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THE EASTERN ELECTRICITY BOARD AREA

Regional and Local Electricity Systems in Britain

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IPSWICH

After several earlier attempts to develop an electricity supply in the town, a municipal system was finally opened in 1903. Charles S. Peach designed the architectural features of the combined electricity works and tram depot. Originally providing DC supply, AC was added in 1914. Generating capacity was extended to 14,250kW by 1925/26 and 29,750kW a decade later. Cliff Quay power station, built on the south edge of Ipswich took over the power load from the late 1940s.

Ordnance Survey, Six Inch Map Series, Suffolk, Sheet LXXV.SE, 1925 (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 which 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 which developed electricity supplies in Eastern England.

The Eastern 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 Eastern Area included the whole of the counties of Cambridgeshire, Hertfordshire, Huntingdonshire, the Isle of Ely, Norfolk, Suffolk, and parts of Bedfordshire, Buckinghamshire, Essex, Middlesex, Oxfordshire and the Soke of Peterborough.² The boundary lines drawn in 1947 continue to be entrenched in the distribution franchise area of the present day.

Constituents of the Eastern Electricity Board

When the Eastern Electricity Board began operations on 1 April 1948 it incorporated the distribution services and areas of 20 local authorities and 18 companies. The constituent areas varied enormously in size. East Anglian Electric Supply Co. covered about 2,700 square miles while Harwich Corporation occupied an area of just over 2 square miles. Norwich Corporation's electricity department served an area of 700 square miles, considerably larger than the County Borough (12.7 square miles). As in many places, electricity service areas did not always coincide with those of local authorities.

With a total area of about 7,760 square miles and an estimated population of about 4,670,000, the Eastern Electricity Board covered every type of district from the crowded suburbs of North London to

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.

the Norfolk coast. Domestic sales at 45.1 percent were considerably higher than industrial sales at 35.8 percent.³

After a difficult search for property, the head office was established at Wherstead near Ipswich.

Development of Electricity Supply Areas

The 1948 pattern illustrated in **Figure 1** represented the climax of over 50 years of development. Unusually for a new 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 which 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 the early technology.

Twelve of the applications in 1882 came from the Eastern region, two by local authorities (Colchester and Norwich) and ten by companies. All but one of the companies were subsidiaries of the Anglo-American Brush Co. which was particularly active in the 1882 round of applications. Six Electric Lighting Orders were granted but all were subsequently revoked for lack of activity.⁵

Although general urban electrification failed to take off in the region, private systems began to develop. Private systems provided a market for electrical equipment, helped in the training of electrical workers, and gave opportunities to refine details of the new technology. Some early private lighting systems in the region included Hatfield House, Stevenage⁶, Berechurch Hall near Colchester⁷, and the Tilbury Docks⁸.

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. Six applications for the

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.

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

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. The South Eastern (Brush) Electric Light & Power Co. began a supply in Colchester from a plant in Culver Street during 1884. Few customers subscribed, the operation was closed, and the Lighting Order was revoked in 1885. See Janet Cooper & C.R. Elrington eds. *Victoria County History, Essex, Vol.9, The Borough of Colchester* (London, 1994), p.295.

⁶ Graeme Gooday, *Domesticating Electricity* (London: Pickering & Chatto, 2008), pp.76-89.

⁷ Brian Bowers, *A History of Electric Light and Power* (Stevenage: Peter Peregrinus, 1982), pp.126-128.

⁸ Institution of Mechanical Engineers, *Proceedings*, 1886, p.452.

Eastern area were submitted to the Board of Trade for the 1890 Parliamentary session.⁹ Three ELOs were granted to the Corporations of Bedford, Cambridge and Great Yarmouth. Applications by the Brush Electrical Engineering Co. for Ipswich and Norwich were rejected by Parliament. Cambridge Corporation transferred the ELO to a private company and a distribution system in the town was inaugurated in 1892.¹⁰ Bedford and Great Yarmouth followed in 1894.

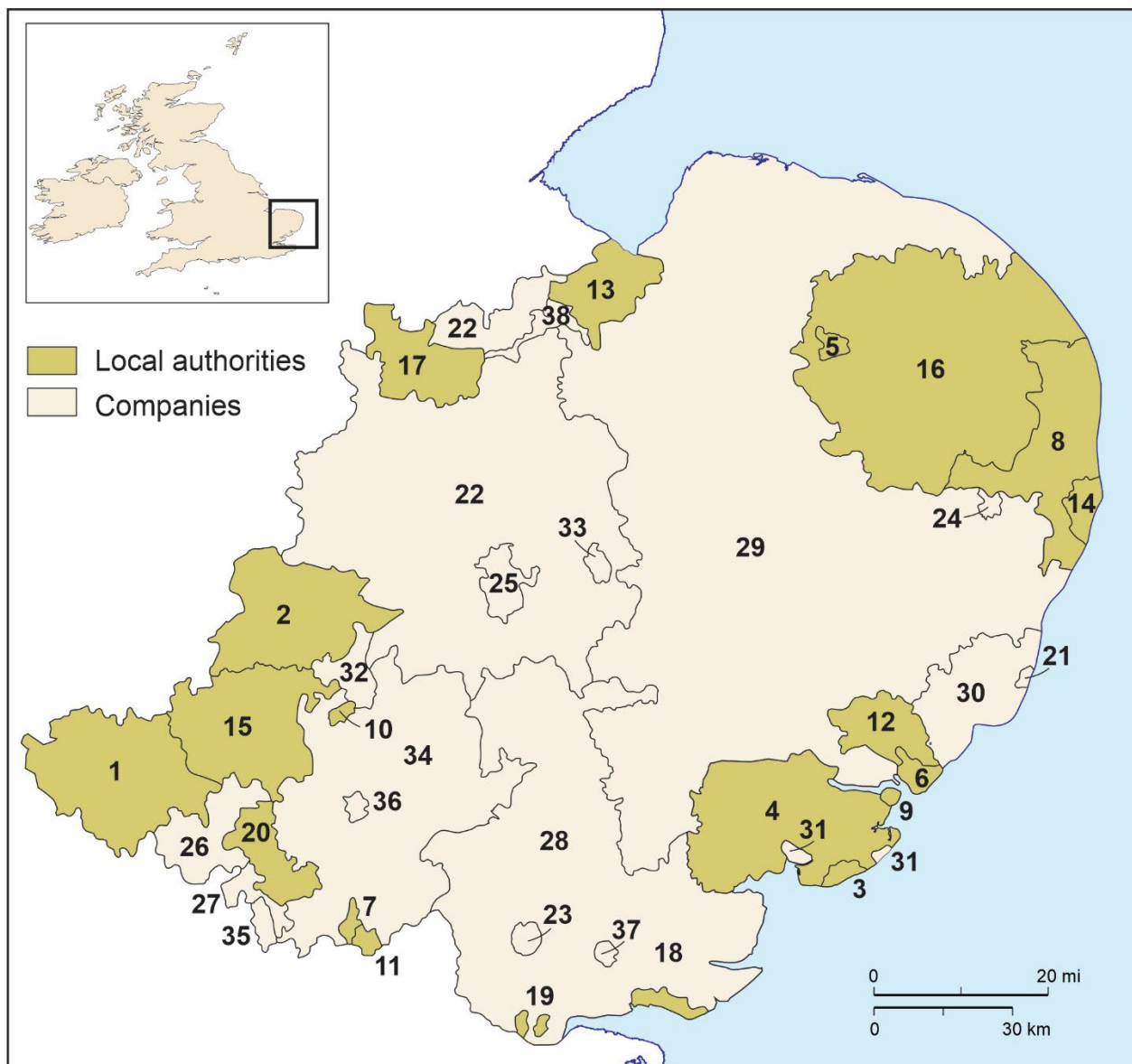


Figure 1 CONSTITUENT AREAS OF THE EASTERN ELECTRICITY BOARD 1948.

⁹ Board of Trade, Proceedings under the Electric Lighting Acts. *Parliamentary Papers* 1890. HC 273.

¹⁰ R.H. Parsons, *The early days of the power station industry* (Cambridge: Cambridge University Press, 1939), pp.173-175. This station was the first in the region to use steam turbines.

Table 1 EASTERN ELECTRICITY BOARD AREA CONSTITUENT UNDERTAKINGS, 1948.

MAP #	LOCAL AUTHORITIES
1	Aylesbury MB
2	Bedford MB
3	Clacton UD
4	Colchester MB
5	East Dereham UD
6	Felixstowe UD
7	Finchley MB
8	Great Yarmouth CB
9	Harwich MB
10	Hitchin UD
11	Hornsey MB
12	Ipswich CB
13	King's Lynn MB
14	Lowestoft MB
15	Luton MB
16	Norwich CB
17	Peterborough MB
18	Southend-on-Sea CB
19	Thurrock UD
20	Watford MB
COMPANIES	
21	Aldeburgh ES Co.
22	Bedfordshire, Cambridgeshire & Huntingdonshire E. Co.
23	Brentwood District Electric Co.
24	Bungay Gas & Electric Co.
25	Cambridge ES Co.
26	Chesham EL&P Co.
27	Colne Valley ES Co.
28	County of London ES Co.
29	East Anglia ES Co.
30	East Suffolk Electricity Distribution Co.
31	Frinton-on-Sea & District EL&P Co.
32	Letchworth Electricity Ltd
33	Newmarket EL Co.
34	North Metropolitan EP Supply Co.
35	Northwood EL&P Co.
36	Welwyn Garden City ES Co.
37	Wickford & District ES Co.
38	Wisbech EL&P Co.

Key to Abbreviations

CB: County Borough

EL Co: Electric Light Company

EL&P Co: Electric Light & Power Company

EP Co: Electric Power Company

UD: Urban District

ES Co: Electric Supply Company

ES&P Co: Electric Supply & Power Company

MB: Municipal Borough

RD: Rural District

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 standardization would become 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 EASTERN ENGLAND ELECTRICITY UNDERTAKINGS 1912.

