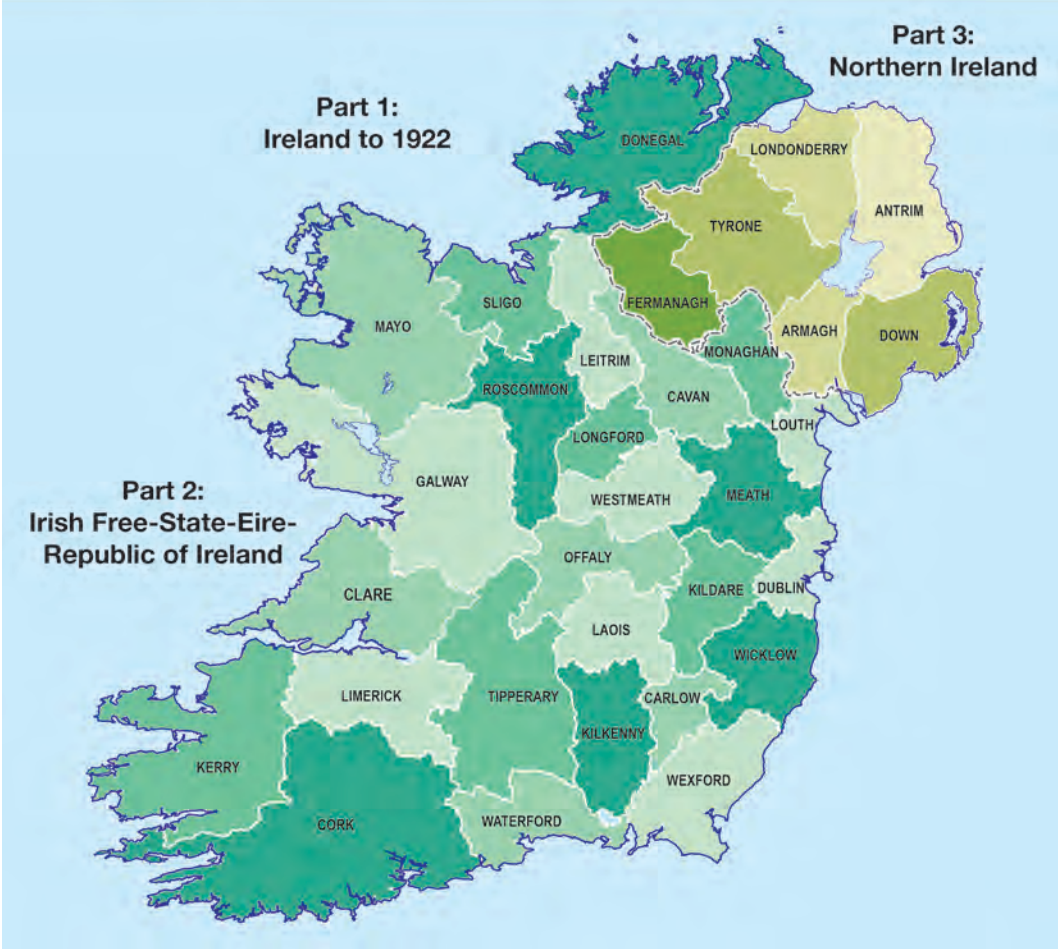


ELECTRICITY IN IRELAND



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The development of electricity supply in Ireland is reviewed in three parts. The first covers the period from the 1880s until the Government of Ireland Act 1920 came into effect. At this point Ireland was divided: 26 counties became the autonomous Irish Free State while six counties remained in the United Kingdom as Northern Ireland.

