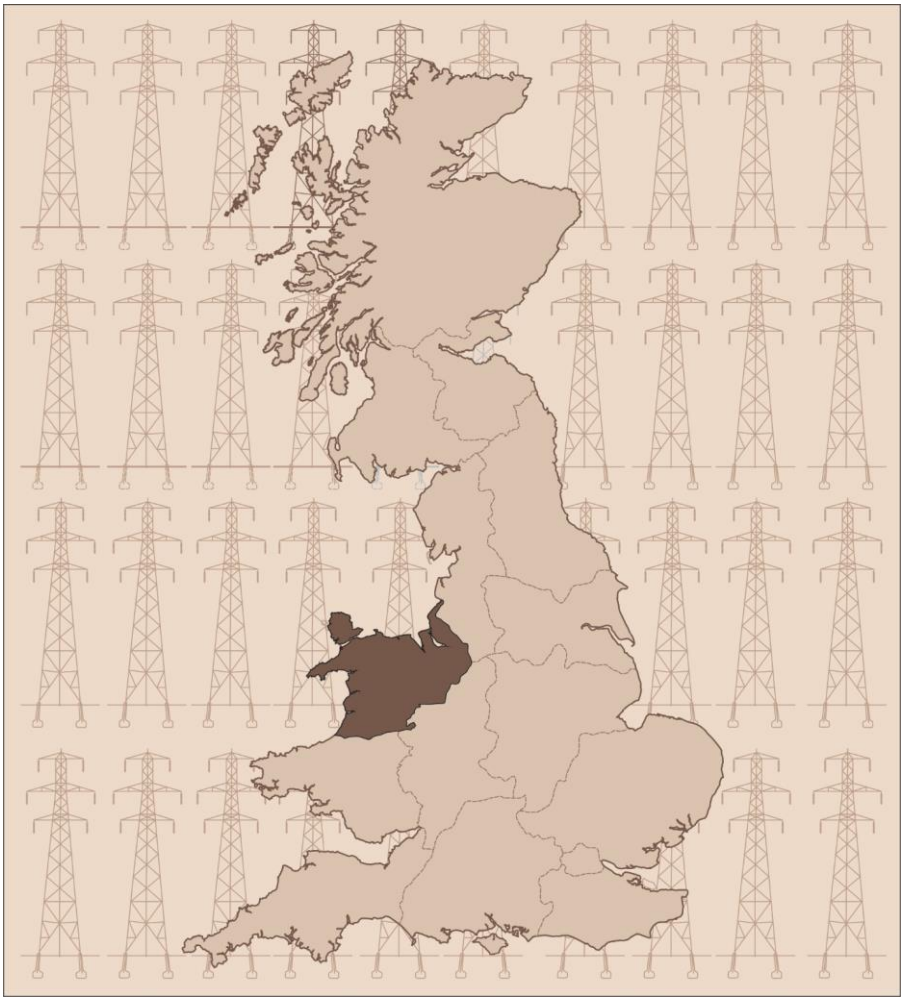

THE MERSEYSIDE AND NORTH WALES BOARD AREA

Regional and Local Electricity Systems in Britain

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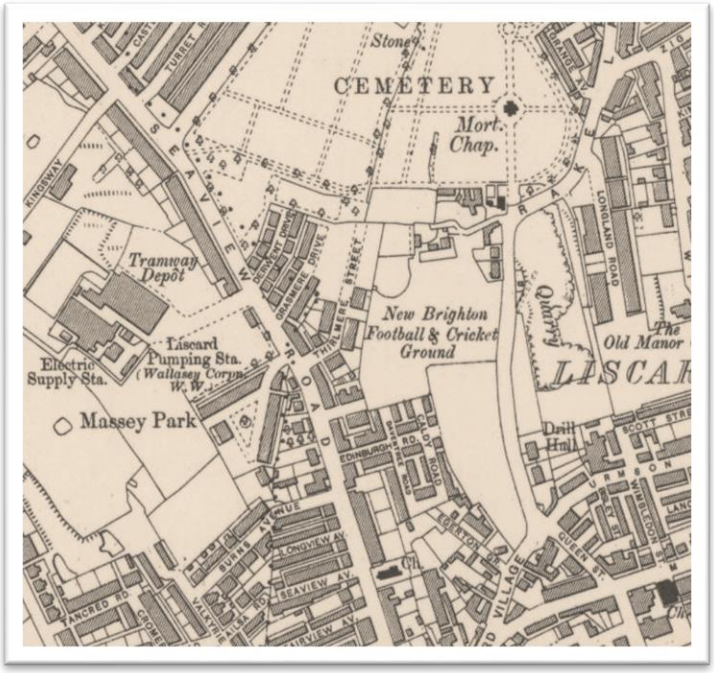

WALLASEY

Wallasey Urban District Council opened the Sea View Road power station in 1897. Electric tramway supply was added in 1902 and at the time this map was revised accounted for 64 percent of all electricity sales. A new power station in the docks area was completed in 1915 to serve the rapidly growing demand.

Ordnance Survey Six Inch Map, Cheshire VII. SE, 1909 (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 Merseyside and North Wales.

The Merseyside and North Wales 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. The Merseyside and North Wales Area, as defined at this time, had been part of the North West England and North Wales Electricity Scheme Area since 1928. The other part of this very large region became the North Western Electricity Board Area.

In detail the Merseyside and North Wales Electricity Board Area included the counties of Anglesey, Caernarvonshire, Denbighshire, Flintshire, Merionethshire, Montgomeryshire and parts of Cardiganshire, Cheshire, Lancashire (including Liverpool) and Shropshire.[2] The boundary lines drawn in 1947 continue to be entrenched in the distribution franchise area of the present day.

[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.

Constituents of the Merseyside and North Wales Electricity Board Area

When the Merseyside and North Wales Electricity Board began operations on 1 April 1948 it incorporated the services and areas of 31 local authorities and 8 companies as well as a Joint Electricity Authority.[3] The constituent areas varied enormously in size. The Electricity Distribution of North Wales and District Ltd covered about 1,500 square miles while the Bethesda Urban District occupied an area of a little over one square mile. Birkenhead Corporation's electricity department served an area of 62 square miles, considerably larger than the Birkenhead County Borough (13.5 square miles).

With an area of about 4,729 square miles and an estimated population of about 2.8 million, the Merseyside and North Wales Electricity Board Area covered every type of district from the sparsely populated parts of Snowdon to the densely settled areas of central Liverpool. The distinctive economic geography of the region resulted in a high proportion of industrial sales (52.3 percent) and a correspondingly low proportion of domestic sales (27.3 percent).

The dominance of the Liverpool electricity service area, with about one third of the Merseyside and North Wales Area's population, made the city the obvious location for the Board's head office. By 1952 the headquarters were settled in part of the Melias Building on Love Lane. In 1969 the Board moved to a new site on the outskirts of Chester.

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.

[3] Congleton which had been part of the North West Midlands JEA from the late 1920s was included in the Merseyside and North Wales area but later transferred to the Midlands Electricity Board.