Table 2 EASTERN ELECTRICITY BOARD AREA ELECTRICITY SUPPLY UNDERTAKINGS C. 1912.

	UNDERTAKING	COUNTY	SUPPLY BEGAN
LOCAL AUTHORITIES	Bedford MB	Beds	1894
	Bury St Edmunds MB	Suffolk, W	1900
	Clacton-On-Sea UD	Essex	1906
	Colchester MB	Essex	1898
	Finchley UD	Middx	1903
	Gray's Thurrock UD	Essex	1901
	Great Yarmouth CB	Norfolk	1894
	Hornsey MB	Middx	1903
	Ipswich CB	Suffolk, E	1903
	King's Lynn MB	Norfolk	1899
	Leigh-On-Sea UD	Essex	1901?
	Lowestoft MB	Suffolk, E	1901
	Luton MB	Beds	1901
	Norwich CB	Norfolk	1893 ¹
	Peterborough MB	Soke of Peterborough	1900
	Southend-On-Sea MB	Essex	1902
	Watford UD	Herts	1899
COMPANIES	Aldeburgh	Suffolk, E	1912
	Cambridge	Cambs	1892
	Chelmsford ²	Essex	1890
	Chesham	Bucks	1904
	Cromer ³	Norfolk	1903
	Diss N/S	Norfolk	
	Felixstowe	Suffolk, E	1899
	Frinton-On-Sea	Essex	1903
	Harrow-On-The-Hill	Middx	1896
	Hendon ²	Middx	1908
	Hertford ⁴	Herts	1901
	Hitchin ²	Herts	1906
	Letchworth N/S	Herts	1907
	Newmarket	Suffolk, W	1899
	North Metropolitan Electric Power	Middx/Herts	1902
	Northwood	Middx	1905
	Orford N/S	Suffolk, E	1912?
	Oulton Broad N/S	Norfolk	
	St Albans ⁵	Herts	1908
	Southwold N/S	Suffolk, E	
Stowmarket N/S	Suffolk, E		
Walton-On-The Naze ⁶	Essex	1902	

Notes:

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

¹ Begun by private company; taken over by Corporation in 1903.

² Owned by Electric Supply Corporation.

³ Operated by Edmundsons for UD until sold to company in 1922.

⁴ Operated by Northmet, the Electric Lighting Order was however retained by the Hertford Corporation until nationalisation (listed in 1947 Electricity Act).

⁵ Owned and operated by Northmet. By the mid-1920s when the high-voltage network was extended northwards, St Albans and Hertford were fully integrated into the Northmet system.

⁶ The company went bankrupt in 1915 and the assets were taken over by the Council in 1921.

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 17 local authorities were clear examples of local initiative in developing electric lighting and power. Norwich Corporation (population 121,490 in 1911) was the largest of the local authorities. Clacton-on-Sea Urban District (population 9,777) was the smallest. Norwich was first electrified by a company (1893) which was taken over by the city in January 1903. Ipswich had four earlier attempts to develop a public supply system before inaugurating a lighting and tramway system in 1903. The ELO granted to Provincial Brush Co. in 1883 was revoked two years later for lack of action. An application by the Brush Electrical Engineering Co. in 1890 failed to secure approval and the two ELOs granted in 1890-91 were subsequently revoked.¹¹ Finally Ipswich Corporation was successful with the grant of an ELO in 1897.

The 21 companies in the region were very varied in scale and location. Several were non-statutory operators mostly in small towns but the First Garden City Ltd engaged in the building of Letchworth was also in this category until “legitimised” by Special Order in 1924. While most companies were local in management, some were subsidiaries of large national businesses. In the “electricity boom” of the mid-1890s, several contracting firms began to develop and operate complete local systems. The largest was Edmundson’s Electricity Corporation Ltd which by 1910 was operating 46 systems from Inverness to Guernsey. Three of these were in the Eastern region at Cromer, Hitchin and Newmarket. The Electric Supply Corporation (associated with Crompton & Co.) owned the systems in Chelmsford and Hendon.

In contrast to those smaller-scale operations, the North Metropolitan Electric Power Distribution Co. covered an extensive area in Hertfordshire and Middlesex.¹² An Act of 1900 empowered the North Metropolitan Electric Power Supply 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. Northmet had begun supply in Barnet in 1900 and then, in association with the Metropolitan Electric Tramway Co., built a power station at Brimsdown (Enfield) and acquired the Taylor’s Lane (Willesden) station from the Urban District Council. By 1912 Northmet sales amounted to 29.2million kWh with about half this volume going to the tramway system. Northmet had begun as a subsidiary of British Electric Traction Co. but from 1913 became increasingly associated with the Underground Electric Railways of London group.¹³

Electrification in the Eastern region around 1912 was still incomplete with only a small part covered by Electric Lighting Order. Some towns still unserved included Dunstable (population 9,890 in 1911), March (8,403), Ely (7,913), Sudbury (7,141) and Brentwood (6,923). Aylesbury Corporation (11,048) and the Wisbech company (10,822) both began public supply systems in 1915. Companies in the Colne Valley and Wood Green had begun public systems in 1914.

Lighting was 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

¹¹ Board of Trade, Proceedings under the Electric Lighting Acts. *Parliamentary Papers* 1893-94. HC 270. The ELO granted to Lawrence, Scott & Co. Ltd (Norwich) was revoked 30 December 1891 and the other to Ipswich Electric Lighting Co. Ltd was revoked on 17 January 1893.

¹² The company was initially a subsidiary of the Electric Power Distribution Co., formed in 1898 by Emil Garcke and others and absorbed by British Electric Traction in 1902. The Distribution Companies held Electric Lighting Orders while Supply Companies owned generating stations. The Northmet Distribution Co. was dissolved in 1922. Similar companies were established in County Durham and Surrey (Sutton). See: N.C. Friswell, *Northmet* (Horsham, 2000), Chapter 2.

¹³ T.C. Barker and Michael Robinson, *A History of London Transport Vol. II* (London: Allen & Unwin, 1974), pp.180, 512.

prices. Diversification of the load to other uses, 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 by 1900 and in the search for economies of scale, the introduction of more efficient prime movers became a priority. Northmet's first power stations at Barnet and Hertford were small DC operations. In contrast, the Brimsdown generating station (opened in 1904) employed AC (50Hz) from the start and installed three 1,000kW steam turbines.¹⁴

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 many accounts of electrification.

Although Chelmsford had a public electricity supply as early as 1890, the new large industrial firms preferred to generate their own power. These included Crompton & Co. making electrical equipment and the Hoffman Manufacturing Co. producing bearings.¹⁵ The new works of Marconi manufacturing wireless telegraphy equipment (opened in 1912) were also self-sufficient in power, using two high-speed steam turbines.¹⁶ In Ipswich, large engineering firms such as Ransomes & Rapier and Ransomes, Sons & Jeffries all had private power stations. The corset manufacturers William Pretty & Sons had introduced electricity in 1896, seven years before Ipswich had a public supply.¹⁷

Isolated industrial establishments generating their own power included Kynochtown, Essex, a purpose-built explosives factory and settlement; Sundon cement works near Luton¹⁸; and the engineering works of Richard Garrett at Leiston, Suffolk. The Great Eastern Railway also had a substantial generating plant at Parkeston Quay for powering the cranes and other dock facilities as well as the station and hotel in Harwich.¹⁹

Hotels were early in adopting electric lighting as one of the amenities of high-class modern hospitality. The Sandringham Hotel at Hunstanton (owned and operated by the Great Eastern Railway) was proud to note "electrically lighted throughout" in its advertisements.²⁰ Two hotels in Southwold with electric lighting probably drew their supply from the recently established non-statutory company.

Other large institutions of a different type were also introducing electricity. The Middlesex Asylum at Napsbury, London Colney, Hertfordshire (opened in 1905) had a private supply, with the boiler house and water tower prominent features of the plan.²¹

¹⁴ Friswell, *Northmet*, Chapter 3.

¹⁵ I.Mech.E. *Proceedings* 1926, pp.813-815.

¹⁶ *The Engineer* Vol.113, 1912, pp.684-685.

¹⁷ I.Mech.E. *Proceedings* 1926. Ipswich works visits, pp.785-792.

¹⁸ I.Mech.E. *Proceedings* 1913. Cambridge works visits, pp.973-974.

¹⁹ "Electrical coal belts at Parkeston Quay," *The Engineer* Vol.113, 1912, p.390. The Parkeston power station generated 2.4million kWh in 1927-28 and was also providing a bulk supply to the town.

²⁰ *Bradshaw's April 1910 Railway Guide* (reprinted Newton Abbot: David & Charles, 1968), p.1075. Includes hotel advertisements from Aberdeen to York.

²¹ See: Napsburg Hospital, County Asylums website: www.countyasylums.co.uk

ELECTRIC TRAMWAY SYSTEMS IN THE EASTERN REGION¹

	YEARS OPERATING	ROUTE MILES	MAX. NO. OF CARS
<i>Colchester Corporation</i>	1904-1929	5.74	24
<i>Great Yarmouth Corporation</i>	1902-1933	9.94	35
<i>Ipswich Corporation</i> ²	1903-1926	10.82	36
<i>Lowestoft Corporation</i>	1903-1931	4.08	19
<i>Luton Corporation</i>	1908-1932	5.25	13
<i>Metropolitan Electric Tramways Co.</i>	1904-1933 ²	53.51	382
<i>Norwich Tramway Co.</i>	1900-1935	15.16	52
<i>Peterborough Tramway Co.</i>	1903-1930	5.31	14
<i>Southend-On-Sea Corporation</i>	1901-1942	9.22	71

Nine electric tramway systems were developed in the region, six by local authorities and three by companies. All were developed between 1900 and 1908. The systems were very variable in size, from the Metropolitan Electric Tramways Co. in Middlesex to very small operations in Luton and Peterborough.