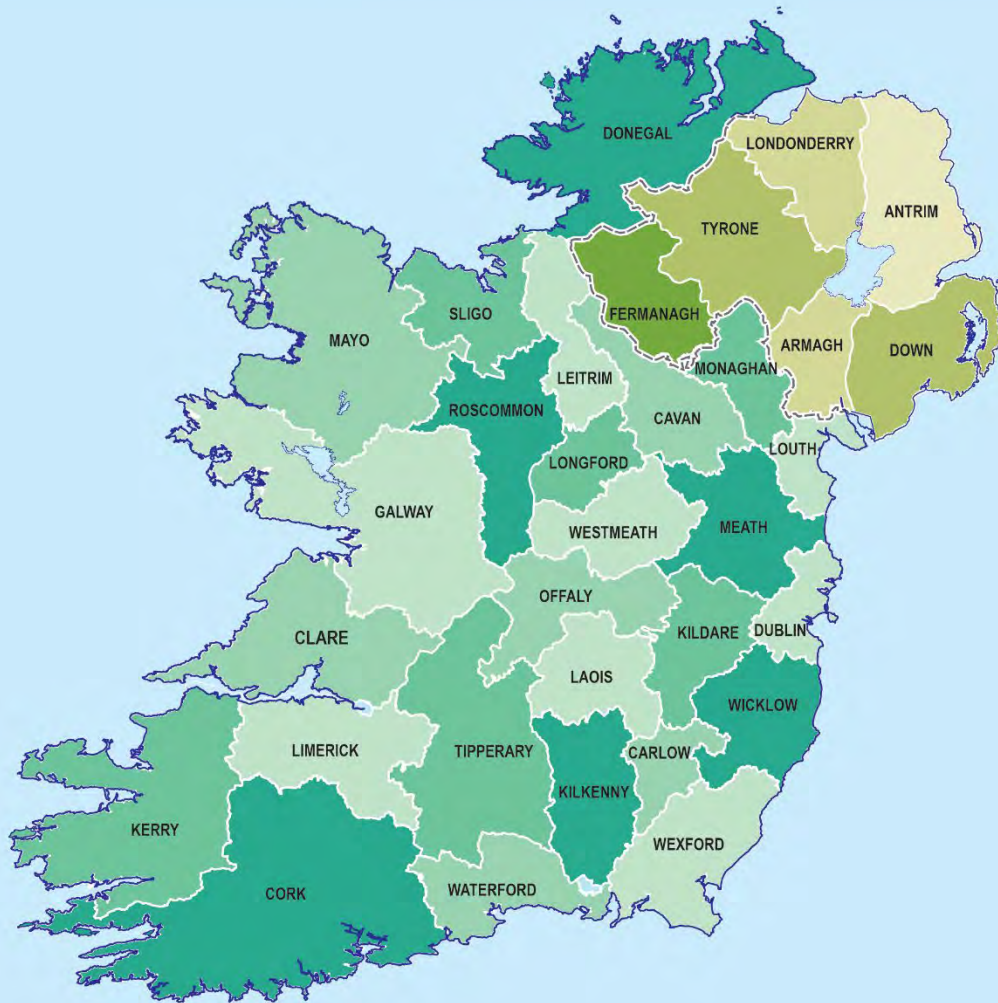
Since the separate parts took very different directions in electrification, they are considered as separate entities from 1922.

Unlike the chapters on Great Britain these studies of Ireland also review changes from 1960 to the present. In recent decades the two Irish systems have become interconnected as well as being connected by cable and gas pipeline to Britain.

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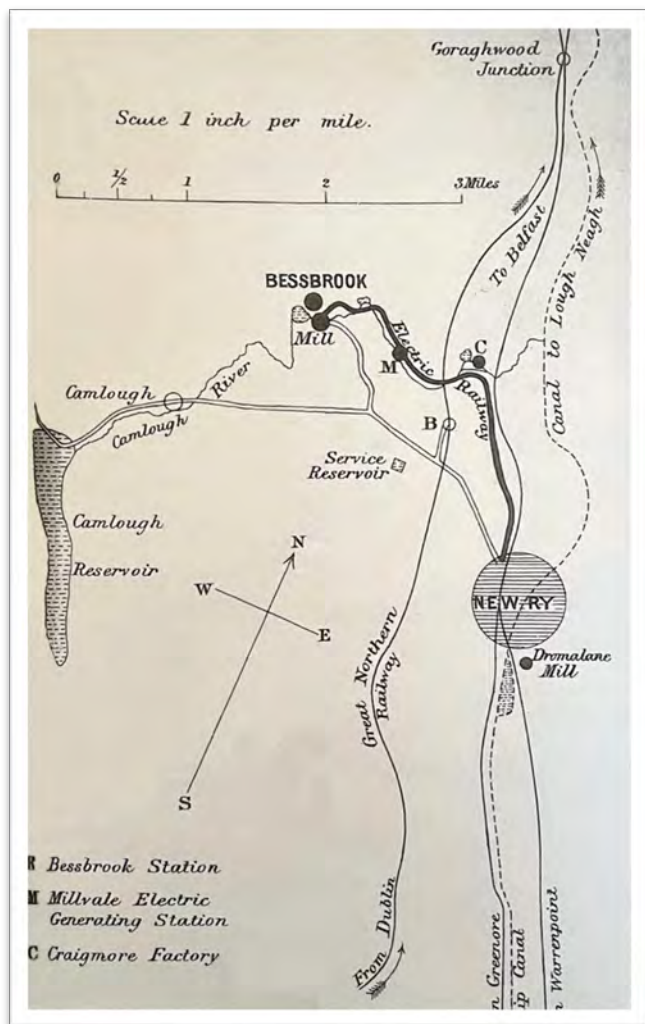
ELECTRICITY IN IRELAND



PART ONE: IRELAND TO 1922

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BESSBROOK AND NEWRY TRAMWAY

A pioneer electric line opened in 1885 with equipment built by Mather & Platt of Manchester. Carrying freight and passengers, the line connected the linen mill with Newry. A hydro-electric plant at Millvale (originally 46kW) supplied all the power requirements of the line until closure in 1949.