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

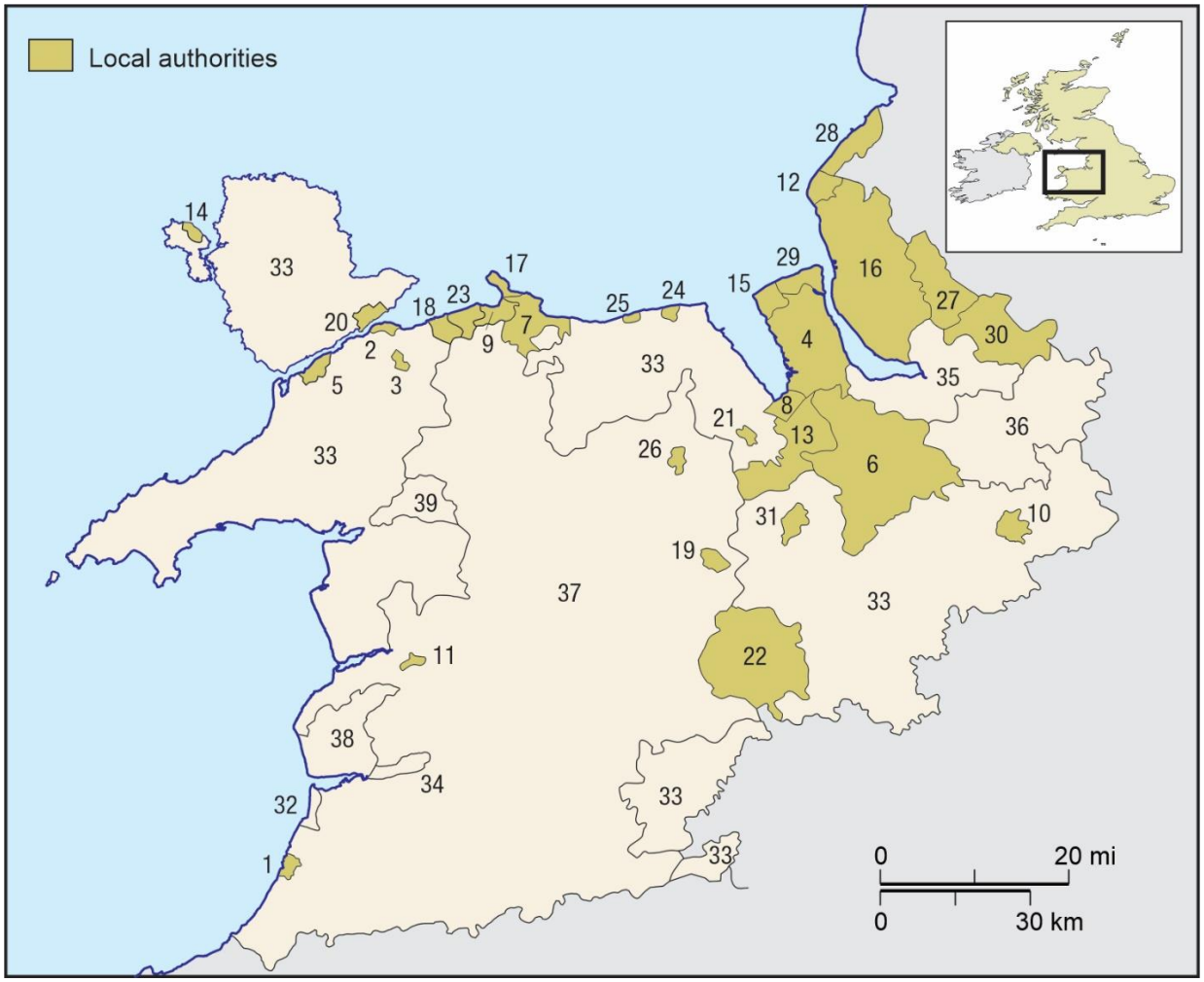

Figure 1 **CONSTITUENT AREAS OF THE MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD 1948.**

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.

Two of the applications in 1882 came from the Merseyside and North Wales area. Birkdale Local Board was granted an ELO but, since no action was taken, the Board of Trade revoked the Order in 1893. The Union Electric Light and Power Company's application for a franchise in Chester, however, "…was not considered as the provisions of the Act had not been complied with."[5]

[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.

Liverpool in the early 1880s was the setting for several early electricity projects. The Mersey Docks and Harbour Board had established a small generating set (made in France) in late 1877 and the new Picton Library Reading Room was lit by arc lamps when opened two years later. In a dispute over the cost of gas street lighting, the Corporation sent its city engineer G.F. Deacon to Paris in 1878 to report on the new lighting installed for the Exposition. His report prompted the Liverpool Electric Lighting Bill 1879 which, before approval, was considered in detail by a Parliamentary Select Committee.[6] The Act gave Liverpool Corporation powers to light streets by electricity and, although the subsequent contracts failed in their implementation, the local authority was supportive of other ventures.

Table 1 **MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD CONSTITUENT UNDERTAKINGS 1948.**

Map No.	Local Authorities		
1	Aberystwyth MB	**17**	Llandudno MB
2	Bangor MB	**18**	Llanfairfechan UD
3	Bethesda UD	**19**	Llangollen UD
4	Birkenhead MB	**20**	Menai Bridge UD
5	Caernarvon MB	**21**	Mold UD
6	Chester CB	**22**	Oswestry MB
7	Colwyn Bay MB	**23**	Penmaenmawr UD
8	Connah's Quay UD	**24**	Prestatyn UD
9	Conway MB	**25**	Rhyl UD
10	Crewe MB	**26**	Ruthin MB
11	Dolgelly UD	**27**	St Helens CB
12	Formby UD	**28**	Southport CB
13	Hawarden RD	**29**	Wallasey CB
14	Holyhead UD	**30**	Warrington CB
15	Hoylake UD	**31**	Wrexham MB
16	Liverpool CB		
Companies			
32	Borth & Ynyslas ES Co		
33	Electricity Distribution of North Wales & District Ltd		
34	Machynlleth ES Co		
35	Mersey Power Co		
36	Mid-Cheshire ES Co		
37	North Wales Power Co		
38	Towyn, Aberdovey & District ES Co		
39	Yale Electric Power Co		

Key to Abbreviations

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

[6] "Report of the Select Committee on schemes by local authorities for lighting by electricity," ***Parliamentary Papers*** 1878-79, HC 224, 313 pp. The work of this committee, chaired by Sir Lyon Playfair, prepared the ground for the 1882 legislation.

Two local consulting engineers, Arthur Bromley Holmes (1849-) and John Clough Vaudrey (1853-1937), established the Liverpool Electric Supply Co. in January 1883 and opened a generating station later in the year, with overhead wires to serve customers in part of the central city.[7] The venture succeeded and the company provided lighting and electrical service in the well publicised Liverpool Jubilee Exhibition 1886.[8] An Electric Lighting Order in 1889 gave the Company more powers and further Orders in 1890-91 and 1895 extended the service area to Toxteth Park and other parts of the city.

The Liverpool Electric Supply Co. showed that a viable and profitable electricity supply system could be developed. It was sold to the Liverpool Corporation in 1895-96 for £400,000, the assets including four power stations. Arthur Holmes served the city as electrical engineer from 1896 to his retirement in 1913. J.C. Vaudrey had earlier moved to Birmingham to become managing director and engineer of the newly established supply company in 1889. He also served as the first city electrical engineer from 1901 to 1903.

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 including the successful grant for the Liverpool company. In 1890 there were 161 applications of which five came from this region. Those from Birkenhead, Chester and Wrexham were successful, although the latter order for the Wrexham and District Electric Supply Co was revoked in 1896 for lack of action. The two applications from the House-to-House company for Bootle and Liverpool were rejected.

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 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.

The 17 local authorities were clear examples of local initiative in developing electric lighting and power. Liverpool County Borough (population 755,758 in 1911) was by far the largest of the local authorities. Penmaenmawr (population 4,042) was the smallest and at the time provided

[7] G. Woodward, "Electricity in Victorian Liverpool 1851-1901," ***Engineering Science and Education Journal***, Vol 1(4), 1992, pp.183-191.
[8] K.G. Beauchamp***, Exhibiting electricity*** (London: Institution of Electrical Engineers, 1997), pp.142-143.

only street lighting with current purchased from an outside source. Southport was the first town in the region to open a municipal system, in 1894. Liverpool Corporation bought out the private company in 1896 and them embarked on a large-scale programme of electrification including the earlier horse tram network.

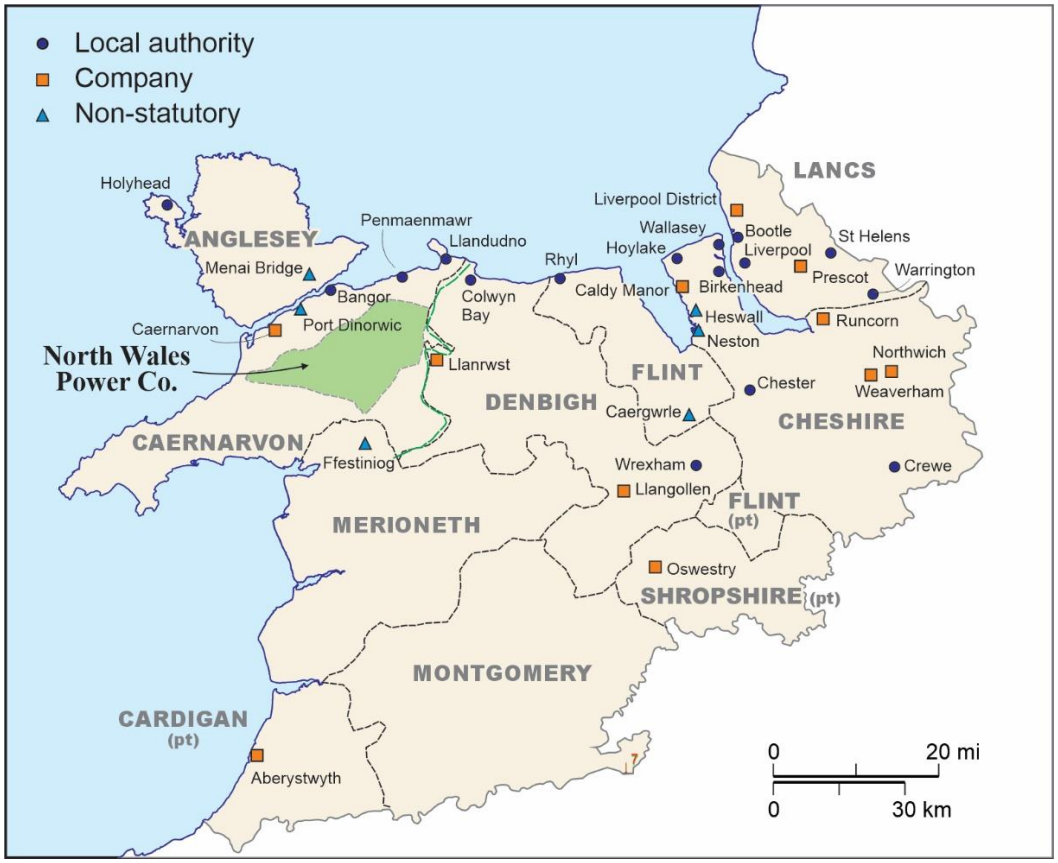

Figure 2 **ELECTRICITY UNDERTAKINGS IN MERSEYSIDE AND NORTH WALES c. 1912.**

Company undertakings in the region were mostly local in origin, the exception being Aberystwyth which was owned by London interests until taken over by the Borough Council in 1936.[9] Caddy Manor Estates had begun an exclusive residential development on the western shore of the Wirral Peninsula in 1905, was granted an ELO in 1908 and opened a small system the following year. Two industrial firms provided local electricity service. British Insulated Cables was very early in developing electricity supply to Prescot in 1891, adding further territory in Whiston later. In Runcorn-Widnes the Mersey Power Co. provided local service from the beginning of 1912. First registered in 1911, the Mersey was a subsidiary of the Salt Union, a large chemical producer which had surplus electricity at the time.[10]

[9] The franchises for Aberystwyth and Chiswick were obtained by the Bourne and Grant Electric Supply Co in 1893. This company was renamed Aberystwyth and Chiswick Electric Supply in 1898 and the Chiswick Electric Supply Corporation Ltd in 1904.When the two franchises expired after 42 years and were taken over by the local authorities, the company was wound up in 1936.