Norwich Tramways Co. was the only operator with an independent power station; all the other systems drew current from public supplies. The Norwich generating station off Duke Street had a capacity of 1,100kW and generated 2.1million kWh in 1927/28.

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. Tramway power sales were still significant in 1925/26, accounting for 22.2 percent in Southend-on-Sea and 16.6 percent in Lowestoft. Traction sales were worth about one third of Northmet consumer sales at this time.

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.

In the northwestern suburbs of London, electric railways were being developed at the same time as the tramways. The Metropolitan Railway electrified its line from Baker Street to Harrow and Uxbridge in 1905 with a power station at Neasden. Northwood Electric Power & Light Co. took a bulk supply from the railway company.³ The Underground line to Golders Green, opened in 1907, drew its power from Lots Road, Chelsea.

As part of the electrification of suburban lines from Euston to Broad Street, the London and North Western Railway built a power station at Stonebridge Park, Wembley in 1917. The initial capacity of 20,000kW was later increased to 50,000kW.

Further extensions of the electric railways generally used public supplies, as in the case of Finsbury Park-Cockfosters (1932) from Northmet and Barking-Upminster (1932) from County of London Co. The postwar electric services from Liverpool Street were all powered from the grid.

Notes

¹ Compiled from Keith Turner, *Directory of British Tramways*, Vol.1 (Stroud: The History Press, 2007).

² Transferred to the London Passenger Transport Board July 1933.

³ Alan A. Jackson, *London's Metropolitan Railway* (Newton Abbot: David & Charles, 1986), p.284. In 1925/26 Northwood was the only place with part of its system working at a frequency of 33¹/₃Hz (the frequency used by all the London Underground railways electrified from 1904).

Throughout the region country houses, estates and larger farms added electricity. Holkham Hall in Norfolk installed electric lighting between 1909 and 1912 with the generators powered by two producer gas engines. A connection with the mains supply of the East Anglian Electric Supply Co. was made in 1933.²²

The war economy from 1914 boosted electricity sales especially in the industrial zones of the Lea Valley and Watling Street on the northern edge of London. Hendon aerodrome was one of the main centres of British aviation and several aircraft factories were set up in the vicinity.²³ More isolated establishments such as Short's airship works at Cardington south of Bedford, required a special electricity supply. The two power stations of the Northmet Company were connected by cable in 1918.

II State Intervention

Difficulties of interconnection, differences in AC frequencies, and the need for coal conservation by the use of large-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.

The London and Home Counties Electricity District was defined in July 1920 with boundaries including the whole of Middlesex, Hertfordshire and western Essex. Although the Northmet objection to inclusion in the Electricity District was overruled, some boundary adjustments were made such as the exclusion of Watford. After protracted negotiations, the London and Home Counties Joint Electricity Authority was formed and held its first meeting on 4 November 1925.²⁴

Since most of the northern and eastern parts of the JEA were already consolidated under two large companies with power stations at Willesden, Brimsdown and Barking, there was little work for the new Authority. One minor and lasting effect was the creation of the small island of electricity supply in the Tilbury Urban District, an area otherwise surrounded by the County of London company. The JEA had supported the Urban District Council's application for a Special Order which was granted in 1927.²⁵

In the 1930s, when the JEA had become active in local distribution (in Surrey), there were proposals for taking over company distribution rights in north Middlesex (Northmet territory in Tottenham, Edmonton and Enfield) and northwest Middlesex (Colne Valley and Northwood companies).²⁶

²² Christine Hiskey, "Palladian and Practical: country house technology at Holkham Hall", Chapter 2 in R.S. Barnwell and Marilyn Palmer, *Country House Technology* (Donington: Shaun Tyas, 2012), pp.30-34.

²³ T.F.T. Baker and R.B.Pugh eds. *Victoria County History, Middlesex*, Vol.5 (London, 1976), pp.14-16, 27-29.

²⁴ *Sixth Annual Report of the Electricity Commissioners 1925-26* Appendix G, p.106.

²⁵ *Seventh Annual Report of the Electricity Commissioners 1926-27* Appendix G, p.143.

²⁶ See Severin Peter Langhoff Jr, "Rationalization trends in the electricity distribution system of Greater London," *Journal of Land and Public Utility Economics* Vol.11 (2), 1935, pp.133-145.

While only two new local authority undertakings were formed in the early 1920s, at Harwich and Saffron Walden (both beginning supply in 1925), several new companies were established. These were:

Bishops Stortford Gas & Electric in 1919

Welwyn Garden City in 1921

Stevenage in 1923

Wickford in 1923

Brentwood in 1924

Brundall District (Norfolk) in 1924

Maldon (Sadd & Son) in 1925

Woodbridge in 1925

Several had begun earlier as non-statutory undertakings. The two large companies, Northmet and the County of London, were both expanding into the suburban areas of Hertfordshire and Essex.

Electricity had a prominent place in the British Empire Exhibition held in Wembley during 1924 and 1925. It was the largest exhibition held in Britain since 1851.²⁷ A failed pleasure park was transformed into a glittering array of exhibition halls and the great stadium building. For the 1924 season, an independent power station generated most of the needs and offered visitors the inside view of how electricity was generated.²⁸ Northmet supplied all the light and power needs in the following year.

The Hall of Engineering was the venue for the First World Power Conference held between 30 June and 12 July 1924. Opened by the Prince of Wales, the Conference welcomed 1,700 delegates from 40 different countries. Although papers on all forms of engineering and power were presented, electricity was the highlight. The conference was promoted by the British Electrical and Allied Manufacturers Association (BEAMA) led by D.N. Dunlop²⁹ one of the great electrical propagandists. One purpose of the event, according to a Canadian observer, was:

...a heroic attempt to break free of the red tape of the Board of Trade, and to wake Britain up to the fact of her inferiority in the matters of power production. ...To the amazement of all the English delegates, engineers from America, Canada, Switzerland and Central Africa told stories of stupendous power development that made every plant in Britain look like a child's toy.³⁰

Beyond the Exhibition grounds, Wembley Urban District was becoming one of the new "electric suburbs" of London. The population had grown from 4,519 in 1901 to 16,187 in 1921 and would reach 48,581 by 1931 and 121,600 by the end of the 1930s. Wembley was very much part of Metro-Land promoted by the Metropolitan Railway from Baker Street and its later associate Metropolitan Railway Country Estates Ltd.³¹ Although dominated by its semi-detached estates, Wembley also had some

²⁷ K.G. Beauchamp, *Exhibiting Electricity* (Stevenage: Institution of Electrical Engineers, 1997), pp.247-252.

²⁸ "Empire Exhibition. Power Station", *The Engineer* Vol.137, 1924, pp.250-253. The station had three 1,500kW turbo generators.

²⁹ Daniel Nicol Dunlop (1868-1935). Born in Scotland, he became active in electrical work in 1896 when he joined the Westinghouse Company in the United States, returning to Britain in 1899 as Manager of the European Publicity Department. He was a founding member of BEAMA in 1911. In later years he became more famous for his work in theosophy.

³⁰ Herbert N. Casson, "Significance of the World Power Conference", *Industrial Management, the Engineering Magazine* Vol.LXVIII (5), 1924, pp.255-259.

³¹ Alan A. Jackson, *London's Metropolitan Railway* (Newton Abbot: David & Charles, 1986). See especially Chapters 13 to 15. The earlier attempt to develop Wembley Park with an Eiffel tower is described on pp.100-103.

industrial development including the substantial research laboratories of the General Electric Company opened in 1922. A public supply was begun in Wembley in October 1914 by the Northmet Company.³²

Metropolitan Essex also experienced rapid growth in the interwar period. The large Becontree garden suburb built by the London County Council from 1921 brought in 103,328 new residents by March 1932. Many of these were in the Dagenham Urban District, formed in 1926, where the population expanded from 9,127 in 1921, to 89,362 in 1931 and 109,300 in 1939. Hornchurch Urban District, also created in 1926, grew in population from 10,891 in 1921 to 28,417 in 1931, and 81,486 in 1939. Electricity supply by the County of London Co. began only after World War I and depended on the completion of the new power station at Barking. Service in Hornchurch began in 1925 but later in Dagenham (from 1934) where the LCC houses had been fitted only with gas.³³

The 46 undertakings in 1925/26 (**Table 3**) operated a variety of systems. Fifteen were mixed AC/DC systems reflecting a shift away from DC which 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. Twenty places had wholly DC systems, Southend-on-Sea being the largest place that had not yet added AC. Several places operated AC systems with frequencies different from what had become the national standard of 50Hz. Part of Bedford worked at 60Hz and the whole of Cambridge at 90Hz.

Data on generating capacity show a wide range in size, from Northmet with 25,050kW capacity to Wickford & District with only 45kW. Steam turbines were dominant in all the larger stations and varied in scale from a 7,000kW unit in Luton to a 300kW machine in Chelmsford. Older reciprocating steam engines were still common in DC generation such as in Colchester. Gas engines were employed in the plants of Bishop Stortford, Saffron Walden and Walton-on-the-Naze. Diesel engines were in use in most of the smaller power stations.

Statistics on electricity consumption per head of population reveal major contrasts among electricity undertakings. Nine places in the region exceeded 100.0kWh per person. Each place had a distinctive market profile reflecting the local economic and social geography. Luton had a balanced profile in 1925/26, consisting of 42.6 percent of sales in the lighting segment, 0.2 percent in public lighting, 2.0 percent for the tramways and 55.2 percent in power. Two towns, Hendon and Great Yarmouth with similar-sized populations (around 60,000) had very different market profiles. Yarmouth had a fairly balanced profile with lighting sales at 34.2 percent, public lighting at 6.5 percent, tramways at 12.3 percent and power at 47.0 percent. Hendon in contrast was dominated by lighting sales at 71.0 percent; with power sales at 29.0 percent; there were no sales for public lighting or traction. Annual per capita sales in Hendon reached 142.1kWh while Great Yarmouth's amounted to only 65.1kWh.