Institution of Mechanical Engineers, Proceedings, 1888, Plate 79

Ireland to 1922

Nineteenth-century Ireland had many characteristics that were different from other parts of the United Kingdom: these included culture, religion and a predominantly agricultural economy.¹ The absence of significant coalfields meant that new technologies such as town gas manufacture, railways and most steam power depended on imported coal.

The most profound difference between Ireland and the other parts of the British Isles was a continued decline in population that followed the catastrophic Famine of the 1840s. The relative size of Ireland in the larger United Kingdom declined from 31.6 percent of the total population in 1841 to only 9.7 percent in 1911. All aspects of Irish life and economy were affected for over 100 years.

Census	Ireland	%	Scotland	%	England & Wales	%	Total
1841	8,177	31.6	2,626	10.2	15,014	50.2	25,817
1881	5,175	14.8	3,736	10.7	25,974	74.5	34,995
1911	4,390	9.7	4,761	10.5	36,070	79.8	45,221

Source: Compiled from Mitchell & Deane, *British Historical Statistics*.

The strategic value of Ireland for the supply of foodstuffs to the British market declined as free trade gave new opportunities for suppliers in Europe. Steamships and then refrigeration brought in new suppliers of grain, meat and dairy products from North America, Argentina, Australia and New Zealand. All these changes affected Irish agriculture and industrial development.

Most towns and cities were influenced by the larger demographic shifts. Dublin grew slowly after 1841 while other centres stagnated or, like Limerick, declined. The population of Limerick City only revived to the 1841 total by the mid-1940s.

1841		1881		1911	
Dublin	233	Dublin	250*	Belfast	347
Cork	81	Belfast	208	Dublin	304*
Belfast	70	Cork	80	Cork	76
Limerick	48	Limerick	38	Londonderry	41
Waterford	23	Londonderry	29	Limerick	38
Londonderry	15	Waterford	22	Waterford	27

Note: * Including suburbs

Source: Compiled from Census reports

The remainder of the urban system consisted of ten towns between 10,000 and 12,000, 27 towns with between 5,000 and 10,000, and another 65 places with 2,000 to 5,000 inhabitants. Overall there was a

¹ T.W. Freeman, *Ireland: a general and regional geography* (London: Methuen, 3rd edition, 1965). New Oxford History of Ireland: W.E. Vaughan ed. Vol VI: *Ireland under the Union II 1870-1921* (2000); J.R. Hill ed. Vol. VII: *Ireland 1921-1984* (2010). The significance of Ireland's industrial development and scientific and technological achievements is emphasised in Colin Rynne, *Industrial Ireland: an archaeology* (Cork: The Collins Press, 2006, reprinted 2015), 534pp.; and Mary Mulvihill, *Ingenious Ireland: a county-by-county exploration* (Dublin: Four Courts Press, 2nd edition, 2019), 493pp.

low level of urbanisation in Ireland—34.1 percent in 1911 compared with 78 percent in England and Wales and 69 percent in Scotland. This affected the potential for electrification in Ireland.

The rise of Belfast to become the largest city in Ireland by 1911 reflected the industrialisation of the Lagan valley and the marked differences with other parts of the country. Industrial growth, first with the factory production of linen, and then shipbuilding, together with a high concentration of Protestants, set the Belfast region apart from the rest of Ireland. This was also reflected in the resistance to the Home Rule Bill of 1912 and subsequent events that culminated in the partition of Ireland from 1922.

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.² 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 area³, 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.

Only one of the applications in 1882 came from Ireland. The Incandescent Lighting Co. Ltd had begun an application for developing a system in Belfast but this “was not proceeded with”.⁴ Meanwhile the Dublin Electric Light Co. had begun a small experimental power station in Schoolhouse Lane which provided arc lighting in Kildare Steet, Dawson Street and part of St Stephen’s Green.⁵ There were 17 arc lamps in 1881 and 114 by 1882, all mounted on wooden poles and connected to the generators by overhead wires. The experiment was, however, short-lived.

Although general urban electrification failed to take off in Ireland, 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.

The St James’s Gate brewery of Arthur Guinness Son & Co. introduced electric lighting in 1883 and was an early user of Parsons steam turbines.⁶ In Belfast the shipyard of Harland & Wolff had replaced gas lighting with incandescent lamps and arc lights by 1885.⁷ By 1888 there were more establishments with

² Basic details of this Act and subsequent legislation are outlined in *Electricity Supply in Great Britain: A chronology* (London: Electricity Council, 1977).

³ In Ireland there were urban and rural sanitary authorities constituted under the Public Health (Ireland) Act 1878. Electric Lighting Act 1882, 45&46 Vict. Ch.56, s.37 and schedule. The urban and rural sanitary districts became urban and rural districts, following the English model, by the Local Government (Ireland) Act 1898.

⁴ “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.

⁵ Maurice Manning and Moore McDowell, *Electricity supply in Ireland: The history of the ESB* (Dublin: Gill & Macmillan, 1984), p.1.

⁶ “Northern Ireland and the Republic of Ireland Supplement”, *The Engineer*, Vol.249, 1960, p.17. Two 60kW turbines were installed in 1895.