[10] J. Tulley, "Electrical supply and the borough council in Widnes, 1899-1911***," Transactions of the Historic Society of Lancashire and Cheshire***, Vol.138, 1988, pp.159-179. The paper illustrates very clearly the many obstacles to obtaining and implementing an Electric Lighting Order.

Table 2 **MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD AREA ELECTRICITY SUPPLY UNDERTAKINGS c.1912**

UNDERTAKING	*COUNTY*	*SUPPLY BEGAN*
Local Authorities		
Bangor	Caernarvon	1900
Birkenhead	Cheshire	1896
Bootle	Lancashire	1898
Chester	Cheshire	1896
Colwyn Bay	Denbigh	1907
Crewe	Cheshire	1900
Holyhead	Anglesey	1904
Hoylake	Cheshire	1901
Liverpool	Lancashire	1883[1]
Llandudno	Caernarvon	1898
Penmaenmawr	Caernarvon	1906
Rhyl	Flint	1901
St Helens	Lancashire	1896
Southport	Lancashire	1894
Wallasey	Cheshire	1897
Warrington	Lancashire	1900
Wrexham	Denbigh	1901
Companies		
Aberystwyth	Cardigan	1895
Birkdale	Lancashire	1902
Caergwrle	Flint	1909
Caernarvon	Caernarvon	1905
Caldy Manor	Cheshire	1909
Ffestiniog N/S	Merioneth	1902
Heswall N/S	Cheshire	1909
Liverpool District	Lancashire	1897
Llangollen	Denbigh	1904
Llanrwst	Denbigh	1899
Menai Bridge N/S	Anglesey	?
Neston N/S	Cheshire	
North Wales Power & Traction[2]	Caernarvon	1906
Northwich	Cheshire	1897
Oswestry	Shropshire	1895
Port Dinorwic	Caernarvon	1902
Prescot[3]	Lancashire	1891
Runcorn-Widnes[4]	Cheshire/Lancs	1912
Weaverham N/S?	Cheshire	?

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

Notes:

1. Municipal control from 1896.
2. Name changed to North Wales Power 1922.
3. Owned by British Insulated Cables.
4. System owned by Mersey Power Co.

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]

Electrification in the Merseyside and North Wales region around 1912 was still incomplete and mostly confined to major towns and some smaller places such as Port Dinorwic where local enterprise had developed a system. Significant towns without an electricity service included Bebington (population 15,064 in 1911), Ellesmere Port (10,366), Conway (6,392), and many small towns with around 5,000 populations such as Sandbach (5,723), Flint (5,472), and Connah's Quay (4,596). Only a small part of the region was covered by Electric Lighting Orders; most of the territory was still unclaimed.

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 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 systems became apparent to many larger undertakings after 1900 and in the search for economies of scale the introduction of more efficient prime movers became a priority. Liverpool, for example, adopted the AC (50 Hz) in 1903 so that the more distant parts of the city could be served economically. In the following year the first turbine unit (1600kW) was installed in the new Lister Drive No.2 station. St Helens followed a similar process, adding AC in 1910 when a 1,000kW turbine was introduced. Modernisation in St Helens increased the generating capacity from 1,700kW in 1909 to 7,200kW by late 1916.[11] Sales of electricity in the town grew from 2.6m kWh in 1909 to 6.5m kWh in 1916 and 13.5m kWh in 1919. Mixed AC/DC systems became increasingly common in the early 1920s as towns, such as those in North Wales, added AC from the power company. Conversion to a full AC system was a slow process, in the case of St Helens not completed until the mid-1950s.

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 most of the power required for operating dock gates and cranes was provided by hydraulic stations, the Mersey Docks and Harbour Board had many separate electric lighting plants. The Liverpool Hydraulic Co. provided a similar energy system in the warehouse district of the city. In the Garton docks the LNW Railway had an independent electricity system. Shipyards and graving docks had adopted electric power. Cammell Laird, for example, had a battery of Premier gas engines generating power. Processing industries based on imported raw materials also tended to be self-sufficient. Port Sunlight had electric lighting by 1891 and went through several stages of power station building. By 1949 the soap works station had a capacity

[11] "A modernised power station", ***The Engineer***, Vol.121, 1916, p.252

of 16,000kW.[12] The new Bowater paper mill at Ellesmere Port, opened in 1931, included a generating plant with a capacity of 15,000kW (similar in size to the Southport power station).

The chemical industry centred in Northwich, Runcorn, St Helens and Widnes was an early adopter of electricity. The Electro Chemical Co. which opened in St Helens in 1896 had two 500kW Parsons turbines.[13] In Runcorn the Salt Union completed a very large plant in 1911 and the surplus electricity formed the basis of the Mersey Power Co. which began public supply in Runcorn and Widnes in 1912.[14] A new station (25,000kW) was built by Mersey Power after the war adjacent to the earlier salt works.[15] Also at this time the United Alkali Co. completed a 12,000kW power station in Wines for its own use in the chemical works.[16]

Other industrial firms across the region were generating their own electricity. British Insulated Cables had established a power station by 1891 which also supplied Prescot and a wider area until taken over by the Liverpool Corporation in 1936.[17] The railway workshops in Crewe had independent facilities until the mid-1920s when North Wales Power supply was substituted. Vulcan motor works at Crossens on the northern edge of Southport included a powerhouse when opened in 1908. Aluminium smelting at Dolgarrog began shortly after with an initial capacity of 4,000kW powered by water turbines. The Dolgarrog power plant, later extended, was closely associated with North Wales Power.[18]

Wartime industrial demand in explosives production resulted in two significant power stations. –in World War I at Queensferry, later sold to Chester Corporation, and in World War II at Marchwiel, part of the very large Wrexham Royal Ordnance Factory.[19] This station was also transferred to the public system after the war.

Hotels were early in adopting electric lighting as one of the amenities of high-class hospitality. This was very evident in the coastal resorts of North Wales where public supplies began with the opening of the Llandudno municipal system in 1898. For establishments like the 70-room West End Hotel in Pwllheli which featured electric light in its advertising, private generation was the only course.[20] Although the Pwllheli Town Council had obtained an Electric Lighting Order in 1900, it failed to act and a public supply was delayed until the late 1920s.

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[12] The Institution of Mechanical Engineers held their annual summer meetings in Liverpool during 1891, 1909. 1934 and 1949. The ***Proceedings*** of those years include many detailed accounts of electricity generating facilities in the works visits.
[13] "The Electro-Chemical Company's works at St Helens", ***The Engineer*** Vol.81, 1896, pp.370-372.
[14] "New salt works in Cheshire", ***The Engineer*** Vol.112, 1911, pp.424-428.
[15] "New electric power station at Runcorn", ***The Engineer*** Vol 132, 1921, pp.584-588.
[16] "West Bank Dock electric generating station", ***The Engineer*** Vol.131, 1921, pp.148-150.
[17] For general background on the company, see: Gordon Read, "The BICC archive and artefact collection", ***Business History*** 58, 1989, pp.40-47.
[18] G. Woodward, "Hydroelectricity in North Wales 1880-1948", ***Transactions of he Newcomen Society*** 69 (1), 1998, pp.205-235.
[19] Wayne D. Cracroft, ***Dangerous energy: The archaeology of gunpowder and military explosives manufacture*** (Swindon: English Heritage, 2000).
[20] The hotel advertised in the Ward Lock Co's Illustrated Guide Books***, Isle of Man*** (London, c1904) p.35 in the "Hotel, Hydropathic Establishment and Boarding House Directory" section of the guide book.

Electric Tramway Systems in the Merseyside and North Wales Region[1]

	YEARS OPERATING	*ROUTE MILES*	*MAX NO. OF CARS*
Birkenhead Corporation	1901-1937	13.7	65
Chester Corporation	1903-1930	3.6	18
Liverpool Corporation	1898-1957	97.2	1,305
Liverpool & Prescot Co.	1902-1919	3.1	7
Llandudno & Colwyn Bay	1907-1956	8.4	39
St Helens & District Co.[2]	1899-1936	21.9	50
Southport Corporation[3]	1901-1934	17.3	54
Wallasey Corporation	1902-1933	12.0	77
Warrington Corporation	1902-1935	6.8	27
Waterloo & Great Crosby Co.[4]	1900-1925	2.6	16
Wrexham & District Co.	1903-1927	4.4	10

Eleven electric tramway systems were opened between 1898 and 1907. Six were owned and operated by local authorities.

