties Trust holdings.

[52] 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.

Proposals published in April 1937[53] was met with strong opposition and more pressing issues of the time meant that reorganisation of distribution was set aside.

Edmundson's Electricity Corporation took note of these moves toward amalgamation and reduced the number of small subsidiaries in the SWS company territory. The spatial organisation of the late 1930s remained essentially unchanged until nationalisation.

Demand for electricity, especially by industrial users, grew rapidly after 1936 with rearmament and then the war effort. Large shadow factories in the Birmingham ad Stoke-on-Trent districts as well as aircraft factories in Gloucester and Cheltenham and the Royal Ordnance Factory at Swynnerton, Staffordshire were all large consumers of electricity. Major extensions added capacity to the larger generating stations such as Hams Hall, Ironbridge, Stourport, Ocker Hill and Worcester. Two new power stations were built: Hams Hall B and Castle Meads in Gloucester.

Building the large new power stations became increasingly challenging in the 1920s as the West Midlands JEA found with its plans to develop a site on the River Severn at Buildwas, Shropshire. The application to the Electricity Commissioners for a Special Order for compulsory purchase of land in December 1926 was opposed by local property owners and other interested parties. A local inquiry was held and, with some changes to the area of the site, the Order was approved in December 1927. Further opposition to the application to build the power station resulted in another local inquiry. Formal consent to the construction of the Ironbridge station was granted in August 1928.[54]

A decade later the North West Midlands JEA also found that there were many obstacles to the building of a new station to serve the Stoke-on-Trent district. The Authority's proposal in March 1939 to build a station at Strongford on the River Trent south of the city faced opposition from many interests. Local residents were concerned about dust and dirt as well as the loss of amenity around the village of Barlaston and Trentham Park. The Stone Rural District Council opposed the plans as did the Wedgwood Company which was currently building a new all-electric factory and model village only half a mile from the proposed site. A local inquiry was held over six days in July and the Electricity Commissioners ruled against the proposal.[55] The JEA revised its plans and made a further application in October 1940 for a site at Meaford about two miles further south. Although the local councils supported the proposal, landowners and residents were opposed and a local inquiry was held in May 1941. The decision remained in abeyance until confirmed by the Minister of Fuel and Power and Parliament in July 1944.[56] Meaford power station was formally opened by the Minister on 20 October 1947.

Limited surface water resources in the central part of the region always posed a problem for power stations. The canal network provided an early source of cooling water, but larger stations required cooling towers. Prince's power station at Nechells, Birmingham had a very large battery of some 45 wooden cooling towers when opened in the mid-1920s. Hyperbolic reinforced concrete cooling towers became a new landscape feature—first at Hams Hall (1928), and later at Wolverhampton (1942), Ocker Hill (1947), Meaford (1947) and Walsall (1948). By 1959 there were 31 concrete cooling towers in the Midlands, with the largest cluster of 13 towers at the three Hams Hall stations.

Table 6 lists the various undertakings that were consolidated from 1910 when four municipal systems were amalgamated as Stoke-on-Trent. Other municipal systems became part of an enlarged City of

[53] Ministry of Transport, ***Electricity Distribution: Outline of Proposals*** (London: HMSO, 1937).
[54] See: ***Annual Reports of the Electricity Commissioners***: 1926-27, pp.44,72; 1927-28; pp.34-35, 46; 1928-29, p.48.
[55] ***The Times*** reported on the power station proposals in the issues of 3 March 1939, p.11; 7 June 1939, p.13; 7 July 1939, p.17.
[56] Twentieth Annual Report of the Electricity Commissioners 1939-45, pp.104-105.

Birmingham or were taken over by the SWS Co. which, following the practice of Edmundson's, merged most of its subsidiaries under the Consolidation Act of 1938.

Table 6 MIDLANDS ELECTYRICITY BOARD AREA CONSOLIDATIONS TO 1948.