⁷ “Electric lighting in Belfast”, *The Engineer*, Vol,59, 1885, p.72.

electric lighting, including a woollen mill at Lucan and the Royal Irish Linen Warehouse in Belfast. Pioneer electric tramways powered by water turbines were in operation at Bessbrook and Newry and Giant's Causeway.⁸

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. Four applications for Ireland were submitted to the Board of Trade for the 1890 Parliamentary session.⁹ Electric Lighting Orders for Belfast and Galway were granted but the applications by the Irish House-to-House Electricity Co. for Cork and Londonderry were rejected, since "the promoters failed to procure the consent of the local authority or satisfy the Board of Trade that it should be dispensed with, and the Board of Trade refused to grant the Order".¹⁰

With the grant of legal powers, the new undertakings began raising capital and building a generating and distribution system. Dublin opened the first municipal system in 1892 with a power station in Fleet Street.¹¹ Londonderry followed in 1894¹² and Belfast completed its system in 1895. The Galway company that had begun operations in 1888, before the grant of an ELO, was followed by the Kerry Electric Supply Co. in 1893.¹³

The development of electricity for lighting and other uses had, from the beginning, faced strong opposition from a well-established coal gas industry. In Ireland an infrastructure of urban gas works and mains had been built from the early decades of the 19th century. By 1897 there were 110 gas undertakings in Ireland, supplying most of the market that the nine newly established electricity undertakings were beginning to enter.¹⁴

Gas was mostly used for lighting commercial and residential premises as well as for street lighting. The Dublin company, with 16,000 consumers, also supplied 6,531 public lamps in the city and suburbs. Streets in many small towns were also lit by gas. Kilrush, County Clare, for example, had 27 public lamps in 1897.

Town gas was also used to power small gas engines in workshops where a steam engine would be cumbersome to install and awkward to maintain. The first power station in Belfast (376 kW) used gas from the municipal system to generate electricity.¹⁵ Most gas engines, however, tended to use an integrated producer gas unit that made gas at a higher calorific content and more cheaply than public systems. Some smaller electricity systems in Ireland used producer gas for power generation.¹⁶

⁸ Institute of Mechanical Engineers, *Proceedings* 1885. Dublin summer meeting has brief notices.

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

¹⁰ The House-to-House Electricity companies were particularly active in the 1890 proceedings, with 51 applications across the British Isles. Only five were successful in being granted ELOs and only Coatbridge in Scotland was actually developed, the others being revoked for lack of activity. The Cork Gas Company was one of the objectors to the House-to-House application. In a letter to the Board of Trade, Denny Lane, managing director, provided detailed arguments against the granting of an Electric Lighting Order. See Charles J. O'Sullivan, *The Gasmakers: historical perspectives on the Irish gas industry* (Dublin: T. O'Brien Press, 1987), pp.142-144.

¹¹ Dublin Corporation had begun with a licence granted in 1889 and received a full ELO in 1892.

¹² Londonderry Corporation was granted an ELO in the 1890-91 Parliamentary session.

¹³ The Killarney ELO was granted in 1890-91. The Town Commissioners had withdrawn their application in favour of the private company.

¹⁴ *The Gas Works Directory and Statistics, 21st edition 1897* (London: Hazell, Watson & Viney, 1897). Google Books. The statistics collected by the Board of Trade and published as the Gas Returns in the Parliamentary Papers included only statutory undertakings in the United Kingdom: 9 companies in Ireland in 1897 (1898, HC 364) and 7 local authorities (1898, HC 365). Non-statutory gas companies were also common in Britain. As late as 1937 there were 544 non-statutory undertakings as well as 706 statutory undertakings (406 companies, 300 local authorities). Political and Economic Planning, *Report on the gas industry in Great Britain* (London: PEP, 1939), p.48.

¹⁵ *The early days of the power station industry* (Cambridge: Cambridge University Press for Babcock & Wilcox, 1939), pp.156-158.

¹⁶ The new systems at Portarlinton and Port Stewart, opened in 1914-15, both used producer gas systems.

The gas supply industry also supported a range of specialised manufacturing and service companies. These included making retorts, gas holders, pipes, fittings and meters as well as service and installation. J. Edmundson & Co. was a firm developing equipment as well as installation. It had begun as an ironmonger in Chapel Street, Dublin in 1830 and moved into gas installation work a decade later. Led by John Wigham,¹⁷ the company made significant innovations in gas lighting especially in lighthouses and other marine work. A London branch established by the 1870s also carried out gas installations and added electrical work in the early 1880s. This business became the nucleus of Edmundson's Electricity Corporation Ltd, incorporated in 1897. The company went on to develop local electricity systems in Britain by 1910.¹⁸