Tramway electrification prompted the building of new power stations in Liverpool at Pumpfields and Lister Drive to meet the new power demands. In Birkenhead the Corporation Tramways Committee built its own power station on Craven Street behind the Light Committee's station facing Bentinck Street. The two stations were brought under common management in 1910. With the exception of Birkenhead, all the other systems drew current from general public supplies.

Tramway power supply was very important in the early years and ensured the viability of many public supply systems. In 1909, for example, tramway sales accounted for 64 percent of Wallasey Corporation's electricity sales. Tramway power supply as a proportion of total electricity sales was still significant in 1925/26. The trams in Llandudno accounted for 36.8 percent of the town's electricity sales while the larger tramway systems in Liverpool and Birkenhead represented 24.9 percent and 23.1 percent of total sales. Wallasey which had diversified was down to 14.9 percent.

Electric tramways provided fast, efficient and cheap urban transport and were very profitable before 1914. Motor bus competition after the war quickly ended the viability of the smaller systems.

From the 1890s Liverpool was a focus for electric railway development. The Liverpool Overhead Railway, opened in 1893, was built over the waterfront streets avoiding congested traffic on the ground. A decade later the Mersey Railway was electrified and in 1904 the Lancashire & Yorkshire Railway completed electrification of its long suburban line to Southport. Each of the railways had an independent power station. In 1923 the Formby power station was generating 33.3 million kWh (similar in output to the public system in St Helens) while the Birkenhead station of the Mersey Railway with 6.0 million kWh was producing at a similar rate to Chester's public system.

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[1] Compiled from Keith Turner, ***Directory of British Tramways***, Vols 2 & 3 (Stroud: The History Press, 2009, 2010).
[2] Taken over by St Helens Corporation, 1 October 1919.
[3] Includes the Southport Tramways Co. which also worked in Southport and Birkdale between 1901 and 1918.
[4] Worked by the Liverpool Overhead Railway company.
[5]The various electric railways were described in the Institution of Mechanical Engineers, ***Proceedings***, 1909.

Other large institutions of a different type were also introducing electric lighting. The North Wales Lunatic Asylum at Denbigh began its own generation in the late 1890s when accommodation and facilities were being extended.[21] Winwick Hospital near Warrington, opened in 1902 for the Lancashire Asylums Board, included a powerhouse from the outset and was an early adopter of Parsons turbines.[22]

Throughout the region country houses, estates and larger farms added electricity. Eaton Hall, the seat of the Dukes of Westminster, had its own power station by the mid-1890s.[23] In contrast, Knowsley Hall on the outskirts of Prescot was electrified in 1893 with a mains supply from British Insulated Cables.[24]

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 the electricity undertakings in the defined area were then invited to submit proposals for reorganisation schemes emphasising the technical, administrative and financial aspects of a JEA.

Two Electricity Districts were defined in July 1920 for the region: No. 5: Mersey and West Lancashire, and No. 6: North Wales and Chester (**Figure 3**). The long deliberations that followed illustrate the difficulties faced by the Electricity Commissioners in attempting to create Joint Electricity Authorities that would consolidate generation in a single regional entity.

Electricity generation in the Mersey and West Lancashire Electricity District was largely controlled by local authorities and dominated by Liverpool (population 805,000 in 1921). Longstanding differences and rivalries between Liverpool and the Wirral shores (principally Birkenhead and Wallasey) arose again with electricity supply. In the end these differences proved impossible to resolve despite "…the consistent effort of the Commissioners to remove the difficulties and to induce a spirit of goodwill."[25]

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[21] "The Asylum List" at: www.countyasylums.co.uk

[22] Tests of the 2x100kW turbines at Winwick were noted in C.A. Parsons and G.A. Storey, "Trials of steam turbines for driving dynamos", ***Proceedings of the Institution of Mechanical Engineers*** 1901, p.801.

[23] Howard Clayton, ***The Duffield Bank and Eaton Railway*** (Oakwood Press, 1968), p.54.

[24] Gordon Read, "The BICC archive and artefact collection", ***Business History*** 58, 1989, p.42.

[25] A general comment made about the mistrust and political feeling in some districts that militated against cooperation. See ***Fourth Annual Report of the Electricity Commissioners*** 1923-1924, p.15.

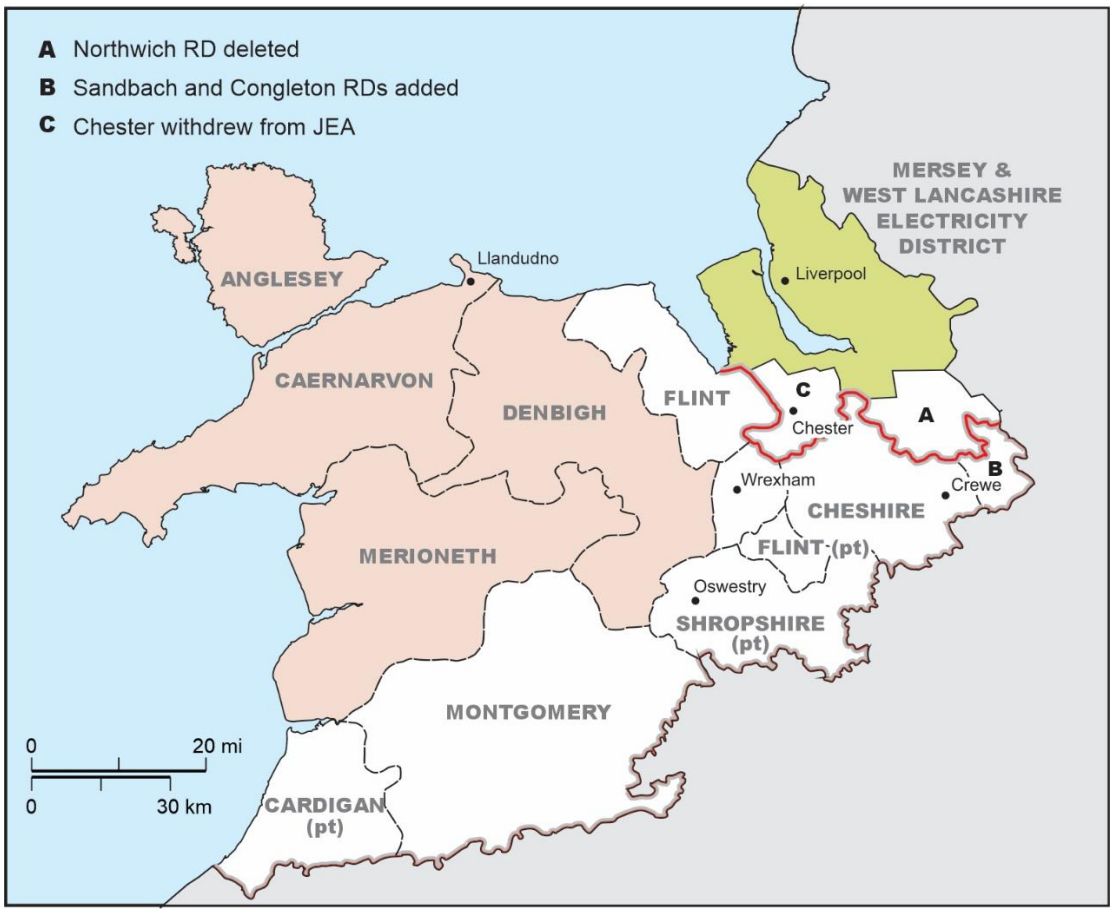

Figure 3 **NORTH WALES AND SOUTH CHESHIRE JOINT ELECTRICITY AUTHORITY 1920-1923.**

Two schemes for reorganisation were considered at the public inquiry held In Liverpool during January and March 1921. Liverpool Corporation proposed a new station on the riverfront and a transmission system linking the city with the Wirral, St Helens and Warrington. A scheme put forward by Wallasey, supported by Birkenhead, emphasised the new Wallasey power station and a separate JEA for the Wirral peninsula. A further inquiry, held in Liverpool during May 1923, was unable to resolve the differences and the meeting adjourned without any final decisions being made. Shortly afterwards, Liverpool resumed expansion of the Lister Drive complex, abandoning earlier plans for a riverfront location.

The North Wales and Chester Electricity District boundaries were drawn to cover a wide area. It was the largest of all the Electricity Districts and seemingly designed to emphasise hydroelectric power.[26] Crewe, dominated by the railway workshops, was the largest potential market. North Wales Power, previously confined to Snowdonia, now had much broader ambitions and with the backing of Aluminium Ltd at Dolgarrog had the largest hydroelectric generating capacity outside Scotland. Local authorities were generally small and scattered; only Chester and Crewe had populations of about 40,000.

[26] The Water Power Resources Committee, appointed in 1918 by the Board of Trade, was strongly in favour of developing hydroelectric power. Sir John Snell was chair of the Committee and also chaired the Electricity Commissioners.