UNDERTAKING	YEARS IN OPERATION	NEW OWNER
Burslem	1905-1910	Stoke-on-Trent Corporation
Hanley	1894-1910	Stoke-on-Trent Corporation
Longton	1901-1910	Stoke-on-Trent Corporation
Stoke-Upon-Trent	1904-1910	Stoke-on-Trent Corporation
Aston Manor MB	1903-1912	Birmingham Corporation
Handsworth UD	1905-1912	Birmingham Corporation
Smethwick[1]	1906-1913	SWS Co.[3]
Dudley CB	1899-1914	SWS Co.
Wednesbury MB	1904-1918	Midland Electric Corporation
Redditch UD	1879-1923/4	SWS Co.
Ludlow EL Co.	1906-1927	SWS Co.
Church Stretton ES Co.	1904[2]-1928/9	SWS Co.
Hereford MB	1899-1929/30	SWS Co.
Halesowen L&T Co.	1915-1930	SWS Co.
Ross EL&P Co.	1902-1932/3	SWS Co.
Banbury & District ES Co.	1903-1938	SWS Co.
Kidderminster & District EL&T Co.	1900-1938	SWS Co.
Ledbury ES Co.	1913-1938	SWS Co.
Stratford-On-Avon E Co.	1907-1938	SWS Co.
Tewkesbury EL Co.	1909-1938	SWS Co.
Shrewsbury MB	1895-1938	West Midlands JEA
Leominster ES Co.	1912- ?	SWS Co.

Notes:

[1] Public electricity supply in Smethwick was provided by the Birmingham & Midlands Tramways from the opening of their power station in Downing Street in 1906. See: ***Minutes of the Proceedings of the Institute of Civil Engineers*** Vol.204, 1916/17, p.248.

[2] Originally non-statutory. An ELO was granted in 1916.

[3] Shropshire, Worcestershire & Staffordshire Electric Power Co.

III Nationalisation

After three decades of discussion, the whole organisation of electricity was restructured following the Electricity Act 1947. From 1 April 1948, the Midlands Electricity Board took over the assets of 28 local authorities 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 Midlands Electricity Board was responsible for integrating all the undertakings. Systems had to be standardised and the multiplicity of tariffs reduced.[57] For administrative purposes, the Board area was subdivided into 11 sub-areas and 56 districts. The Radnor and Brecon sub-area, previously part of the SWS Co., was transferred to the South Wales Board in 1949.

[57] ***Conurbation: A planning survey of Birmingham and the Black Country by the West Midland Group*** (London: Architectural Press, 1948), 285pp. This volume illustrates the physical and administrative complexities of the core region. There is a clear map of the electricity undertakings on page 56.


MILES
5
Wednesfield
Wolverhampton
WALSALL
Bilston
WEDNESBURY
Darlaston
Sutton Coldfield
Sedgley
Wombourn
Tipton
Great Barr
Perry Barr
WEST BROMWICH
DUDLEY
Netherton
Oldbury
BRIERLY HILL
SMETHWICK
Cradley Heath
Birmingham
Glebe Farm
Blackheath
Quinton
HALESOWEN
Sparkbrook
Sheldon
STOURBRIDGE
Harborne
KINGS HEATH
West Hagley
Kidderminster
NORTH WESTERN
CHESHIRE
Stockport
Sheffield
YORKSHIRE
Macclesfield
Buxton
DERBY
CONGLETON
Biddulph
LEEK
Alfreton
Kidsgrove
Tunstall
Burslem
Hanley
Stoke on Trent
NEWCASTLE UNDER LYME
Longton
Cheadle
Belper
Ashbourne
NORTH STAFFORDSHIRE
MARKET DRAYTON
Eccleshall
Uttoxeter
Derby
EAST
STAFFORD
Burton on Trent
MIDLANDS
Newport
Rugeley
Hednesford
MERSEYSIDE &
NORTH WALES
Welshpool
Shrewsbury
WELLINGTON
SHROPSHIRE
Shifnal
WOLVERHAMPTON
CANNOCK
& DISTRICT
LICHFIELD
Coalville
Pontesbury
Ironbridge
Chasetown
Brownhills
Tamworth
Much Wenlock
Wolverhampton
WALSALL
Sutton Coldfield
S.STAFFS. & N.WORCS
Church Stretton
Bridgnorth
Tipton
WEDNESBURY
Walsall
Nuneaton
Administered by the Midlands E.B.
Bishop's Castle
Perry Barr
Birmingham
HALESOWEN
Acocks Green
BIRMINGHAM & DIST
SHROPSHIRE
Kings Norton
SOLIHULL
Coventry
Knowle
LUDLOW
&
KIDDERMINSTER
Hollywood
Shirley
WARWICK
RADNOR
Knighton
Presteigne
Bewdley
Stourport
BROMSGROVE
HEREFORDSHIRE
REDDITCH
Leamington
Llandrindod Wells
Martley
Droitwich
WORCESTER
Alcester
Kington
LEOMINSTER
Worcester
& DISTRICT
STRATFORD on AVON
Builth Wells
Bromyard
HEREFORD
Pershore
Malvern
EVESHAM
Shipston on Stour
BANBURY
HEREFORD
Upton on Severn
Chipping Campden
Ledbury
Talgarth
Tewkesbury
Hook Norton
BRECKNOCK
Winchcombe
Stow
Chipping Norton
Ross
Newent
CHELTENHAM
Administered by M
SOUTH WALES
Gloucester
Cinderford
Monmouth
Painswick
Ebw Vale
Administered by the S.Wales E.B
Coleford
GLOUCESTER
LYDNEY
STROUD
MONMOUTH
CENTRAL GLOUCESTERSHIRE
Nailsworth
Chepstow
Dursley
Pontypridd
Newport
Thornbury
Wotton under Edge
CHIPPING SODBURY
SOUTHERN
Cardiff
Bristol
Chippenham
Warmin
WILTSHIRE
Bath
MIDLANDS AREA
Area H.Q.
Sub-Area H.Q.
District H.Q.
Area Bdy.
Sub-Area Bdy.
District Bdy.
County Bdy.
Service Centre shown thus
Alcester
SCALE OF MILES
0
20