³² N.C. Friswell, *Northmet* (Horsham, 2000), p.108.

³³ W.R. Powell ed. *Victoria County History, Essex*, Vol.5 (London, 1966) includes an extensive review of Metropolitan Essex since 1850 and covers the growth of Dagenham. Hornchurch is included in Volume 7 (1978).

Table 3 EASTERN ELECTRICITY BOARD AREA ELECTRICITY SUPPLY UNDERTAKINGS 1925/26.

UNDERTAKING	COUNTY	SYSTEM	GENERATING CAPACITY kW	PER CAPITA CONSUMPTION kWh
Local Authorities				
Aylesbury MB	Bucks	AC/DC	2,900	38.4
Bedford MB	Beds	AC	11,800	149.9
Bury St Edmunds MB	Suffolk, W	DC	900	48.6
Clacton UD	Essex	DC	1,220	50.2
Colchester MB	Essex	DC	2,375	55.2
Felixstowe UD	Suffolk, E	AC/DC	300	46.8
Finchley UD	Middx	AC/DC	6,725	92.2
Gray's Thurrock UD	Essex	DC	300	53.8
Great Yarmouth CB	Norfolk	AC/DC	5,000	65.1
Harwich MB	Essex	AC	-	22.4
Hornsey MB	Middx	AC/DC	4,450	46.7
Ipswich CB	Suffolk, E	AC/DC	10,250	117.8
King's Lynn MB	Norfolk	AC/DC	4,100	78.7
Lowestoft MB	Suffolk, E	DC	2,125	53.4
Luton MB	Beds	AC/DC	19,400	202.8
Norwich CB	Norfolk	AC/DC	12,250	162.6
Peterborough MB	Soke of Peterborough	AC/DC	7,000	419.2
Saffron Walden MB	Essex	DC	60	4.7
Southend-On-Sea CB	Essex	DC	8,610	125.5
Walton-On-The-Naze UD	Essex	DC	188	29.0
Watford MB	Herts	AC	10,620	96.9
Companies				
Aldeburgh ES Co	Suffolk, E	DC	116	39.5
Bishops Stortford ETC G&E	Essex	DC	100	3.9
Brentwood District E Co.	Essex	AC	-	11.4
Brundall District Service Co.	Norfolk	AC	-	12.8
Cambridge ES Co.	Camb	AC	4,650	46.8
Chelmsford ¹	Essex	AC/DC	1,295	23.1
Chesham EL&P Co.	Bucks	AC/DC	-	53.5
Colne Valley ES Co.	Middx	AC	-	31.8
County Of London Co.	Essex	AC	-	..
Cromer ²	Norfolk	DC	180	28.9
Frinton-On-Sea & Dist EL&P	Essex	DC	200	48.4
Harrow EL&P Co.	Middx	DC	-	70.4
Hendon ES Co.	Middx	AC	-	142.1
Hitchin ¹	Herts	DC	565	23.8
Letchworth	Herts	AC/DC	4,890	132.6
Maldon (Sadd & Sons)	Essex	DC	780	..
Newmarket EL Co.	Suffolk, W	DC	500	30.6
North Metropolitan EPS Co.	Middx/Herts	AC/DC	25,150	..
Northwood EL&P Co.	Middx	AC	-	89.5
Stevenage EL&P Co.	Herts	AC/DC	235	27.8
Welwyn Garden City ES Co.	Herts	AC	-	216.1
Wickford & District ES Co.	Essex	DC	45	8.3
Wisbech EL&P Co.	Isle of Ely	DC	1,025	44.6
Woodbridge & Dist EL&P	Suffolk, E	DC	244	10.1
Wood Green ³	Middx	DC	500	23.2

Notes:¹ Owned by Electric Supply Corporation.² Owned by Edmundsons Electricity Corporation.³ Owned by Tottenham & District Light, Heat & Power Co.Source: Electricity Commissioners, *Engineering and Financial Statistics 1925/26*

Electrification and extension of supply areas were given a new impetus following the Weir Report (1925)³⁴, 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 entrants in the late 1920s included East Dereham and Tilbury Urban District Councils, Bungay Gas & Electric Co., Orford & District Co., and Woodbridge & District Co. The two latter companies had previously been non-statutory operations. Two larger companies also began work in this period.

The Bedfordshire, Cambridgeshire & Huntingdonshire Electricity Act 1925 gave the new company a 50-year franchise for an area of about 1,200 square miles in the three counties. From the beginning until 1935 the company was managed by Northmet and power supply from that system was connected at Royston.³⁵ Little Barford was a key node in the Bedfordshire, Cambridgeshire & Huntingdonshire Co. plans and was connected to Bedford in 1929 as one of the earliest sections of the grid to be completed. A power station was built at this location in 1940. Sales grew from 10.66million kWh in 1930 to 22.78million kWh in 1935, a figure that included 5.17m kWh bulk supply mostly to the Cambridge and Newmarket companies.

A franchise area of 2,700 square miles was granted by the East Anglia Electricity Act 1927 covering a large part of Norfolk and Suffolk counties. The Act also legitimised the East Anglian Electric Supply Co. that had been providing a public supply in some small towns for 20 years. Sales expanded from 3.95m kWh in 1930 to 12.75m kWh in 1935.

As part of the efforts to encourage rural electrification, the Electricity Commissioners supported two demonstration projects in the region. One covering 109 square miles around Bedford began in 1930. The Bedford Corporation scheme showed substantial growth of sales from 1.35m kWh in 1930/31 to 15.06m kWh in 1936/37. One factor in this growth was the London Brick Company's works and housing at Stewartby. The results of the Norwich demonstration scheme (125 square miles centred on Reepham) were more modest, with sales only growing from 0.21m kWh in 1931/32 to 1.35m kWh in 1936/37.³⁶ Both schemes showed a deficit when capital charges were added. One conclusion to be drawn from the experience was the need for some kind of subsidy if full electrification in rural areas was to be achieved.

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 region. The South East England scheme was adopted by the CEB in February 1928 and the East England scheme which covered Norfolk and Suffolk followed in March 1930. The national grid was designed to connect

³⁴ Ministry of Transport, *Report of the Committee appointed to review the National Problem of the Supply of Electrical Energy* (London: HMSO, 1927), 39 pp.

³⁵ N.C. Friswell, *Northmet* (2000), pp.139-143.

³⁶ *Seventeenth Annual Report of the Electricity Commissioners 1936-37* (London: HMSO, 1937), Appendix A, pp.66-78.

“selected” power stations. These were generally the largest and most efficient generating plants that also had some potential for expansion.

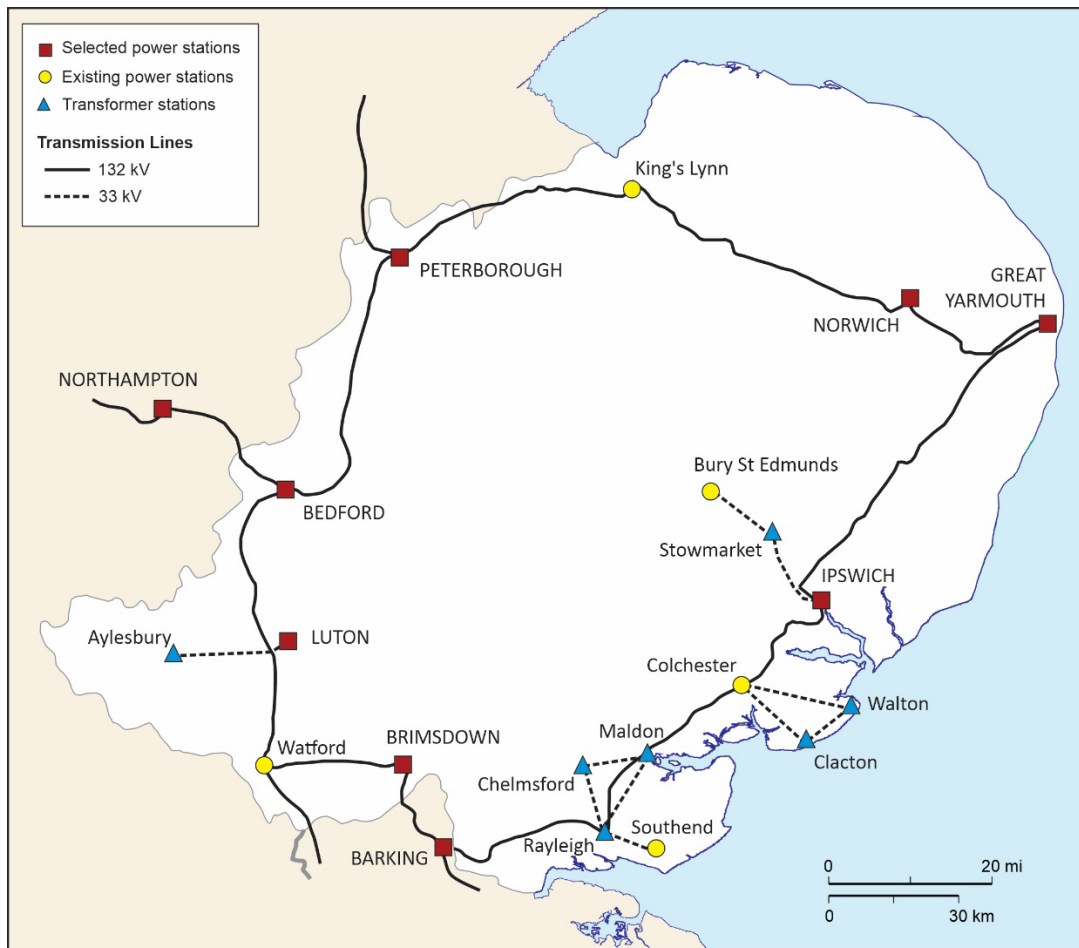


Figure 3 EASTERN ENGLAND NATIONAL GRID.