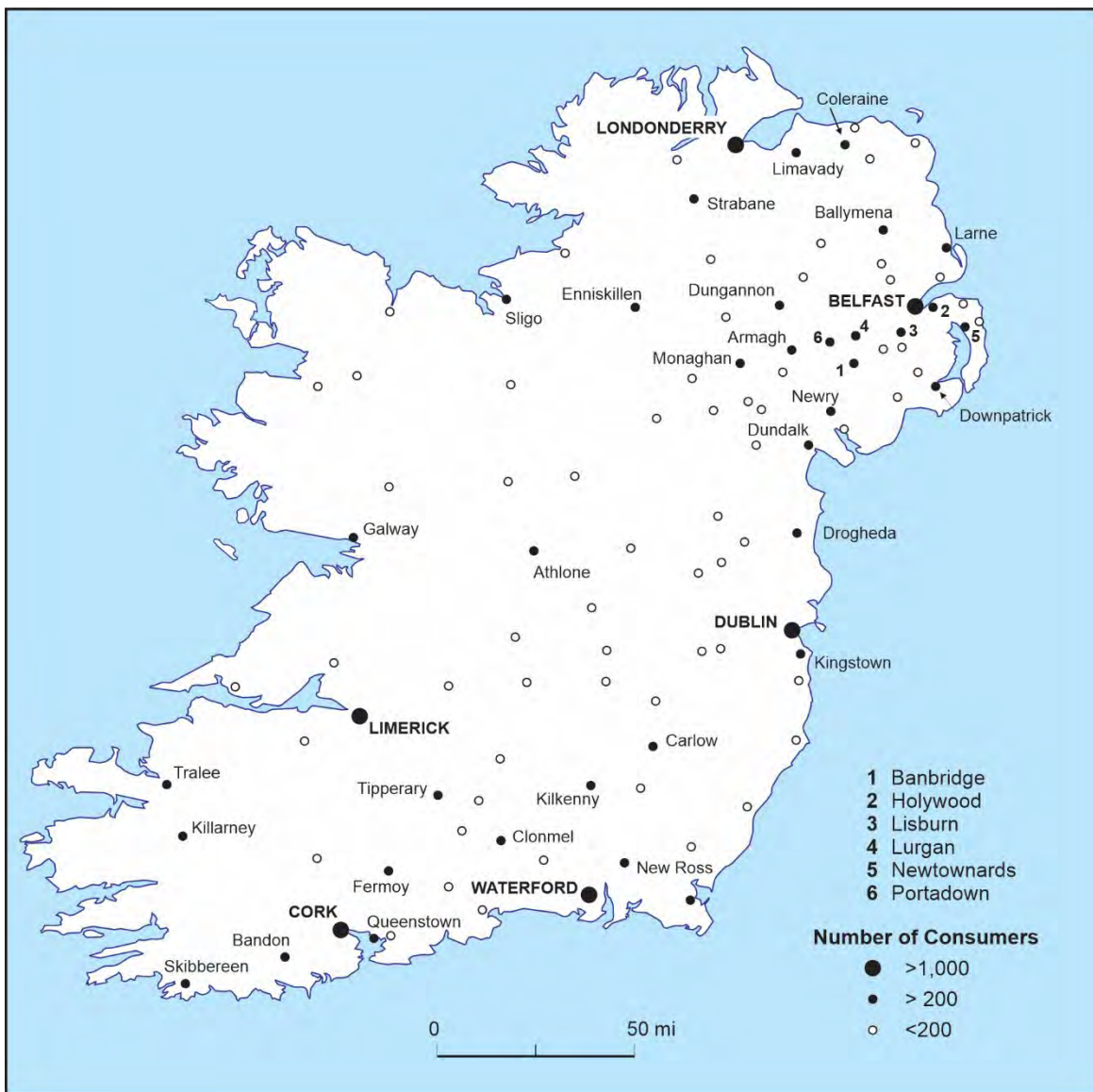


Figure 1 IRELAND GAS UNDERTAKINGS 1897.

¹⁷ Patrick Long, "Wigham, John Richardson (1829-1906)", *Dictionary of Irish Biography*, Royal Irish Academy (available online at www.dib.ie)

¹⁸ *Garcke's Manual of Electrical Undertakings 1910/11*, p.410, notes 46 undertakings from Inverness to Ilfracombe. Although the company built a system in Guernsey, nothing was ever developed in Ireland.

Figure 1 shows the gas undertakings operating in Ireland by 1897. They were widespread, all towns with a population of 5,000 or over having a gas supply. Ballybay, County Monaghan (population 1,378 in 1891) was one of the smallest places with a gas works. The map shows a concentration in northeast Ulster with 10 undertakings in County Antrim and 15 in County Down.

The structure of the industry was dominated by private companies varying in size from the large Alliance and Dublin Consumers Gas Co. (16,000 consumers) to the Rathkeale Gas Co., County Limerick with only 50 consumers. Most of the gas companies were non-statutory, with only nine companies operating under various local acts of incorporation. Making and selling gas was profitable. In 1897 the gas companies in Dundalk, Dublin, Omagh, Waterford and Wexford were all paying dividends of 10 percent.