Figure 7

Figure 7 shows the geographical organisation in 1957 when there were 7 sub-areas and 39 districts. One notable feature is the network of 110 service centres where consumers could pay their bills and purchase appliances.[58] These service centres were an important and profitable part of the Board's business.

Most parts of the Midlands region enjoyed an economic boom after World War II. In the national expansion of the motor vehicle industry from 508,000 cars and commercial vehicles in 1948 to 1,560,000 in 1959, the region was a major contributor of finished vehicles, parts and sub-assemblies.

Solihull which had grown in population from 25,372 in 1931 to 67,979 in 1951, continued to expand, reaching 96,010 in 1961. This suburban expansion contributed to rising demand for domestic electricity supply. The Rover Company's re-use of the wartime shadow factory provided a new load centre for industrial power.

Over the decade 1948/9 to 1958/9, total sales of electricity in the region grew from 4,059m kWh to 8,449m kWh. The number of consumers expanded from 980,000 to 1,391,000. Employees of the Board increased from 9,384 in March 1949 to 13,368 in 1959.

Electricity Generation and Transmission

Unlike other parts of the country, the Midlands Division of the British Electricity Authority did not cover the whole area of the distribution board. Part of Gloucestershire, including the Castle Meads power station (Gloucester) was in the South Western Division, while Lydney power station was part of the South Wales Division. This lack of coincidence of boundaries was a result of the pre-1948 grid system which had been part of the South West England and South Wales scheme and controlled from Bristol.

The Midlands Division was an amalgamation of the 132kv transmission system developed by the Central Electricity Board and the power stations previously owned by the local authorities, Joint Electricity 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.

Table 7 lists the 19 power stations in the new organisation. They varied in size from large turbine-powered stations at the top to small diesel-engined powered units at the bottom. Hams Hall A and B stations formed the largest municipal generating complex in Britain (516,200kW) and also included the largest concentration of ten hyperbolic cooling towers, Shrewsbury was one of the older, surviving stations (dating from 1895) while Meaford had only begun service early in 1948.

Five power stations were built in the region after nationalisation. All were developed on or adjacent to existing facilities which helped to reduce construction costs and avoided controversial public inquiries.

Power station	***Date commissioned***	***Last unit installed***
Walsall	28 June 1949	1954
Stourport B	27 July 1950	1954
Nechells B	30 June 1951	1953
Meaford B	29 November 1955	1957
Hams Hall C	30 August 1956	1958

[58] ***Electricity Supply Handbook 1958*** (London: Electrical Times, 1958), pp.112-119.