Two schemes were considered at the inquiry held in Llandudno in February 1921. North Wales Power proposed a new hydro station at Maentwrog and a regional transmission system extending eastwards to Crewe. Chester Corporation's scheme included the use of the former Ministry of Munitions steam station at Queensferry and a series of low-level hydro plants along the River Dee.[27] The Power Company's scheme was preferred by the Commissioners and a draft order for the JEA was prepared. A second inquiry opened in Llandudno in November 1922. Chester Corporation strongly objected to the proposals and withdrew from the deliberations. The Power Company scheme went ahead as proposed and the district was renamed North Wales and South Cheshire. An order for the establishment of a Joint Electricity Authority under this name was prepared by the Commissioners on 29 June 1923, confirmed by the Minister of Transport on 30 July, and affirmative resolutions were passed by both Houses of Parliament on 1 August.[28]

The North Wales and South Cheshire was the first Joint Electricity Authority to be constituted under the 1919 Act. Arthur Hewitt of Llandudno was appointed chairman and Col. F.A. Cortez-Leigh (chief electrical engineer of the LMS Railway) served as vice-chairman. At the first meeting of the JEA held in Llandudno Town Hall on 12 October 1923, the most important action was to transfer all rights of distribution in the area to the North Wales Power Co. From this time until 1948 the JEA was effectively the power company. With the financial reinforcement of a £1.7 million low-interest loan under the Trade Facilities Act 1921, the North Wales Power Co. began work on the Maentwrog hydro-electric plant and the major transmission lines eastwards to Crewe.[29]

Figure 4 shows the evolution of the transmission network of North Wales Power Co. from 1921 to 1928 when the initial JEA plans were completed. During this period the service area of the company grew from around 150 square miles in Snowdon to 4,000 square miles in the whole district. Later, transmission lines were extended to Holyhead and southwards from Legacy, Wrexham to Oswestry and Newtown. Aberystwyth was still unconnected to the regional system in 1940. The boundary lines fixed in the 1923 order served as the southern and eastern limits of the 1948 Electricity Board.

New electricity undertakings formed after 1912 included five local authorities:

Betts-y-Coed	1914
Conway MB	1923
Formby UD	1924
Connah's Quay UD	1925
Hawarden RD	1925

[27] John B.C. Kershaw, "Actual and projected water-power developments in North Wales," ***The Engineer,*** Vol. 131, 1921, pp.195-198.

[28] The final scheme was described, with a map, in the ***Fourth Annual Report +of the Electricity Commissioners 1923-1924***, pp.19-22.

[29] An appendix in the Electricity Commissioners ***Annual Report*** from 1924/5 to 1935/6 outlined development of the scheme.

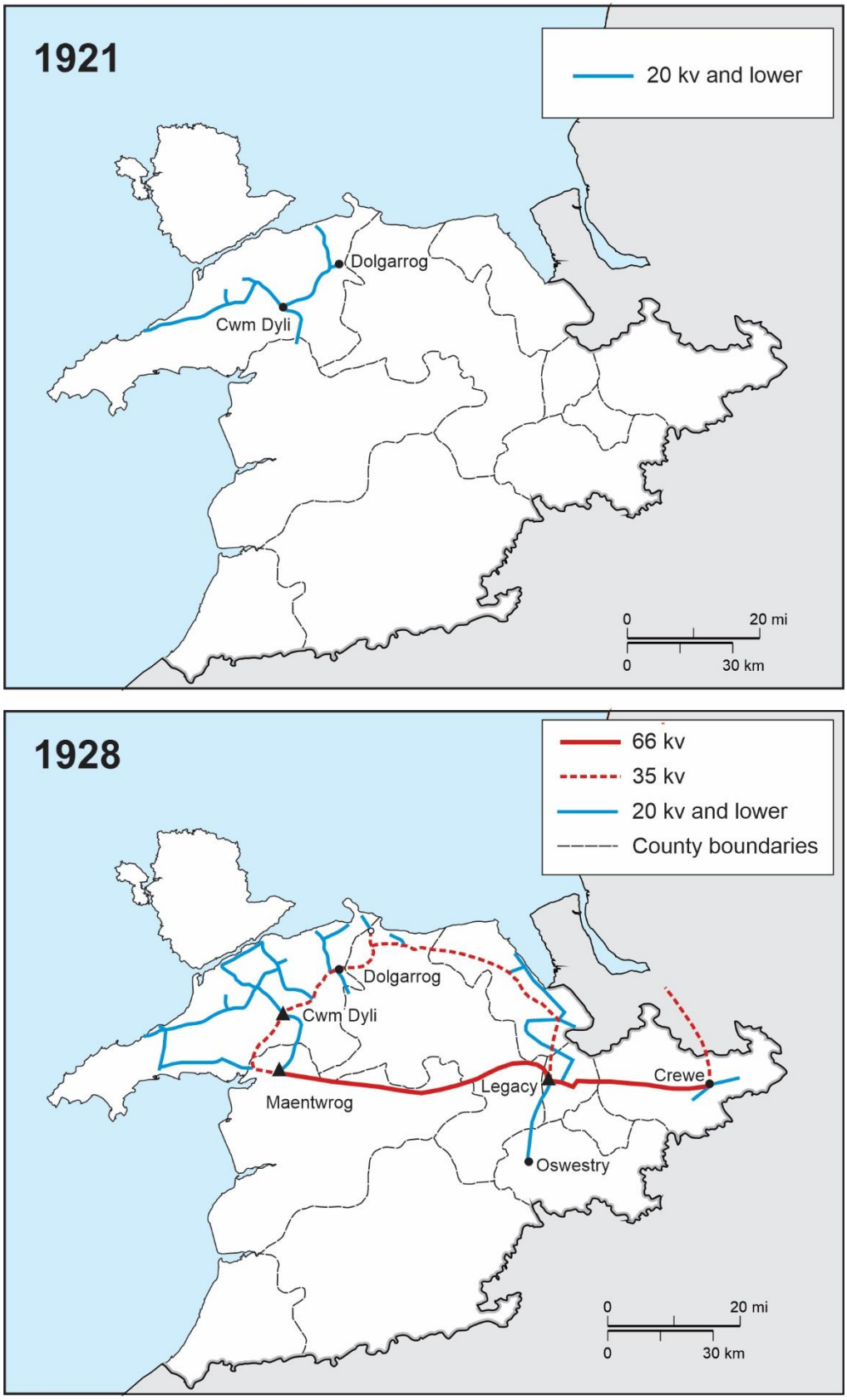

Figure 4 **GROWTH OF NORTH WALES POWER CO. TRANSMISSION NETWORK.**

Formby initially took a bulk supply from the adjacent LMS Railway power station. Conway, Connah's Quay and Hawarden were supplied by North Wales Power Co.

There were also three new company formations: Ruthin (1915), the Hightown Gas & Electric Co. in Crosby, and the Castner-Keller Alkali Co. which supplied part of the Weston area of Runcorn.

The Mersey Power Co. expanded after 1912, especially after the completion of the new Percival Lane power station, adding areas in Wirral notably Ellesmere Port in 1922.[30]

The 36 undertakings in 1925/26 (**Table 3**) operated a variety of systems. DC was still the most common, with 14 systems, and 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. Most of the larger places that had begun with DC had added AC to be able to serve the suburban areas. All the AC systems worked at a frequency of 50 cycles (Hz) with the exception of Formby, which, drawing supply from the LMS railway, worked at 25 Hz.

The data on generating capacity show that all but eight of the 36 undertakings generated their own power. Many stations were very small; only eight had a capacity larger than 5,000kW. Steam turbines were dominant in the larger stations and varied in size from 12,500kW in Liverpool and the Mersey Power Co. at Runcorn to one of 400kW at Birkenhead. Older reciprocating steam engines were still common in small centres such as Crewe, Hoylake, Llandudno and Wrexham. The Mid-Cheshire Co. in Northwich was unusual in using gas engines. Diesel engines were used for supplementing power in smaller places.

Statistics on electricity consumption per head of population reveal major contrasts among electricity undertakings. Nine places exceeded 100.0kWh per person, Mersey Power Co. at 494.4kWh being particularly high for the time. Each place had a distinctive market profile reflecting the local economic and social geography. Chester's profile in 1925/26 consisted of 60.4 percent of sales in the lighting segment, 7.4 percent in public lighting, 8.0 percent for the tramways and 24.2 percent in power. Two towns, Holyhead and Llandudno with similar-sized populations (around 12,000) had very different market profiles. Holyhead was dominated by lighting at 63.2 percent while in Llandudno the lighting, traction and power sales were about one third each of total sales. Annual per capita sales in Holyhead amounted to only 18.5kWh while sales in Llandudno had reached 206.7kWh per person.

Electrification and extension of supply areas were given a new impetus following the Weir Report (1925),[31] the Electricity (Supply) Act 1926 and the formation of the Central Electricity Board in 1927.

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[30] Peter J. Aspinall and Daphne Hudson, ***Ellesmere Port: The making of an industrial borough*** (Borough of Ellesmere Port-Neston-South Wirral, 1982), p.193.