Ten local authorities owned gas undertakings in 1897. Belfast Corporation had taken over the private company in 1874 while Clonmel did so in 1895. Belfast was the largest municipal operation with 28,500 consumers while the Kilrush Town Commissioners gasworks was the smallest (124 consumers). Profits from municipal operation were commonly used to maintain lower local tax rates.

New innovations sustained the Irish gas industry's dominant position until 1914. These included the Welsbach incandescent mantle that improved the brightness of gas light and various improvements to cooking and heating appliances that helped to extend the market for town gas.

World War I interrupted coal supply especially in the early years when U-boat submarines were very active in the Irish Sea. Costs and prices rose sharply and electricity became more competitive especially in smaller places.

How did the gas industry affect the growth of early electricity supply? One effect of local dominance of a gas company was to inhibit the development of electricity. Ennis, County Clare (population 5,472 in 1911) which had gas supply from 1854, failed to attract any entrepreneurs or the Town Council to invest in a public electricity system. Such a system had to wait until 1929/30 when the town was connected to the national transmission system and the Electricity Supply Board laid mains in the streets. The gas company closed by 1934.¹⁹

The precedent of non-statutory operation by most gas companies was also followed by some of the new electricity suppliers. Three of the nine electricity undertakings in 1897 were non-statutory. Numbers increased to at least 13 in 1912 and then to well over 100 by the early 1920s. The non-statutory companies avoided the expense of Parliamentary proceedings and with the consent of the local authority were subject to few regulations and restrictions.

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 or consulting engineer to decide. Consequently after 1888 large numbers of fragmented operators developed DC and AC systems with little attempt at co-ordination. Dublin began with an AC system with a frequency of 83 cycles (Hz) while Killarney selected 100Hz. Londonderry and Belfast both began with DC systems as did the later Dublin suburban systems in Rathmines and Pembroke. This lack of standardization would be a major problem when interconnection between areas became advantageous.

¹⁹ Map of gas works in Ireland 1934 in Charles J. O'Sullivan, *The gas makers* (1987), p.164. The number of gas undertakings had fallen from 110 in 1897 to 73 in 1934.