Table 7 BRITISH ELECTRICITY AUTHORITY: POWER STATIONS IN THE MIDLANDS ELECTRICITY BOARD AREA 1948/49.

POWER STATION	GENERATING CAPACITY KW	TYPE[1]
Hams hall A & B	516,200	S
Ironbridge	200,000	S
Stourport	181,750	S
Nechells	136,750	S
Meaford	120,000	S
Ocker Hill	84,500	S
Worcester	40,500	S
Stoke	37,000	S
Wolverhampton	30,000	S
Birchills	17,500	S
Stafford	6,000	S
Roushill (Shrewsbury)	1,050	I
Sutton Coldfield	1,000	S
Leek	860	I
Newcastle-Under-Lyme	450	I
Malvern	400	I
Powick	385	H
Market Drayton	88	I
	1,374,393	

Note: [1] S – Steam; H—Hydro-electric; I--Internal combustion (diesel).
Source: Compiled from British Electricity Authority, ***Annual Report 1948-49***, Appendix 15.

One new power station at Rugeley was under construction in 1958/9. A generating station had been considered for Rugeley in the early 1920s but had been deferred. The National Coal Board's plan for a new colliery at Lea Hall perhaps prompted reconsideration of the location where conveyor belts could deliver coal directly to the stockyard. The first of the 120,000kW turbines was commissioned in January 1961.

While a coal-burning station was being built in the north, the southern part of the region was being developed for nuclear power generation. Berkeley on the Severn was approved in 1956 and commissioned in June 1962.

Table 8 lists the 16 power stations operating 1958/9. By this time all the small stations had been closed. Birchills, Walsall was the smallest remaining station. Ocker Hill was the only pre-1948 station to be extended in this period, with two 30,00kW units.

The main components of the national grid transmission system as completed in 1933 are illustrated in **Figure 8**. Hams Hall and Ironbridge were dominant stations in the network which included a long north-south line linking the more isolated power stations at Stoke and Worcester and also connecting with the neighbouring grid scheme areas.

By 1946 the main changes were a new line from Ironbridge to Stoke-on-Trent and reinforcement from Stourport to Worcester. Wartime shortages in the south had necessitated the building of a new 132kv line from Watford to Ebbw Vale which also connected with the Castle Meads power station opened in 1942.