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

Table 3 **MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD AREA ELECTRICITY SUPPLY UNDERTAKINGS 1925/26.**

UNDERTAKING	*COUNTY*	*SYSTEM*	*GENERATING CAPACITY kW*	*PER CAPITA CONSUMPTION kWh*
Local authorities				
Bangor MB	Caernarvon	AC/DC	380	52.0
Betts-y-Coed UD	Caernarvon	AC	80	62.2
Birkenhead CB	Cheshire	AC/DC	425	71.7
Caernarvon MB	Caernarvon	DC	260	43.5
Chester CB	Cheshire	AC/DC	6,435	91.6
Colwyn Bay & Colwyn UD	Denbigh	AC/DC	-	63.6
Connah's Quay UD	Flint	AC	-	6.7
Conway MB	Caernarvon	AC	-	36.4
Crewe MB	Cheshire	DC	1,300	38.4
Formby UD	Lancashire	AC	-	84.1
Hawarden RD	Flint	AC	-	0.8
Holyhead UD	Anglesey	DC	253	18.5
Hoylake & W. Kirby UD	Cheshire	AC	1,425	63.8
Liverpool CB	Lancashire	AC/DC	78,540	178.8
Llandudno UD	Caernarvon	DC	600	206.7
Menai Bridge UD	Anglesey	AC	-	16.6
Penmaenmawr UD	Caernarvon	AC	-	8.8
Rhyl UD	Flint	DC	295	45.0
St Helens CB	Lancashire	AC/DC	17,500	308.1
Southport CB	Lancashire	AC/DC	9,000	95.7
Wallasey CB	Cheshire	AC/DC	16,000	178.1
Warrington CB	Lancashire	AC/DC	18,000	176.3
Wrexham MB	Denbigh	AC/DC	1,050	74.4
Companies				
Aberystwyth[a]	Cardigan	DC	695	40.2
Birkdale District ES Co	Lancashire	DC	1,270	63.4
Caldy Manor Estate Ltd	Cheshire	DC	53	128.3
Hightown G&E Co	Lancashire	DC	-	40.4
Llanrwst ES Co	Denbigh	DC	169	23.8
Mersey Power Co	Cheshire/Lancs	AC	26,500	494.4
Mid-Cheshire ES Co	Cheshire	AC/DC	680	35.0
North Wales Power Co	Caernarvon	AC	5,500	..
Oswestry EL&P Co	Shropshire	DC	486	30.2
Port Dinorwic[b]	Caernarvon	DC	120	..
Prescot[c]	Lancashire	AC/DC	4,125	469.5
Runcorn[d]	Cheshire	DC	..	325.6
Ruthin ES Co	Denbigh	DC	124	38.4

Notes:

[a] Chiswick Electricity Supply Corporation Ltd.

[b] G.W.D. Assheton Smith and successors.

[c] British Insulated Cables Ltd.

[d] Castner-Keller Alkali Co. supply to Weston in Runcorn RD.

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

After 1925/26 the remaining areas previously unclaimed by electricity undertakings were quickly taken up. Liverpool extended outwards into the West Lancashire Rural District. Birkenhead by agreement with the Wirral Rural District expanded to serve the rest of the peninsula. The newly incorporated Electricity Distribution of North Wales and District Ltd covered all remaining parts of South Cheshire and north Shropshire. Most of the new local authorities and companies listed in **Table 4** were filling gaps in North Wales left by the larger organisations. Prestatyn Urban District, a developing small resort, began electricity supply in 1927. The Machynlleth Electric Supply Co. began in 1933 to serve that small town (population 1,900). The Yale Electric Power Co, a non-statutory company that had provided lighting in Ffestiniog UD from 1902, was finally "legitimised" by Special Order in 1934.

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.[32] The North West England and North Wales Electricity Scheme was adopted by the Central Electricity Board in October 1928, tenders were advertised, contracts made, and construction work began.

Only the northeastern part of the Merseyside and North Wales region was covered by the national grid. A 132kv circuit linked Liverpool with Penwortham (Preston) and Warrington where connections were made with lines to Manchester, Runcorn and Crewe and on to the Midland region. Birkenhead and Wallasey were connected by cables in the Mersey tunnel to Liverpool. Chester was joined to the grid by a lower-voltage 33kv line. No 132kv lines were built in North Wales; the existing network of the power company had sufficient capacity.

The national grid was designed to connect "selected" power stations. These were generally the largest and most efficient generating plants which also had some potential for expansion. Seven stations in the region were on the selected list in 1934: Clarence Dock and Lister Drive in Liverpool. Percival Lane, Runcorn, St Helens, Southport, Wallasey and Warrington. Clarence Dock, commissioned in 1931, was the largest station and designed to cover the regional base load. The hydro stations of North Wales Power, although not designated as selected stations, were operated as part of the regional system.

When trading began on 1 January 1934, the grid had added a new layer to the complex of undertakings which operated the electricity supply system. The East Didsbury, Manchester grid control office of the Central Electricity Board now managed the flows of power on the transmission lines and directed the hour-to-hour operation of the selected power stations. These stations, such as the one in Wallasey, remained in the ownership and management of the Corporation but the daily operation was now directed from Manchester. Planning for the future became increasingly centralised, particularly from London.

[32] ***Nineth Annual Report of the Electricity Commissioners 1928-1929*** (London: HMSO, 1929), pp.9-11.

Table 4 **MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD AREA ELECTRICITY SUPPLY UNDERTAKINGS 1935/36.**

UNDERTAKING	*SYSTEM*	*GENERATING CAPACITY kW*	*PER CAPITA CONSUMPTION kWh*
Local Authorities			
Aberystwyth MB	DC	800	112.7
Bangor MB	AC/DC	-	173.8
Bethesda UD	AC	-	62.7
Betts-Y-Coed UD	AC	80	99.7
Birkenhead CB	AC/DC	3,550	263.4
Caernarvon MB	AC	-	207.1
Chester CB	AC/DC	6,135	270.8
Colwyn Bay MB	AC/DC	-	185.6
Connah's Quay UD	AC	-	51.5
Conway MB	AC	-	135.0
Crewe MB	AC/DC	1,300	96.9
Dolgelly UD	AC	175	23.3
Formby UD	AC	-	214.1
Hawarden RD	AC	-	92.6
Holyhead UD	AC/DC	-	66.3
Hoylake & West Kirby UD	AC	-	364.4
Liverpool CB	AC/DC	199,500	367.0
Llandudno UD	AC/DC	600	369.7
Llanfairfechan UD	AC/DC	-	73.4
Llangollen UD	?	-	..
Menai Bridge UD	AC	-	65.5
Mold UD	AC	-	83.8
Oswestry MB	AC/DC	80	91.9
Penmaenmawr UD	AC	-	107.6
Prestatyn UD	AC	-	153.2
Rhyl UD	DC	295	151.4
Ruthin MB	DC	345	34.2
St Helens CB	AC/DC	24,750	483.6
Southport CB	AC/DC	17,740	289.7
Wallasey CB	AC/DC	28,500	310.2
Warrington CB	AC/DC	19,250	391.0
Wrexham MB	AC/DC	900	173.5
Companies			
Birkdale & District ES Co	AC/DC	1,270	153.9
Borth & Ynyslas ES Co	DC	76	25.1
Electricity Distribution Of North Wales	AC	-	40.3
Machynlleth ES Co	AC	159	46.4
Mersey Power Co	AC	37,500	501.2
Mid-Cheshire ES Co	AC/DC	-	142.1
North Wales Power Co	AC/DC	47,500	..
Prescot (British Insulated Cables)	AC/DC	6,135	748.1
Towyn, Aberdovey & District	AC	203	..
Yale EP Co (Ffestiniog)	DC	585	..

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

Table 4 shows the situation in 1935/36 when 42 undertakings were in operation. Over the previous decade many changes had taken place. One significant shift was the decline in the number of wholly DC systems (from 14 to 4). Interconnection between undertakings, which had been rare in the early 1920s (Wallasey-Birkenhead was an exception), was now normal practice. As a result, many small stations had been shut down.

Generating technology emphasised economies of scale with larger units. Liverpool had turbine units of 50,000kW at Clarence Dock and 25,000kW at Lister Drive. The new units brought major reductions in coal consumption. Clarence Dock consumed only 1.13lbs of coal for each kilowatt generated and the new section 3 at Lister Drive only 1.50lbs. The latter figure was very much lower than the 5.14lbs per kilowatt in the older sections of the plant. Condensing efficiency at the new Lister Drive section had also been improved by the building of reinforced concrete cooing towers, the first in Britain. Waterpower generation in the region had also been increased at North Wales Power, from a capacity of 5,500kW in 1925/6 to 44,700kW a decade later.

Rationalisation of generation and interconnection of undertakings all contributed to reducing the cost of electricity. Other factors such as the growth of radio broadcasting and lower prices for small appliances helped to boost electricity consumption. By 1935/36 there were 23 places in the region with per capita consumption levels above 100kWh, ranging from 748.1kWh at Prescot to 107.6kWh at Penmaenmawr.