In the Eastern region (**Figure 3**) there were eight selected stations: Brimsdown A and B (Northmet) and the municipal stations at Bedford, Great Yarmouth, Ipswich, Luton, Norwich and Peterborough. All were connected by a 132kv line which encircled the region and connected with other grid schemes at Peterborough and Bedford. Power stations in London were an integral part of the regional scheme. Lower-voltage lines at 33kv gave grid connections to Aylesbury, Stowmarket and towns in Essex.

When trading began on 1 January 1934 in the combined South East England and Eastern England scheme areas, the grid added a new layer to the complex of undertakings that operated the electricity supply system. The Bankside, London grid control office of the CEB now managed the flows of power on the transmission lines and directed the hour-to-hour operation of the selected power stations. Bedford power station remained in the ownership and management of the Corporation but the daily operation was directed from London. Decision-making and planning for the future became increasingly centralised in London.

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

UNDERTAKING	SYSTEM	GENERATING CAPACITY kW	PER CAPITA CONSUMPTION kWh
Local Authorities			
Aylesbury MB	AC/DC	-	271.1
Bedford MB	AC	23,300	582.5
Bury St Edmunds MB	AC/DC	400	193.9
Clacton UD	AC/DC	2,720	207.8
Colchester MB	AC/DC	7,500	158.3
East Dereham UD	AC	-	121.5
Felixstowe UD	AC/DC	300	196.0
Finchley MB	AC/DC	6,625	257.2
Gray's Thurrock UD	AC/DC	-	216.4
Great Yarmouth CB	AC	15,250	187.9
Harwich MB	AC	-	140.7
Hitchin UD	AC	-	136.0
Hornsey MB	AC/DC	6,850	140.0
Ipswich CB	AC/DC	29,750	389.1
King's Lynn MB	AC/DC	4,900	191.1
Lowestoft MB	AC/DC	-	124.9
Luton MB	AC/DC	29,500	689.6
Norwich CB	AC/DC	42,500	265.0
Peterborough MB	AC/DC	25,500	538.8
Southend-On-Sea CB	AC/DC	5,750	365.7
Tilbury UD	AC	-	93.4
Watford MB	AC	22,870	446.1
COMPANIES			
Aldeburgh ES Co	DC	310	131.8
Beds, Cambs & Hunts E Co.	AC	-	70.9
Brentwood District E Co.	AC	-	175.5
Brightlingsea	AC	-	74.1
Bungay G&E Co.	AC	-	75.0
Cambridge ES Co.	AC	4,750	142.7
Chesham EL&P Co.	AC	-	184.0
Colne Valley ES Co.	AC	-	203.6
County of London ES Co.	AC/DC	-	..
East Anglia ES Co.	AC/DC	813	..
East Suffolk ED Co.	AC	-	48.9
Frinton-On-Sea & Dist EL&P	DC	625	422.1
Harrow EL&P Co.	AC/DC	-	179.6
Hendon ES Co.	AC	-	279.3
Letchworth	AC/DC	8,890	385.5
Newmarket EL Co.	AC	-	103.4
North Metropolitan EPS Co.	AC/DC	107,500	..
Northwood EL&P Co.	AC	-	224.3
Welwyn Garden City ES Co.	AC	-	783.2
Wickford & District ES Co.	AC	-	92.3
Wisbech EL&P Co.	DC	1,275	88.8
Woodbridge & Dist ES Co.	AC	-	49.8

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

Table 4 shows the situation in 1935/36 when 44 undertakings were in operation. Over the previous decade many changes had taken place. The numbers of AC and AC/DC systems had grown while wholly DC systems had shrunk to three (in Aldeburgh, Frinton-on-Sea and Wisbech).

Generating technology emphasised economies of scale with larger units that brought significant reductions in coal consumption. The Thorpe, Norwich station (opened in 1926)³⁷ consumed 1.56lbs of coal for each kilowatt hour generated, compared with 2.31lbs a decade earlier at the Duke Street station. In 1935/36 the best regional performance was at Brimsdown which burned only 1.42lbs per kWh. This station also had the largest generators in the region with capacities of 25,000kW.

Rationalisation of generation and interconnections of undertakings all contributed to reducing the cost of electricity. Other factors such as the growth of radio broadcasting³⁸ and lower prices for small appliances helped to boost electricity consumption. By 1935/36 there were 33 places in the region with per capita consumption levels above 100kWh.

The growth of electricity sales, especially in the lighting segment, may be illustrated by the case of Luton. Total electricity sales grew from 19.82million kWh in 1925/26 to 95.3m kWh a decade later. The lighting segment which included domestic uses increased 8.45m kWh to 30.84m kWh. Industrial growth in the town, together with the domestic use, raised per capita consumption from 202.8kWh to 689.6kWh.

The 22 companies in the region were controlled by a variety of interests (**Table 5**). These ranged from Edmundson's Electricity Corporation which covered the most territory to Christy Brothers & Co. which owned the small Aldeburgh undertaking.³⁹ Almost all the holding companies were represented in Eastern England (**Figure 4**)

The North Metropolitan Electric Power Co. was the largest company operating in the region with almost 68 percent of all company sales in 1935/36.⁴⁰ With the formation of the London Passenger Transport Board in 1933, the company became independent of the former Underground Electric Railways of London. With the acquisition of the Harrow (1939) and Hendon (1937) companies, North Met became a substantial holding company until these subsidiaries were consolidated.⁴¹ Companies operating the systems in the two garden cities at Letchworth and Welwyn were the largest of the remaining independents.

³⁷ I.Mech.E. *Proceedings*, 1926, pp.805-807.

³⁸ The Marconi Company in Chelmsford was a pioneer of broadcasting in Britain from its station (2MT) at Writtle on the outskirts of the town. It operated from February 1922 to January 1923. Brookman's Park, near Potters Bar, was opened by the BBC in 1929 as the principal transmitter for the London region. BBC television services began at Alexandra Park in 1936. See: Edward Pawley, *BBC Engineering 1922-1972* (London: BBC Publications, 1972).

³⁹ The company (established in 1883) was based in Chelmsford but most of its interests in electricity were in South West England. See: Peter Lamb and Eric Lodge, "Christy Brothers in the South West", *Histelec News* Supplement S-15 (2000). www.wpehs.org.uk

⁴⁰ The total excludes sales in Essex by the County of London company.

⁴¹ See Friswell, *Northmet* (2000).

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

1. British Electric Traction Co. LTD	1.1 Colne Valley ES CO. 1.2 Northwood EL&P CO. 1.3 Wisbech EL&P CO.
2. British Power & Light Corporation LTD	2.1 East Suffolk E Distribution Co.
3. Christy Brothers & Co. LTD	3.1 Aldeburgh ES Co.
4. County of London Electric Supply Co. LTD	4.1 County of London Co. 4.2 Wickford & District ES Co.
5. Edmundsons Electricity Corporation LTD	5.1 Beds, Cambs & Hunts ES Co. 5.2 Newmarket EL Co. 5.3 Cambridge ES Co. 5.4 East Anglian ES Co.
6. Electric Supply Corporation	6.1 Hendon ES Co.
7. General Electric Co.	7.1 Frinton-on-Sea & Dist EL&P Co.
8. Power Securities Corporation LTD/Balfour Beatty	8.1 Chesham EL&P Co.
9. Southern Areas Electricity Corporation	9.1 Brentwood Dist E Co.
Other Companies	10. Bungay G&E Co. 11. First Garden City, Letchworth 12. Harrow EL&P Co. ¹ 13. North Metropolitan 14. Welwyn Garden City ES Co. 15. Woodbridge & District ES Co.

Notes:

¹ Acquired by Northmet in 1933 but not fully consolidated until 1938.

² Acquired by East Suffolk E Distn Co. in 1936.

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

Although state intervention had begun to rationalise electricity generation, the efforts of the Electricity Commissioners to reduce the very large numbers of distributors were unsuccessful. The McGowan Report published in May 1936⁴² 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 seven of the 20 local authorities were above this limit and many small towns objected to the idea of amalgamation with large companies. The government's Outline of Proposals published in April 1937⁴³ but the continued opposition and more pressing issues of the time meant that reorganisation of distribution was set aside.

⁴² 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.

⁴³ Ministry of Transport, *Electricity Distribution: Outline of Proposals* (London: HMSO, 1937).