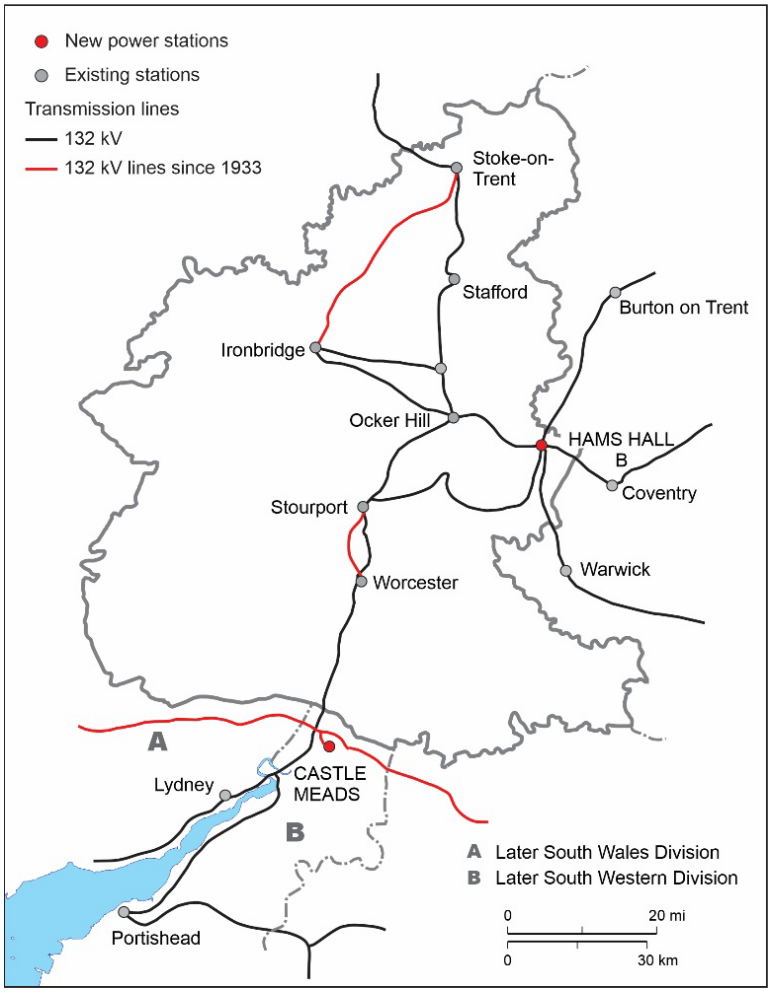


Figure 8 MIDLANDS AREA: DEVELOPMENT OF NATIONAL GRID 1934-46.

Table 8 CENTRAL ELECTRICITY GENERATING BOARD: POWER STATIONS IN THE MIDLANDS DIVISION 1958/59.

POWER STATION	GENERATING CAPACITY kW	TYPE[1]
Hams Hall C	360,000	S
Hams Hall B	321,000	S
Meaford B	260,000	S
Hams Hall A	254,250	S
Ironbridge	210,000	S
Nechells B	210,000	S
Walsall	208,000	S
Stourport A	182,250	S
Ocker Hill	128,000	S
Meaford A	120,000	S
Stourport B	120,000	S
Nechells A	117,750	S
Worcester	40,500	S
Stoke	31,000	S
Wolverhampton	30,000	S
Birchills	17,500	S
	2,610,250	

Note: [1] S – Steam.
Source: Compiled from Central Electricity Generating Board, ***Annual Report 1958-9***, Appendix 1.