The growth of electrification, especially in the lighting segment, may be illustrated by the case of Chester. Total electricity sales grew from 5.72million kWh in 1925/26 to 21.04m kWh a decade later. The lighting segment that included domestic uses expanded from 3.45m kWh to 15.13m kWh. Over the same period, per capita consumption in Chester rose from 91.6kWh to 270.8kWh.[33]

The ten companies in the region were controlled by a variety of interests (**Table 5**). British Electric Traction owned the Birkdale undertaking--a residual from the sale of the tramway interests to Southport Corporation in 1918. British Power & Light (1929) Ltd controlled North Wales Power and Electricity Distribution of North Wales and District Ltd. Mersey Power and the Mid-Cheshire company were owned by regional interests.[34] The Prescot undertaking was owned by British Insulated Cables which had its manufacturing base in the town. All the other companies were small and almost entirely local in ownership and control. The corporate structure was much simpler than in the southern regions of the country.

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.

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[33] Chester Corporation was particularly active in rural electrification. Sydney Ernest Britton (1874-1946) managed the Electricity Department from 1904 to his death in 1946. His work is noted in the Victoria County History, ***Chester***, Vol. 5, part 2 (2005). See also "Rural electrification at Chester", ***The Engineer*** Vol.145, 1928, pp.649-650.

[34] Both companies had expanded in the 1920s from a small urban base. See also "The Mid-Cheshire electricity scheme", ***The Engineer*** Vol.144, 1927, pp.588-589.

Table 5 **MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD AREA CORPORATE STRUCTURE OF ELECTRICITY HOLDING COMPANIES 1934/35.**

1. British Electric Traction Co.	1.1 Birkdale & District ES Co
2. British Power & Light Corporation	2.1 Electricity Distribution of North Wales and District 2.2 North Wales Power Co
3. Edmundson's Electricity Corporation Ltd	3.1 Ruthin ES Co

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

The McGowan Report published in May 1936[35] 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 32 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 1937[36] was met with strong opposition and more pressing issues of the time meant that reorganisation of distribution was set aside.

Demand for electricity, especially by industrial users, grew rapidly after 1936 with rearmament and then the war effort. There were major extensions at Clarence Dock, Liverpool (adding three 50,000kW generators) and Warrington. One new power station, Percival Lane B at Runcorn (30,000kW units), was commissioned 1939-40.

Table 6 lists the various undertakings that were consolidated between 1922 and 1948. Bootle Corporation and Betts-y-Coed UD were the only local authorities to be amalgamated. The resistance of local authorities to any loss of independence was a powerful force against all pressures for amalgamation.

Table 6 **MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD AREA CONSOLIDATIONS TO 1948.**

UNDERTAKING	***YEARS IN OPERATION***	***NEW OWNER***
Bootle Corporation	1898-1922	Liverpool Corporation
Liverpool District Co	1897-1922	Liverpool Corporation
Weaverham Co	1913-1924	Mid-Cheshire Co
Hightown Gas & Electric	c1920-1927	Liverpool Corporation
Weston, Runcorn (Castner-Keller)	c1911-1929	Mersey Power Co
Caldy Manor Estate	1909-1934	Hoylake & West Kirby UD
Port Dinorwic	1902-1934	North Wales Power
Llanrwst El&P Co	1899-1935	North Wales Power
Prescot (British Industrial Cables)	1891-1936	Liverpool Corporation
Betts-Y-Coed UD	1914-1939	North Wales Power
Birkdale & District ES Co	1902-1941	Southport Corporation

[35] 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.
[36] Ministry of Transport, ***Electricity Distribution: Outline of Proposals*** (London: HMSO, 1937).

III Nationalisation

After three decades of discussion, the whole organisation of electricity was restructured following the Electricity Act 1947. From 1 April 1948, the Merseyside and North Wales Electricity Board took over the assets of 31 local authorities and 8 companies (Figure 1).[37] The generating stations and transmission lines of the Central Electricity Board were transferred to the British Electricity Authority.

Electricity Distribution

The Merseyside and North Wales Electricity Board was responsible for integrating the 39 undertakings. Systems had to be standardised and the multiplicity of tariffs reduced. For administrative purposes, the Board area was subdivided five sub-areas and 19 districts.[38] Initially many of the districts tended to reflect the pre-nationalisation company and municipal areas.

Figure 5 **MERSEYSIDE AND NORTH WALES ECLECTRICITY BOARD AREA, 1957.**

Figure 5 shows the geographical organisation in 1957 when there were four sub-areas and 18 districts. One notable feature is the network of 70 service centres where consumers could pay

[37] Ten non-statutory undertakings were also taken over in 1948. See British Electricity Authority, ***First Annual Report 1948-49*** (HC 336), Appendix 38, p.307.

[38] Merseyside and North Wales Electricity Board, ***First Annual Report 1948-49*** (HMSO, 1949). Parliamentary Paper, Session 1948-49, HC 345.

their bills and purchase appliances.[39] These service centres were an important and profitable part of the Board's business.

Postwar economic development brought new demands for industrial supply especially in Merseyside. The Ministry of Supply and its successor, the UK Atomic Energy Authority, was a large consumer of power at the new establishments at Capenhurst and Risley. Suburban growth, such as the expansion of Kirkby from a population of 3,145 in 1951 to 52,207 in 1961, all contributed to the rising demand for electricity.

Over the decade 1948/9 to 1958/9, total sales of electricity in the Merseyside and North Wales Electricity Board area grew from 2,485m kWh to 5,061m kWh. The number of consumers expanded from 632,000 to 905,000 over the same period. Employees of the Board increased from 6,290 in March 1949 to 8,464 a decade later.

Electricity Generation and Transmission

Table 7 ***BRITISH ELECTRICITY AUTHORITY POWER STATIONS IN THE MERSEYSIDE AND NORTH WALES DIVISION 1948/49.***

POWER STATION	*CAPACITY kW*	*TYPE[1]*
Clarence Dock	257,000	S
Percival Lane B	90,000	S
Lister Drive	66,750	S
Warrington	60,000	S
Percival Lane A	25,000	S
Maentwrog	24,000	H
St Helens	24,000	S
Wallasey	22,500	S
Dolgarrog	17,700	H
Southport	17,250	S
Cwm Dyli	6,500	H
Queensferry	5,500	S
Aberystwyth	3,070	I
Crewe	1,230	S
Birkdale	1,140	I
Wrexham	783	S
Dee Hydro	635	H
Ffestiniog	589	H
Towyn	550	I,H
Machynlleth	518	I,H
Dolgelly	148	I,H
	637,363	

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

The Merseyside and North Wales 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

[39] ***Electricity Supply Handbook 1958*** (London: Electrical Times, 1958), pp.126-131.

generating stations and their workforces, to modernise and standardise operations, and to expand capacity to meet the rapidly growing demand.

Table 7 lists the 21 power stations in the new organisation. They varied in size from large turbine-powered stations at the top to small diesel-engined and hydro units at the bottom. A comparison with Table 4 shows that most of the growth in capacity after 1935/36 had been concentrated at three selected stations—Clarence Dock, Percival Lane where a new B station had been built, and Warrington.

Table 8 **CENTRAL ELECTRICITY GENERATING BOARD POWER STATIONS IN THE MERSEYSIDE AND NORTH WALES AREA 1958/59.**

POWER STATION	***Capacity kW***	***Type[1]***
Clarence Dock	370,000	S
Ince	260,000	S(o)
Bromborough	210,000	S(o)
Connah's Quay	180,000	S
Bold A	128,000	S
Percival Lane B	90,000	S
Warrington	90,000	S
Bold B	60,000	S
Lister Drive	50,750	S
Dolgarrog	27,700	H
Percival Lane A	25,000	S
St Helens	24,000	S
Maentwrog	24,000	H
Wallasey	22,500	S
Southport	17,250	S
Marchwiel	12,410	S
Cwm Dyli	6,500	H
Aberystwyth	4,920	I
Machynlleth B	4,258	I
Towyn	950	I
Ffestiniog	589	H
Birkdale	500	I
Machynlleth A	250	I,H
Dolgelly	148	H,I
	1,609,725	

Notes:
1. S – Steam; (o)--oil-fired; H—Hydro-electric; I – Internal combustion (diesel).
Source: Compiled from Central Electricity Generating Board, ***Annual Report 1958-59***, Appendix 1.

Five new stations were commissioned after the war: Bromborough (1951) begun by Birkenhead Corporation; Bold A (1953) partly planned by St Helens Corporation; and Connah's Quay (1953) partly planned by Chester Corporation. The station at Ince (1954) was designed by the British Electricity Authority to cope with the high power demands of the Capenhurst nuclear fuel plant.[40] Bold A station was an early example of a pit-head location with a conveyor link to the

[40] "Ince power station", ***The Engineer***, Vol.204, 1957, pp.566-568.

nearby redeveloped colliery. The adjacent Bold B, where the first unit was commissioned on 30 March 1959, completed the postwar plans for the region.

Table 8 illustrates the development since nationalisation. Five new stations had been commissioned, Clarence Dock had been extended by a further 100,000kW and three old stations had ben closed. Marchwiel, near Wrexham, was taken over from the Ministry of Supply in the early 1950s. In the more distant parts of the region, large diesel generating sets had been added at Aberystwyth and Machynlleth to reinforce local supplies.