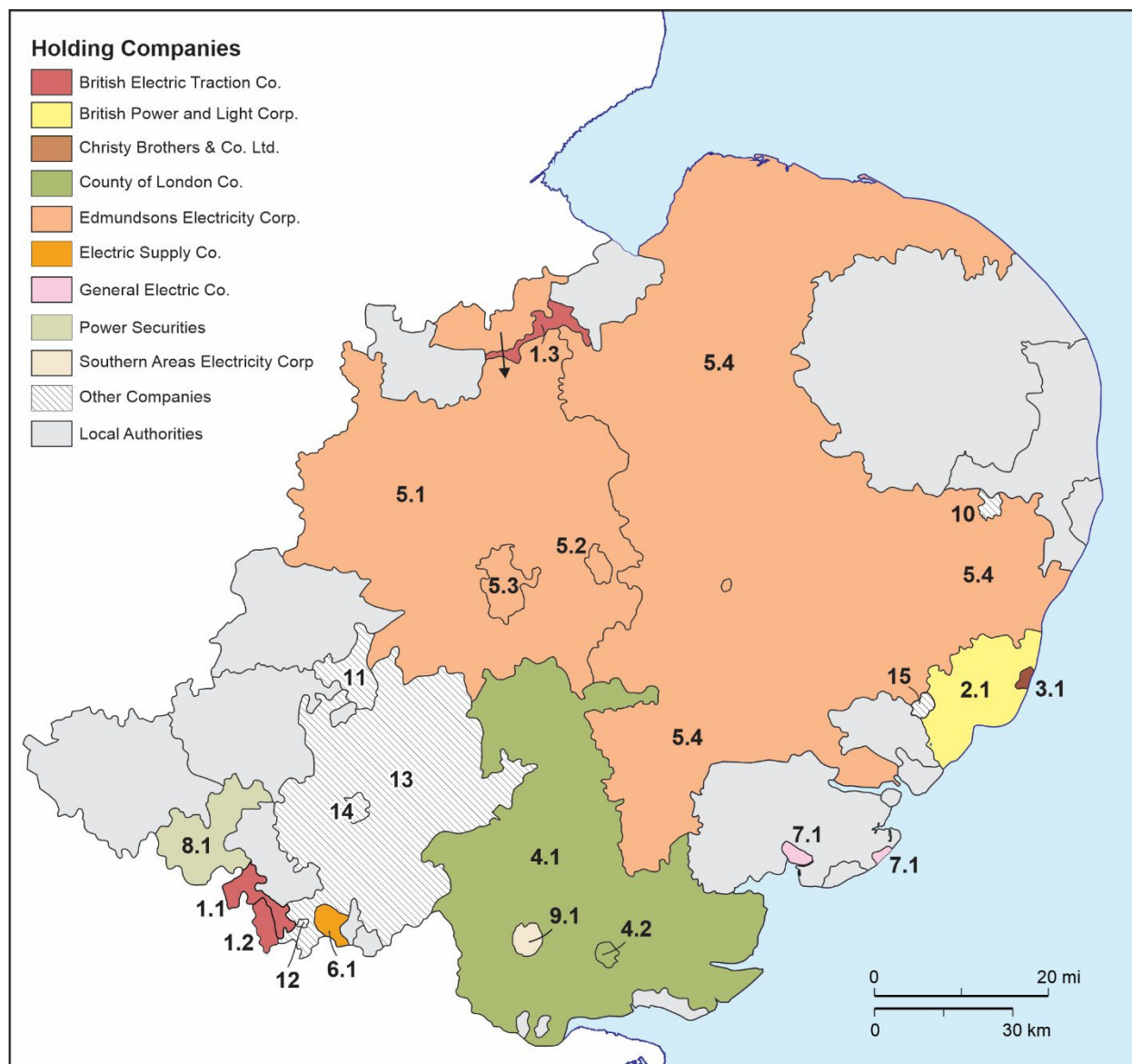


Figure 4 EASTERN ENGLAND ELECTRICITY HOLDING COMPANIES 1934-35.

Private generation tended to peak around 1920, but new industrial plants in rural areas had to be self-sufficient. Ely Beet Sugar Co. installed generating capacity of 1,000kW when opened in the mid-1920s-as did Eastwood's Cement at Barrington near Cambridge.⁴⁴ De Havilland's expanded aircraft factory at Hatfield included a power plant (400kW) to cover part of its power requirements.⁴⁵

Even in the greater London zone private power generation continued, despite the extensive electricity networks. The Ford Motor Co. built a very large powerhouse with two 30,000kW turbines to serve its

⁴⁴ I.Mech.E. *Proceedings* 1931. Cambridge summer meeting describes the works, pp.66,74.

⁴⁵ "De Havilland aircraft works", *The Engineer* Vol.162, 1936, p.636.

new integrated motor works on the Thames at Dagenham.⁴⁶ Kodak Ltd⁴⁷ at Wealdstone, Harrow, also had a substantial power station while the furniture Harris Lebus Ltd used wood waste in generating its power needs.⁴⁸

Demand for electricity, especially for industrial uses, grew rapidly after 1936 with rearmament and then the war effort. Significant extensions were made at the power stations in Letchworth, Norwich and Watford. Capacity at Brimsdown was raised from 107,500kW in 1935/36 to 220,500kW by 1948/49. A new station at Little Barford with four 30,000W turbines began operating in 1939/40.

Hyperbolic reinforced concrete cooling towers became a new landscape feature as surface water courses were unable to cope with the expanded generating capacity. The first of these towers appeared in Luton in the early 1930s and were followed by substantial development at Brimsdown. Although well sited on the River Ouse, the Little Barford station also had a cooling tower ready to serve in periods of low water levels. A cooling tower was built at Letchworth in 1943.

Table 6 EASTERN ELECTRICITY BOARD AREA CONSOLIDATIONS.

UNDERTAKING	YEARS IN OPERATION	NEW OWNER
<i>Leigh-On-Sea UD</i>	1901?-1913	Southend Corporation
<i>Oulton Broad N/S</i>	1914?-1919	Lowestoft Corporation
<i>Stevenage EL&P Co.</i>	1924-1927	Northmet
<i>Brundall & District Service Co.</i>	1925-1931?	Norwich Corporation
<i>Walton-on-the-Naze¹</i>	1902-1931	Colchester Corporation
<i>Maldon (Sadd & Sons)</i>	1925-1932	County of London Co.
<i>Cromer (Edmundsons)</i>	1903-1931/2	East Anglia Co.
<i>Wood Green (Tottenham & Dist Co.)</i>	1913-1932	Northmet
<i>Saffron Walden MB</i>	1925-1934	County of London Co.
<i>Sheringham & District</i>	1926?-1934	East Anglia Co.
<i>Shoeburyness UD</i>	1928?-1934	Southend Corporation
<i>Southwold²</i>	?-1933/34	East Anglia Co.
<i>Bishop's Stortford G&E Co.</i>	1919-1935	Northmet
<i>Chelmsford (ES Corpn)</i>	1890-1935	County of London Co.
<i>Woodbridge & District EL Co.</i>	1925?-1936	East Suffolk ED Co. ³
<i>Grays-Thurrock UD</i>	1901-1937	Thurrock UD
<i>Tilbury UD</i>	1927?-1937	Thurrock UD
<i>Harrow EL&P Co.</i>	1896-1937/8	Northmet
<i>Bury St Edmunds MB</i>	1900-1938	East Anglia Co.
<i>Hendon ES Co. (ES Corpn)</i>	1908-1939	Northmet

Notes:

¹ The Council took over after the bankruptcy of the company in 1921.

² Originally a non-statutory company. ELO granted in 1927.

³ Earlier Orford EL&P Co.

⁴⁶ Paul Collins and Michael Stratton, *British car factories from 1896* (Godmanstone, Dorset: Veloce Publications, 1993), pp.120-121.

⁴⁷ I.Mech.E. *Proceedings*, London, 1947. London summer meeting describes the works, p.231. The powerhouse generated about 12.5m kWh annually from two 1,500kW turbines and two 800kW reciprocating engine sets.

⁴⁸ "Electricity supply in a furniture factory", *The Engineer* Vol.192, 1951, pp.428-431.

Table 6 lists the various undertakings that were consolidated between 1913 and 1939. These mainly resulted from large companies taking over smaller operations in their area, such as the Harrow Company by Northmet in 1933. Local government changes such as the formation of Thurrock Urban District in 1937 merged the Grays-Thurrock and Tilbury systems. The Borough of Bury St Edmunds was one of the few municipalities to heed the recommendations of the McGowan Report and sold its operations to the East Anglian 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 Eastern Electricity Board took over the distribution assets of 38 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



Figure 5

The Eastern 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 six sub-areas and 43 districts.⁴⁹

Figure 5 shows the geographical organisation in 1957 when there were six sub-areas and 32 districts. One notable feature is the network of 151 service centres where consumers could pay their bills and

⁴⁹ The issues of standardisation and administrative divisions are discussed in Cecil T. Melling, *Light in the East: the first decade of the Eastern Electricity Board* (Ipswich: Eastern Electricity, 1987), Chapters 4 and 5.

purchase appliances.⁵⁰ These service centres were an important and profitable part of the Board's business.

Postwar economic development brought new demands for power. This was very evident in the six New Towns established in the region as part of policies to decentralize people and employment from London. Much of the inspiration for the New Towns was drawn from the experience of the First Garden City Ltd which had developed Letchworth from 1903.⁵¹ Developing each New Town required a very substantial investment in the electricity infrastructure of cables, transformers and switchgear.

NEW TOWNS IN EASTERN ENGLAND

	<i>Date of designation</i>	<i>Population 1951</i>	<i>Population 1961</i>
<i>Basildon</i>	January 1949	24,566	53,707
<i>Harlow</i>	March 1947	5,828	53,496
<i>Hatfield</i>	May 1948	9,258	20,504
<i>Hemel Hempstead</i>	February 1947	22,064	54,816
<i>Stevenage</i>	November 1946	7,312	42,422
<i>Welwyn</i>	May 1948	<u>18,787</u>	<u>34,344</u>
		87,815	259,287

Source: Compiled From Census Reports

The Board also faced the need for renewal of distribution systems in the older urban areas and extension of supply into the very large rural zone. In 1948, 86 percent of the territory was administered by Rural District Councils. Farm electrification was extended from 31.8 percent of all farms in 1948 to 78.9 percent in 1959.⁵²

Over the decade 1948/9 to 1958/9, total sales of electricity in the region grew from 3,308m kWh to 7,700m kWh and the number of consumers expanded from 1,232,000 to 1,774,000. Employees of the Board increased from 13,599 in March 1949 to only 14,000 a decade later.

Electricity Generation and Transmission

The Eastern 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 companies and local authorities. 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.

Some firms after experiencing the fuel crisis of early 1947 decide to build some independent supply to cover emergencies. Vauxhall Motors in Luton opened a 5.000kW plant later in the year to cover 40 percent of their power requirements. Five General Motors two-stroke diesel engines generating sets (similar to those used in locomotives) were imported from the United States.⁵³

⁵⁰ *Electricity Supply Handbook 1958* (London: Electrical Times, 1958), pp.98-105.