I Local Initiatives

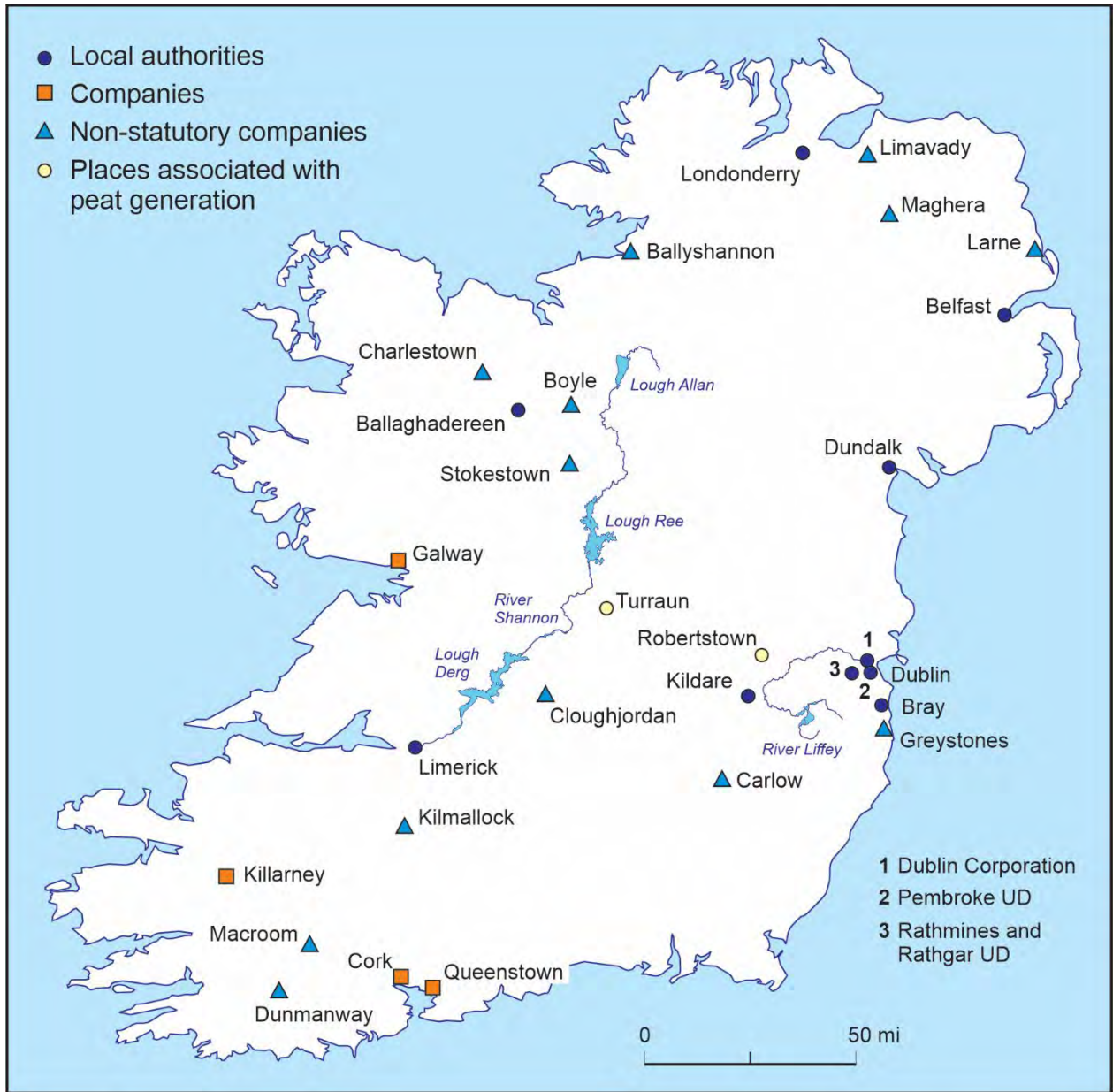


Figure 2 IRELAND ELECTRICITY UNDERTAKINGS 1912.

Table 1 IRELAND: ELECTRICITY UNDERTAKINGS 1912.

<i>UNDERTAKING</i>	<i>COUNTY</i>	<i>SUPPLY BEGAN</i>
<i>Local Authorities</i>		
<i>Belfast</i>	Antrim	1895
<i>Bellaghaderreen</i> ¹	Roscommon	1906?
<i>Bray</i>	Dublin	1892 ²
<i>Dublin</i>	Dublin	1892
<i>Dundalk</i>	Louth	1912
<i>Kildare</i> ³	Kildare	1904
<i>Limerick</i>	Limerick	1903
<i>Londonderry</i>	Londonderry	1894
<i>Pembroke</i>	Dublin	1900
<i>Rathmines</i>	Dublin	1900
<i>Companies</i>		
<i>Ballyshannon N/S</i>	Donegal	1908
<i>Boyle N/S</i>	Roscommon	1899
<i>Carlow N/S</i>	Carlow	1891
<i>Charlestown N/S</i>	Mayo	?
<i>Cloughjordan N/S</i>	Tipperary	1911
<i>Cork</i>	Cork	1898
<i>Dunmanway N/S</i>	Cork	1910
<i>Galway</i>	Galway	1889 ⁴
<i>Greystones N/S</i>	Wicklow	1910
<i>Killarney</i>	Kerry	1893
<i>Kilmallock N/S</i>	Limerick	1890
<i>Larne N/S</i>	Antrim	1891
<i>Limavady N/S</i>	Londonderry	1894-95
<i>Macroom N/S</i>	Kerry	1900
<i>Maghera N/S</i>	Londonderry	1910
<i>Queenstown (Cobh)</i>	Cork	1900
<i>Strokestown N/S</i>	Roscommon	1902

Notes:

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

¹ Castlerea Rural District Council.

² Bray Electric Light & Power Co., a non-statutory operation, was taken over by the local authority in 1896 after the grant of an Electric Lighting Order.

³ Naas No.1 Rural District Council.

⁴ Galway began as a non-statutory company and was granted ELOs in 1890 and 1897.

Figure 2 and Table 1, derived in part 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.²⁰

The 10 local authorities were clear examples of local initiative in developing electric light and power. Belfast Corporation (population 386,947 in 1911) was the largest of the local authorities. At the other end of the scale were the small Rural District Councils of Castlerea and Naas No.1. Dublin was the first local authority in Ireland to open a public supply, in 1892.

The 17 companies were very varied in scale and location. Only four of these had Electric Lighting Orders; the others were non-statutory. Cork Electric Tramways and Lighting Co. (a subsidiary of the British

²⁰ "Map showing electric lighting, power and traction undertakings in operation", *Supplement to Garcke's Manual of Electrical Undertakings*, no date c.1912. Some extra non-statutory undertakings have been added but it is likely that more were in operation at the time.

Thompson-Houston Co.²¹) was by far the largest company and also owned the system in Queenstown (Cobh). The Albert Road power station in Cork opened in 1898 and remained in service until the early 1950s.²² The much smaller companies in Galway and Killarney were local in origin and management.

While most of the non-statutory companies, such as those at Ballyshannon and Limavady were local in origin,²³ a few were developed by outside interests. J.E.H. Gordon & Co.²⁴ from London actively promoted electricity in Bray, Carlow and Larne between 1890 and 1892. Although local systems were established in the three towns, the Irish venture was unprofitable. The Carlow AC system was sold to a local firm in 1894 for £3,500, a small proportion of the £20,000 spent on building the Millford Mills hydro-electric station, the five-mile overhead line to the town as well as the distribution mains and transformers.²⁵

Development of power companies, although several schemes were proposed, was stalled by the failure to raise capital and technical limitations. The Shannon Water and Electric Power Act 1901 allowed for a generating station at Doonass (County Clare) but development awaited further investigation of waterpower resources in the catchment area.²⁶ The Belfast and North-East Ireland Electricity and Power Gas Act 1904 which appeared to have good prospects in an industrialised area was unable to attract investment and the powers lapsed in 1911. The Central Ireland Electric Power Act 1908 gave authority to build a peat-fired station at Robertstown, County Kildare, exploiting the resources of the Bog of Allen.²⁷ Development of this energy source did not begin until 40 years later with the construction of the Allenwood generating station.