The original grid transmission system had been extended during the war (**Figure 6**). New power demands from the Shotton steel works and the aircraft factory at Broughton showed the need for reinforcement in the Wirral area. A new line from Barton power station to Knutsford was also built during the war. In the late 1950s a 132kv line was erected across North Wales from Connah's Quay to Bangor while supplies to Crewe were reinforced by new construction.

The Merseyside and North Wales Division was amalgamated with the North Western Division from 1 April 1954 as "an administrative experiment". The offices at Clarke Gardens, Woolston, Liverpool were closed and all work was moved to East Didsbury, Manchester. This experiment formed the basis of a more general reorganisation, regrouping divisions into larger regions, which began with the formation of the Central Electricity Generating Board in 1958.

The move to a regional organisation partly reflected the planning for a more integrated national system, with much larger coal-fired stations, new generating technology in the form of nuclear reactors, and a high-capacity 275kv Supergrid transmission system (later raised to 400kv).

Development of new power resources became more difficult after the war as new legislation such as the Town and Country Planning Act 1947 and the National Parks Act 1949 added more public consultation and scrutiny. Hydro schemes proposed for Snowdonia were particularly controversial. Nearly a decade later, plans for a 470,000kW nuclear station at Trawsfynydd (using the earlier Maentwrog reservoir for cooling water) caused much debate.[41]. By 1959 construction was underway at Ffestiniog for a pumped storage hydro-electric station (390,000kW) and a conventional hydraulic plant at Rheidol (50,000kW). At this time the 275kv grid was also being extended from Carrington, Manchester to Connah's Quay and on to Trawsfynydd.

During the first decade of nationalisation the generating capacity in the region had been raised from 637,363kW to 1,609,725kW. The grid system had also been extended over more of the service area.

[41] John Sheail, ***Power in Trust: The environmental history of the Central Electricity Generating Board*** (Oxford: Clarendon Press, 1991), pp.78-88, 142-148.

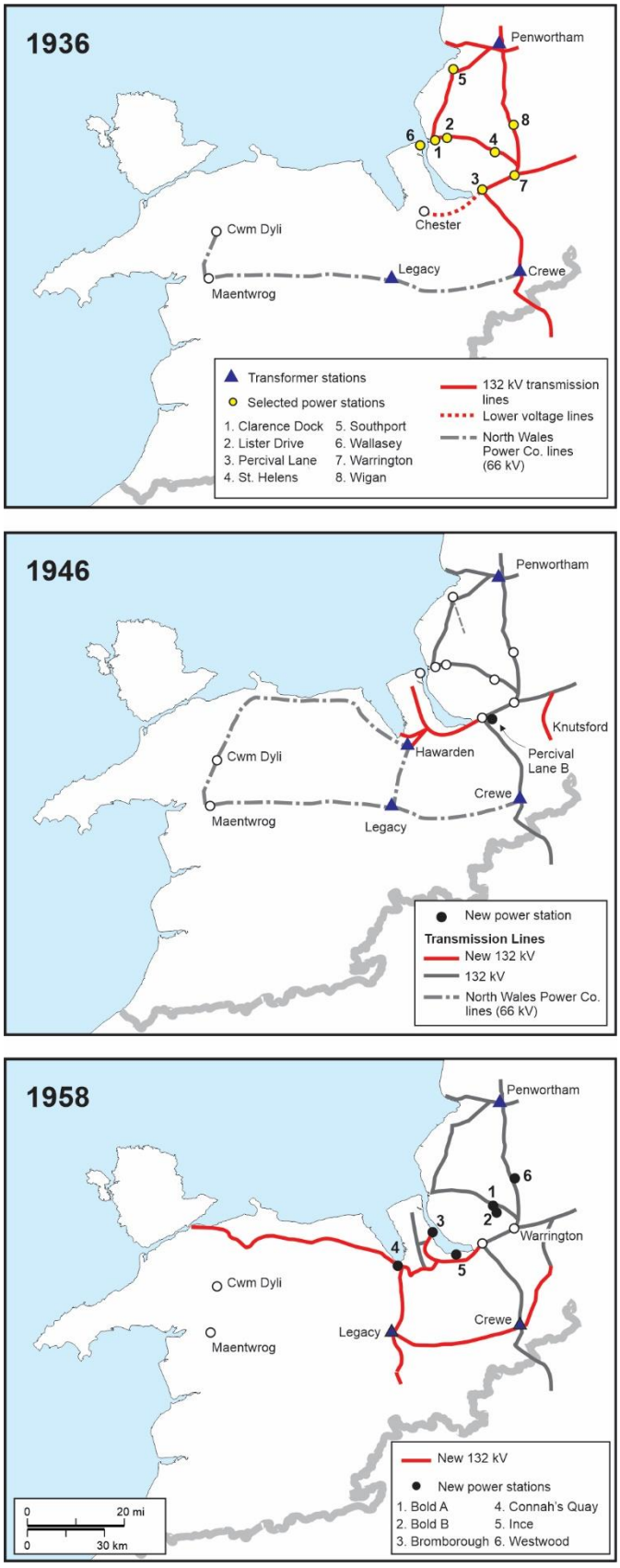

Figure 6 **DEVELOPMENT OF THE NATIONAL GRID.**

Summary

Table 9 shows various indicators of the growth of electrification from 1900. Of the 16 undertakings in that year, 11 were local authorities, illustrating the municipal role in the region. The company role, especially of North Wales Power, was also very significant in shaping the map of electricity production and distribution.

Table 9 **SUMMARY OF DEVELOPMENT IN THE MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD AREA.**

	NUMBER OF UNDERTAKINGS[1]	LOCAL AUTHORITY UNDERTAKINGS	NUMBER OF POWER STATIONS	GENERATING CAPACITY (kW)	PER CAPITA CONSUMPTION (kWh)
1900	17	11	19	..	.. (4)[2]
1912	30	17	32	..	.. (36)[2]
1925/6	36	23	33	195,365	127 (133)[2]
1935/6	42	32	30	395,278	299 (374)[2]
1948/9	..	..	21	637,363	869 (821)[2]
1958/9	-	..	24	1,609,725	1,738 (1,765)[3]

Notes:

[1] Excludes all non-statutory undertakings.

[2] 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.

[3] Calculated from data in Electricity Council, ***Handbook of Electrical Supply Statistics 1977***, p. 63 and census returns.

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. Clarence Dock, which entered service in 1931 with 50,000kW turbines, quickly became a symbol of electric power development on the Liverpool waterfront. With small later extensions it remained the largest powerhouse in the region.

Per capita consumption in the Merseyside and North Wales region (with Great Britain in parentheses) shows substantial rates of growth. For much of the time regional consumption levels were around the national average; the dip in 1935/36 shows the effect of the Depression on some of the traditional industries.

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. 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.[42] 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)[43] 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.

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

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

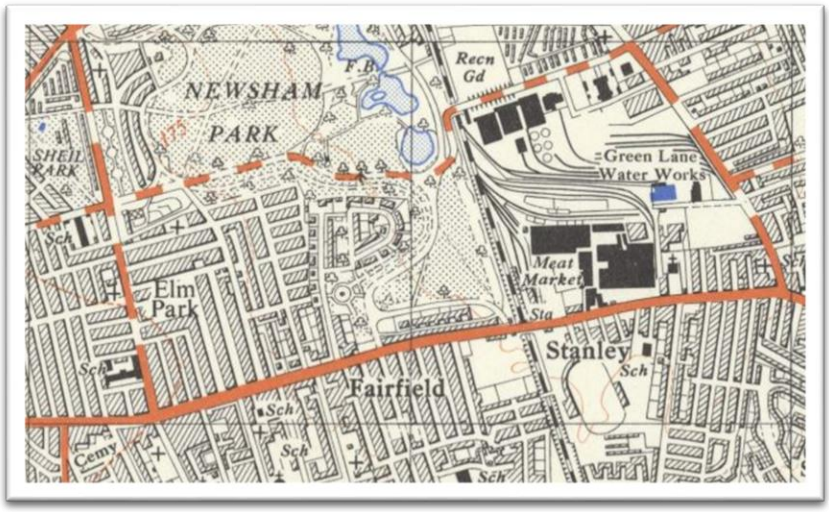
Thereafter they were no longer published by HMSO and became increasingly glossy in appearance and content. From 1964 many details, previously available in the Annual Reports were published in the CEGB ***Statistical Yearbook***. This was not published by HMSO and is comparatively rare.

The Merseyside and North Wales 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. Since privatization in 1990 the records of the Board appear to have been dispersed. "Manweb Remembered", a website developed by former employees, has recovered various items of general interest including publications on Merseyside power stations and issues of "Contact" the staff magazine from the 1950s. Website: www.manwebremembered.co.uk

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.

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.***



LIVERPOOL

Lister Drive was in decline by 1953 (capacity 50,750kW) as the Clarence Dock station took the premier role in Liverpool twenty years earlier. At their peak around 1930, the three adjacent stations had a capacity of 120,000kW. The five circular cooling towers shown on the map reflected Liverpool's pioneering role in the adoption of concrete hyperbolic towers, beginning in 1924.

Ordnance Survey 1:25,000 series, Sheet SJ39, 1953 (National Library of Scotland)