⁵¹ Mervyn Miller, *Letchworth: the first garden city* (Chichester: Phillimore, 1989). In the development of energy supplies, gas was given first priority with the gas works completed in 1905. Small-scale electricity works began in 1907.

⁵² Electricity Council, *First Report and Accounts 1958-59*, Parliamentary Papers HC 312, p.21.

⁵³ "Vauxhall Motors new power station", *The Engineer* Vol.185, 1948, p.122.

Table 7 BRITISH ELECTRICITY AUTHORITY: POWER STATIONS IN THE EASTERN DIVISION 1948/49.

POWER STATION	GENERATING CAPACITY kW	TYPE¹
<i>Brimsdown A&B</i>	220,500	S
<i>Little Barford</i>	120,000	S
<i>Norwich</i>	72,500	S
<i>Cliff Quay</i>	45,000	S
<i>Watford</i>	37,750	S
<i>Letchworth A & B</i>	27,880	S,I
<i>Luton</i>	24,500	S
<i>Bedford</i>	20,000	S
<i>Peterborough</i>	18,500	S
<i>Ipswich</i>	17,250	S
<i>Great Yarmouth</i>	15,250	S
<i>Colchester</i>	7,500	S
<i>Cambridge</i>	7,260	S
<i>King's Lynn</i>	5,250	S
<i>Southend (London Road)</i>	4,800	I*
<i>Finchley</i>	4,700	S
<i>Clacton</i>	2,420	I
<i>Southend (Leigh)</i>	950	I
<i>Frinton</i>	620	I
<i>Cromer</i>	570	I
<i>Felixstowe</i>	300	I
<i>Aldeburgh</i>	200	I
	653,740	

Notes:

¹ S – Steam; I--Internal combustion (diesel).; I* Steam also generated from exhaust gases of diesel engines.

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

Table 7 shows the 24 power stations in the new organisation. They ranged in size from large turbine-power stations at the top to small diesel-engine powered units at the bottom of the table. Cliff Quay, Ipswich, where the first unit was commissioned in 1949, was still under construction.

Over the next decade, five new power stations were commissioned:

<i>Rye House</i>	19 December 1951
<i>Goldington</i>	10 June 1955
<i>Tilbury</i>	27 September 1956
<i>South Denes</i>	26 September 1957
<i>Little Barford B</i>	30 March 1959

The first two stations were equipped with 30,00kW turbines, the others with 60,000kW units working at higher steam pressure. Tilbury and South Denes were both oil-fired.

Two stations were under construction in 1959. One at West Thurrock on the Thames was much larger than any previous stations in the region. Incorporating two 200,000kW and three 300,000kW turbines, the steam pressure at this station would be 2,350lbs per square inch, much higher than the 950lbs per square inch at Little Barford B. Bradwell station, also under construction in 1959, was nuclear-powered,

part of the grand strategy of atomic power announced in 1955. The station was commissioned on 1 July 1962.

Small diesel-engined stations at Aldeburgh, Cromer, Felixstowe, Frinton and Southend (Leigh) were all closed by 1959. Finchley, shut down in 1958, was the only steam station closed.

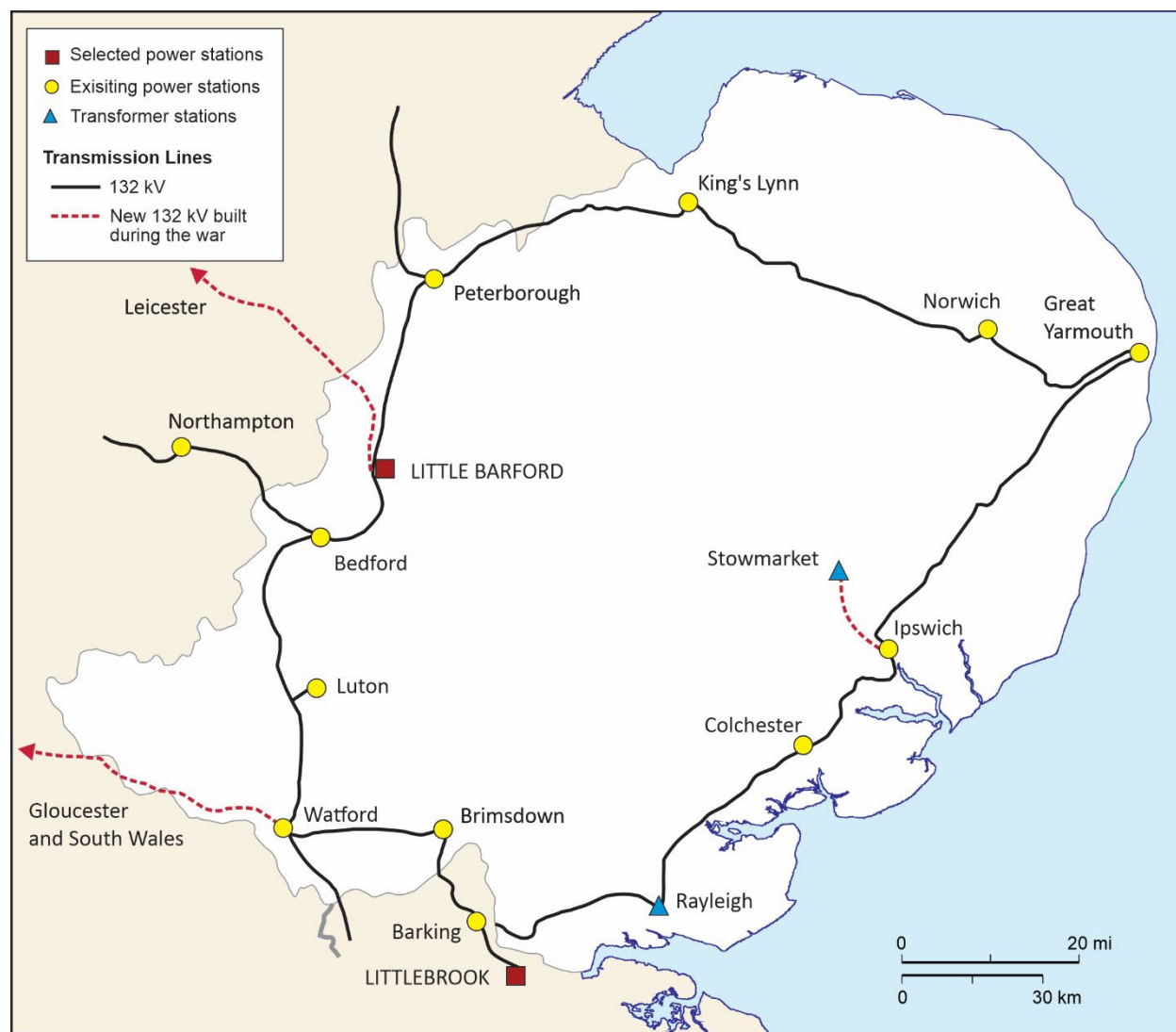


Figure 6 EASTERN AREA NATIONAL GRID SYSTEM 1946.

The main components of the national grid transmission system as completed in 1933 are illustrated in **Figure 3**. By 1946 (**Figure 6**) the main changes were new 132kV lines from Ipswich to Stowmarket, Leicester to Little Barford, and Watford to Ebbw Vale via Oxford and Gloucester.

A new transmission line at 132kV from Ipswich to Sundon (near Luton) was the major addition shown on the 1957 map. Other new lines included the linking up of the Rye House station and reinforcement for

Chelmsford and Braintree. Heavy power demands by the aircraft research establishment near Bedford are reflected in new lines from Little Barford.