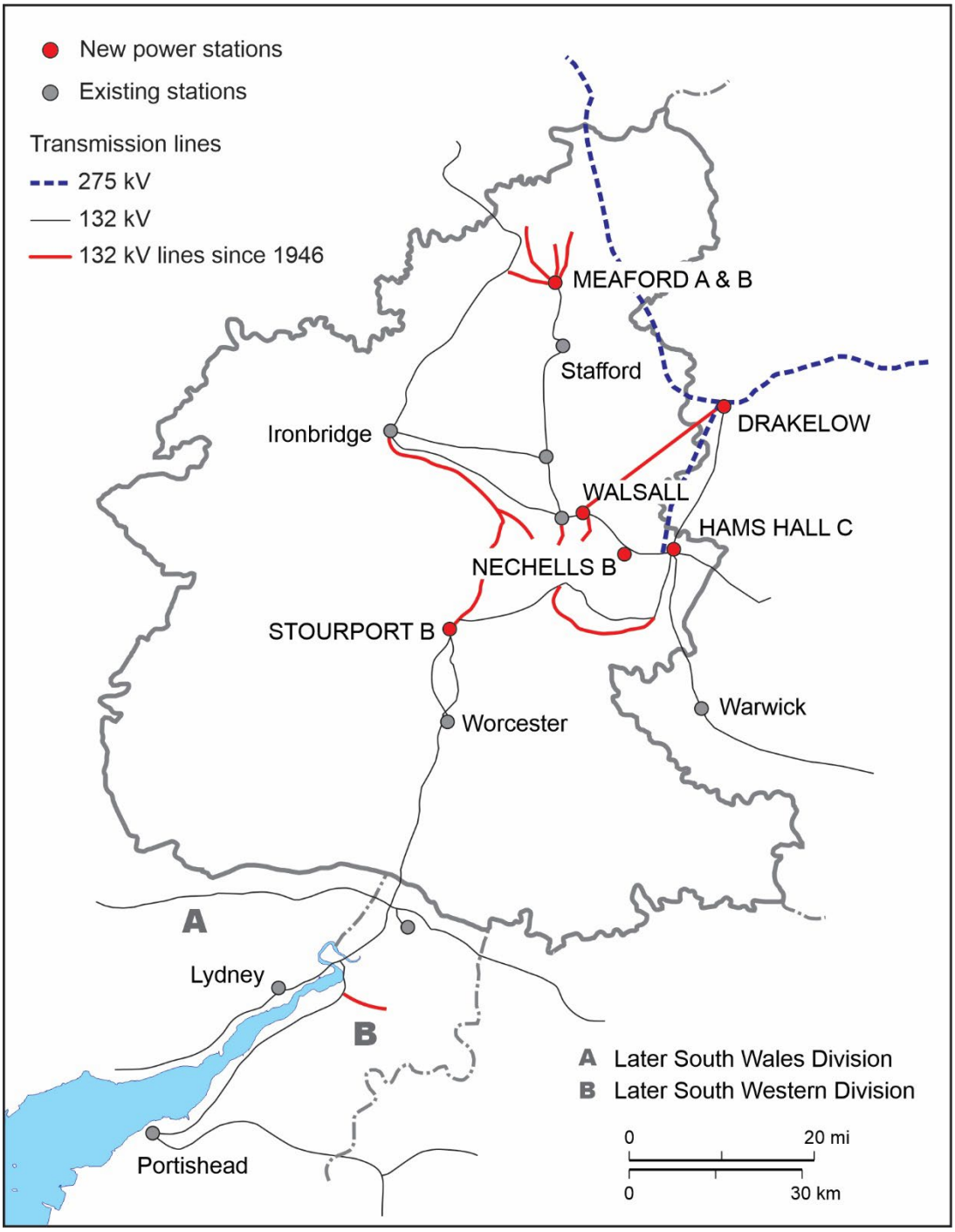


Figure 9 MIDLANDS AREA: DEVELOPMENT OF NATIONAL GRID 1947-57.

The 1957 pattern (**Figure 9**) shows some further extension of the 132kv system, notably a line from Drakelow as well as a section of the Supergrid crossing the region (but without connections) on the route to Carrington near Manchester. By 1959 the higher-voltage system had been extended to Hams Hall and southward to Melksham.

During the first decade of operation the Midlands Division built five new power stations and raised generating capacity from 1,374,373kW to 2,610,250kW. The transmission line capacity was increased to

461 route miles of which 82 route miles were part of the 275kv Supergrid. Over the period numbers employed rose from 3,423 to 4,384.

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 Midlands Region was established incorporating the Midlands and East Midlands Divisions. Under the new arrangements the regional director at Warwick House, Redhill Road, Birmingham, became responsible for the higher-order planning and administration of 29 power stations, 1,242 route miles of transmission lines and 8,040 employees. Design work on new power stations was transferred to the Midlands Projects Group at 59 Wake Green Road, Birmingham and transmission development was centralised in Guildford. A new office complex for the CEGB was built in Solihull at Hasluck Green Road in the mid-1960s.

Summary

Table 9 shows various indicators of the growth of electrification from 1900. Twelve of the thirteen undertakings in that year were local authorities, a point that illustrates the strong municipal role in the region. The role of private companies should not be overlooked, however, for the Birmingham Electric Supply Co. had developed the public system in the city which the Corporation had only just taken over at the beginning of 1900. After a slow start, the Shropshire, Warwickshire & Staffordshire Electric Power Co. came to dominate a very large territory in the southern part of the region. The Midlands Electricity Board Area also had two successful Joint Electricity Authorities.

Table 9 SUMMARY OF DEVELOPMENT IN THE MIDLANDS ELECTRICITY BOARD AREA.

YEAR	NUMBER OF UNDERTAKINGS[1]	LOCAL AUTHORITY UNDERTAKINGS	NUMBER OF POWER STATIONS	GENERATING CAPACITY (kW)	PER CAPITA CONSUMPTION (kWH)[2] (GB IN BRACKETS)
1900	13	12	14	..	.. (4)
1912	32	20	36	..	.. (36)
1925/6	32	16	37	363,976	133 (133)
1935/6	35	19	23	726,809	581 (374)
1948/9	..	..	19	1,374,373	1001 (821)
1958/9	..	..	16	2,610,250	1981 (1765)

Notes:

[1] Excluding non-statutory companies.

[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. Hams Hall adopted 30,000kW turbines in 1929 and Ironbridge had a 50,000kW when opened in 1932. The largest generators in the postwar period (60,000kW at Meaford B) were only a little larger.

Per capita consumption in the Midlands region (with Great Britain in parentheses) shows substantial rates of growth, always around or above the national average. Birmingham was always above the national average, increasing from 55kWh per capita in 1910 to 233kWh in 1925/6 and 557kWh in

1935/6. During the interwar period, Birmingham became the largest municipal operation in Britain, overtaking Manchester which had been the leader for several decades.[59]

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.[60] 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.