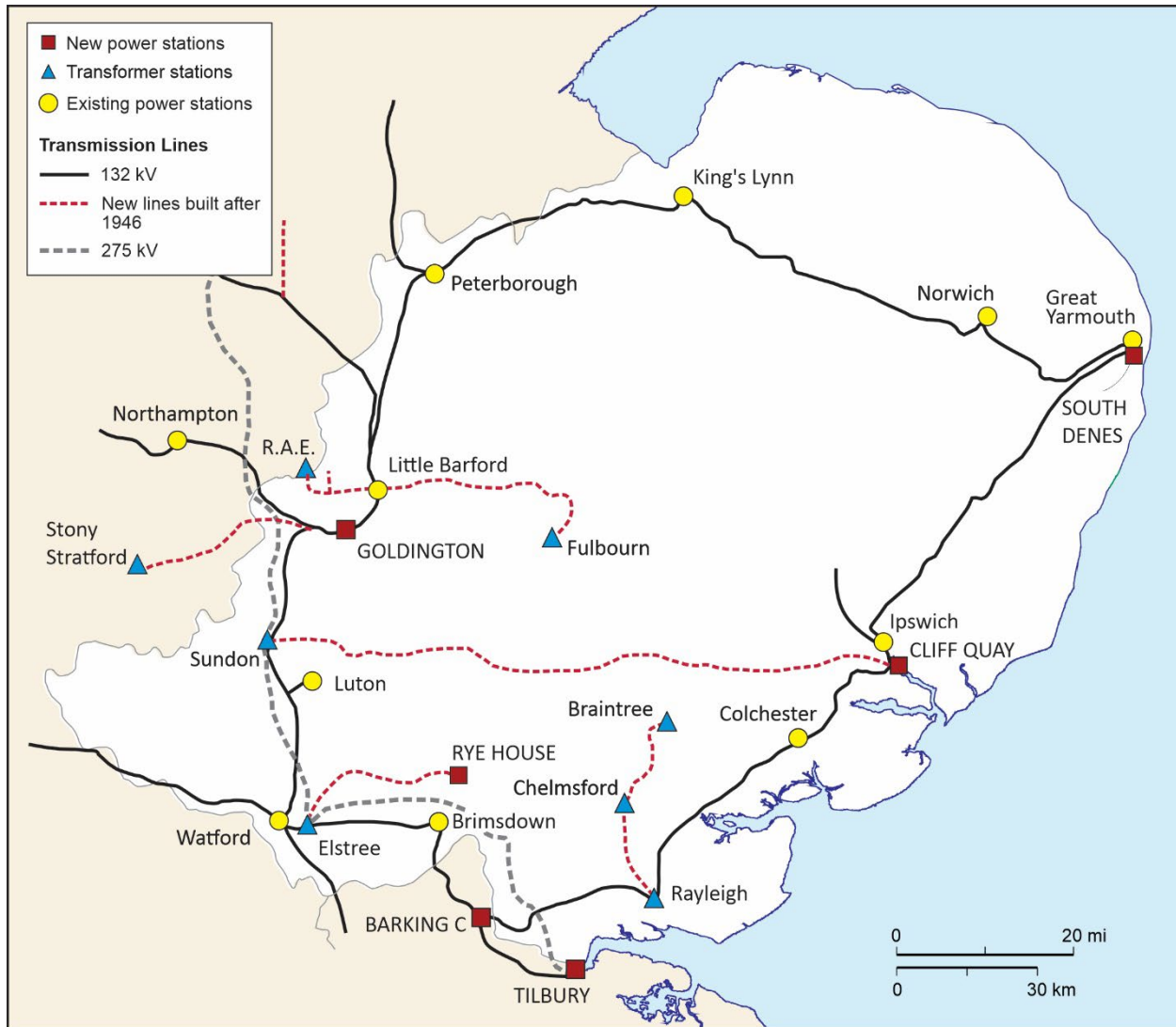


Figure 7 EASTERN AREA NATIONAL GRID SYSTEM 1957.

One striking feature of the 1957 map (**Figure 7**) is the Supergrid (275kv) from Staythorpe in the East Midlands to a substation at Elstree where electricity was transformed to lower voltages for distribution in the greater London area. The extension to Tilbury was still under construction in 1957. With the new power supplies from the coalfields, Little Barford would be the last inland power station in the region. All future growth would be on the Thames or the coast.

The grid control for the area north of the Thames was located in London until about 1956. Cumberland House in Redbourn, near St Albans, was acquired and converted into the regional grid control centre.

During the first decade of operation the Eastern Division built five new power stations and raised generating capacity from 653,640kW to 1,805,930kW (**Table 8**). The transmission line capacity was raised to 770 route miles, of which 123 route miles were part of the 275kv Supergrid. Over the period the numbers employed rose from 2,315 to 3,514.

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

POWER STATION	GENERATING CAPACITY kW	TYPE¹
<i>Tilbury</i>	360,000	S,S(O)
<i>Cliff Quay</i>	276,000	S
<i>Brimsgate B</i>	227,770	S,S(O)
<i>Goldington</i>	180,000	S
<i>Rye House</i>	128,000	S
<i>South Denes</i>	120,000	S(O)
<i>Little Barford A</i>	120,000	S
<i>Norwich</i>	73,500	S
<i>Little Barford B</i>	60,000 ²	S
<i>Peterborough</i>	58,000	S
<i>Brimsgate A</i>	54,800	S
<i>Watford</i>	33,250	S
<i>Luton</i>	23,000	S
<i>Ipswich</i>	17,250	S
<i>Letchworth B</i>	14,500	S
<i>Bedford</i>	12,500	S
<i>Great Yarmouth</i>	11,250	S
<i>Letchworth A</i>	8,000	S
<i>Colchester</i>	7,500	S
<i>Cambridge</i>	7,260	S
<i>Southend (London Road)</i>	5,750	I
<i>King's Lynn</i>	5,250	S
<i>Clacton</i>	2,350	I
	1,557,530	

Notes:

¹ S – Steam; S(O)—steam, oil-fired; I—Internal combustion (diesel).

² Still under construction; final 60,000kW unit installed in 1959/60.

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

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 South Eastern Region was established incorporating the Eastern, London and South Eastern Divisions. Under the new arrangements the regional director in London became responsible for the higher-order planning and administration of 75 power stations, 1,457 route miles of transmission lines and 15,872 employees. Design work on new power stations was transferred to the Southern Project Group working at the old Finchley power station and transmission development was centralised at Guildford.

Summary

Table 9 shows various indicators of the growth of electrification from 1900. Although eight of the thirteen undertakings were local authorities, private companies took the lead in developing local systems. Chelmsford, Cambridge and Norwich were all in operation before Bedford and Great Yarmouth

began service in 1894. Large companies such as Northmet played very important roles in extending service areas beyond the core centres. Non-statutory companies also had a special place before the 1920s in developing electricity in small country towns and new urban centres such as Letchworth Garden City.

Table 9 SUMMARY OF DEVELOPMENT IN THE EASTERN ELECTRICITY BOARD AREA

YEAR	NUMBER OF UNDERTAKINGS ¹	LOCAL AUTHORITY UNDERTAKINGS	NUMBER OF POWER STATIONS	GENERATING CAPACITY (kW)	PER CAPITA CONSUMPTION (kWh) ²
1900	13	8	13	..	.. (4)
1912	33	17	32	..	.. (36)
1925/6	46	21	40	154,948	58.3 (133)
1935/6	44	22	25	347,878	263.7 (374)
1948/9	..	..	24	653,740	707.3 (821)
1958/9	..	..	23	1,557,530	1,486.3 (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.

The number of undertakings grew rapidly to 1925/26 and peaked a decade later. Power stations show a peak number in 1925/26 and gradual consolidation thereafter.

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 were reflected in the increasing size of power stations. Brimsdown station which had 5,000kW turbines in 1925/26 was using 25,000kW machines a decade later. The standard generators in the postwar period were much larger again at 60,000kW.

Per capita consumption in the Eastern region (with Great Britain in parentheses) was always lower than the national average, partly reflecting the extensive rural areas in the region. The contrasts between urban and rural were particularly marked in 1935/36 when per capita consumption in Welwyn Garden City (783.2kWh) and Luton (689.6kWh) were so much higher than the East Suffolk (48.9kWh) and Woodbridge (49.8kWh) areas.

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 in the larger urban centres. The 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

also 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.⁵⁴ 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)⁵⁵ 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 Eastern 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 between 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

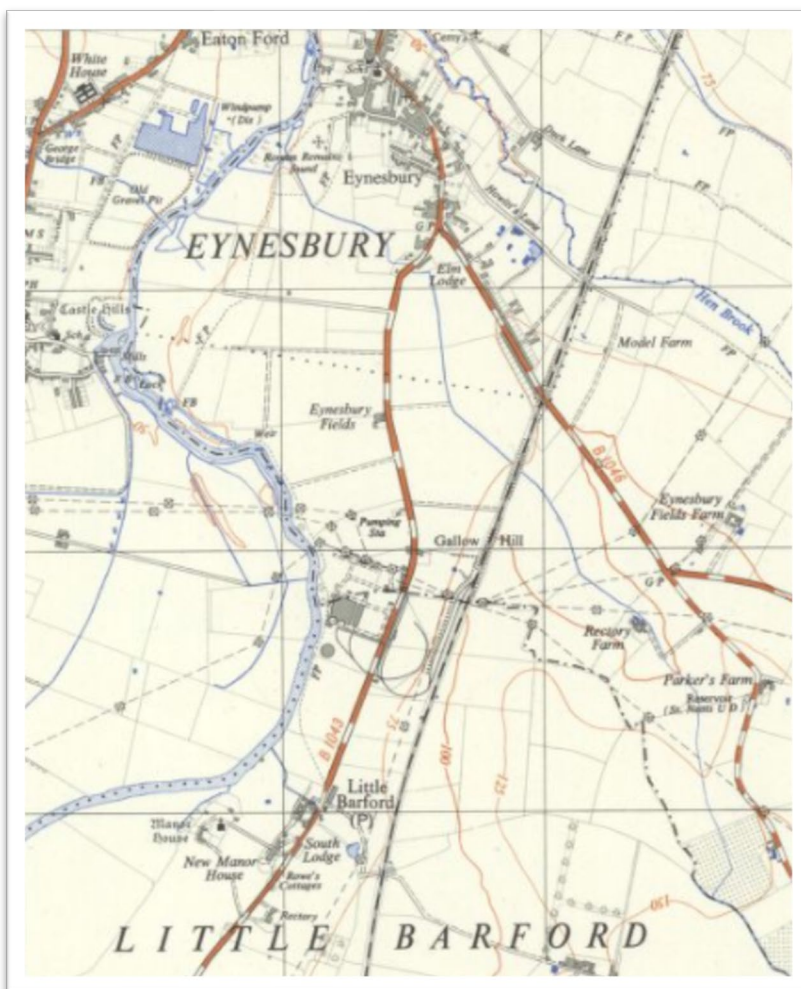
⁵⁴ See **Annual catalogues of British government publications 1920-1970** (Bishop's Stortford: Chadwyck-Healey, 1974).

⁵⁵ The change of title from British Electricity Authority resulted from the formation of the autonomous South of Scotland Electricity Board from 1 April 1955.

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.

After privatisation, the records of the Eastern Electricity Board were dispersed or destroyed. Some publications cover aspects of this large region. The Victoria County History volumes on Essex and Middlesex provide valuable context on the development of electricity and other utilities in the metropolitan zone. N.C. Friswell, *Northmet* (Horsham, 2000) is an invaluable guide to the complexities of the large power company. Cecil T. Melling, *Light in the East* (Ipswich: Eastern Electricity, 1987) offers a useful overview of the challenges that the new Board faced in its first decade.



LITTLE BARFORD

Located on the River Ouse and the Great Northern main line south of St Neots, the station was built by Edmundson's for its subsidiary the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co. Opened in 1939/40 in time to meet the expanded wartime demand, the generating plant had a capacity of 120,000kW. A second station with a similar capacity was completed in 1960.

Ordnance Survey 1:25,000 series, Sheet TL15, 1956 (National Library of Scotland)