Comparative Generating Capacity (kW)

	Birmingham	Manchester
1914	33,000	72,300
1925/26	156,100	209,150
1935/36	322,510	257,900
1948/49	652,950	284,750

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

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)[61] 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 Midlands 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.

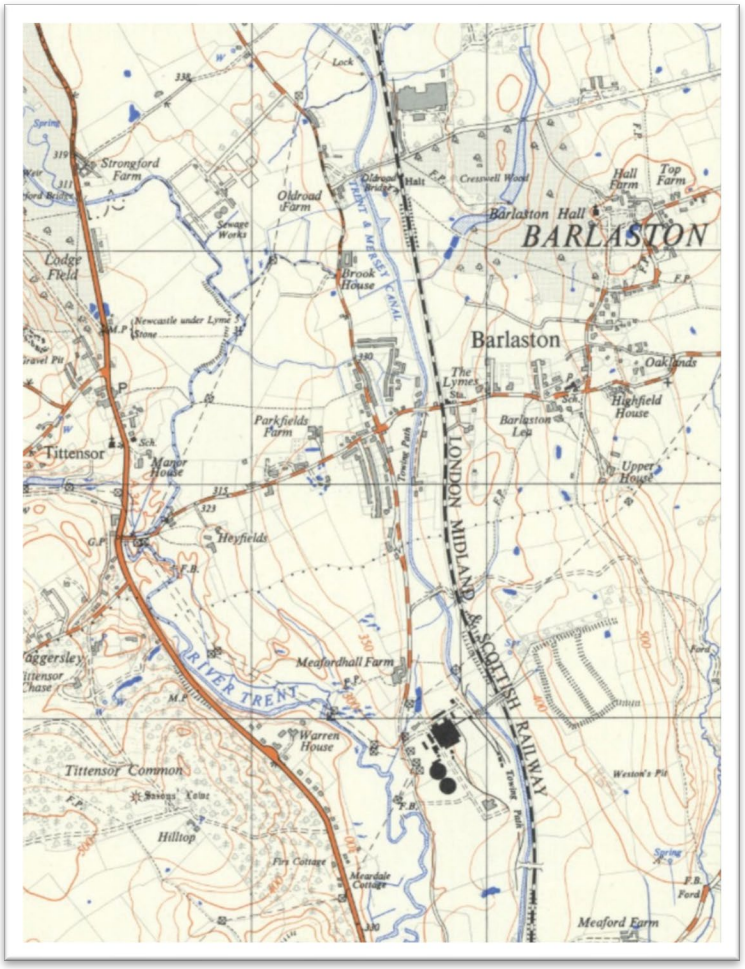
In the postwar period the ***Electricity Supply Handbook*** (published annually by the ***Electrical Times*** from 1947) is a very useful compendium of facts, figures and personnel in the industry. The detailed maps of the grid system are especially important. Like many annual reference works of its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

Dr David Gordon Tucker (1914-1990), Professor of Electrical Engineering at the University of Birmingham 1955-1973, made many contributions to the history of electrification, especially in the Midlands. His work is available on the excellent website: "Millstones to Megawatts, a Bibliography for industrial historians: The publications of Dr D.G. Tucker" (Editor: Tony Bronson, The Midland Wind and Water Mills Group). See: www.outsideecho.com/DGT

Two collections have material relevant to the Midlands:

> 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.***
>
> In Bristol, the Western Power Electricity Historical Society has a museum and extensive archival collection. The Society began in 1994 when employees of the former SWEB began salvaging records of all the former undertakings in the region. A set of Garcke's Manual is a valuable part of the collection for research beyond the South West. The Society has been very active in publishing articles of wide interest and has a particularly effective and comprehensive website at www.wpehs.org.uk

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



MEAFORD

Designed by the North West Midlands Joint Electricity Authority to serve the Potteries area, the station was opened in October 1947. Four 30,000kW turbines were installed and two cooling towers were built. A second station with double the capacity was commissioned between 1955 and 1957.

Ordnance Survey 1:25,000 series, Sheet SJ83, 1952 (National Library of Scotland)