Electrification of Ireland around 1912 was still incomplete with only a very small part of the territory covered by Electric Lighting Orders. Among the larger towns still unserved were Waterford (population 27,464 in 1911), Kingstown/Dun Laoghaire (17,219), Lurgan (12,533), Drogheda (12,501), Wexford (11,531) and Ballymena (11,381).

Lighting was still the dominant use for electricity until the late 1890s. The most profitable demand was in shops, offices, hotels, theatres (and later cinemas) and public buildings.²⁸ 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.

²¹ BTH also owned the tramway companies in Chatham, Motherwell and Paisley.

²² Colin Rynne, *Industrial Ireland: an archaeology* (Cork: The Collins Press, 2006), p.431. Charles H. Merz (1874-1940) while employed with the BTH Co. worked on the Cork and Cobh systems. Early collaboration with William McLellan (1874-1934) in Cork formed the basis for the partnership of Merz and McLellan which became one of the foremost electrical consulting firms in Britain. See John Rowland, *Progress in Power: the contributions of Charles Merz and his associates to sixty years of electrical development* (London: Newman Neame, 1960), Chapter 2.

²³ H.D. Gribbon, *The history of water power in Ulster* (Newton Abbot: David & Charles, 1969), pp.140-146.

²⁴ James Edward Henry Gordon (1852-1893) had built the pioneer Paddington station electricity system in the mid-1880s while employed by the Telegraph Construction Co. From 1888 he became an independent consultant and promoter.

²⁵ "Electricity comes to Carlow", Parts I and II. Website: County Carlow – Ireland Genealogical Projects (igp-web.com)

²⁶ Paul Duffy, "The pre-history of the Shannon scheme", *History Ireland* Vol.12(4), 204. (Available online)

²⁷ Manning and McDowell, *Electricity supply in Ireland* (1984), pp.12-13.

²⁸ An analysis of electricity sales in Belfast during 1896 showed the following results: shops 63 percent, theatres 12 percent, offices 11 percent, hotels and clubs 6 percent, and churches 4.8 percent. *100 years of electricity in Northern Ireland: a short history from 1883* (Belfast: Northern Ireland Electricity Service, 1986), p.8.

ELECTRIC TRAMWAY SYSTEMS IN IRELAND¹

	YEARS OPERATING	ROUTE MILES	MAX. NO. OF CARS
<i>Belfast Corporation</i>	1905-1954	51.45	441
<i>Bessbrook & Newry</i>	1885-1948	3.00	..
<i>Cavehill & Whitewell</i>	1906-1911 ²	3.29	10
<i>Clontarf & Hill of Howth</i>	1900-1907 ³	5.48	12
<i>Cork Electric Tramways</i>	1898-1931	9.89	35
<i>Dublin United Tramways</i>	1897-1949	61.15	670
<i>Dublin Southern District Tramways</i>	1896-1896 ³	7.98	40
<i>Dublin & Lucan Electric Railway</i>	1900-1925 ³	7.00	15?
<i>Giant's Causeway, Portrush and Bush Valley Tramway</i>	1883-1949	8.75	24?
<i>Hill of Howth Tramway</i> ⁵	1901-1959	5.19	10

Ten electric tramway systems were developed in Ireland between 1883 and 1906. Belfast was the only local authority to operate a system. Many of the companies were early pioneers in electric traction. The Giant's Causeway and Bessbrook & Newry were particularly early and both used hydro-electric power.⁶

Dublin Southern District Tramways began an electric service in the city, extending to Dalkey, from January 1896. The AC power station (300kW) was located at the Ballsbridge depot on Shelbourne Road.⁷ Dublin United Tramways built power station at the Clontarf depot in 1897. After the merger of the companies, a new power station was opened on Ringsend Road in 1899. The original capacity of 2,500kW was extended to 5,800kW by 1918⁸ and to 9,000kW by 1929. The station worked at 25Hz, the only example of this frequency in Ireland. Ringsend was the second largest power station in the Irish Free State, generating almost a quarter of the national electricity output in 1928-29.⁹ The station closed in November 1930 when the Shannon Scheme became fully operational.

Other smaller power stations were built for the Dublin and Lucan line (250kW) and the Hill of Howth Tramway at Sutton Station (375kW). Tramways in Belfast and Cork drew their current from the public supply stations. Power for the Dublin tramways came from the Shannon Scheme after 1930.

Tramway power supply was very important in the early years for ensuring the viability of public supply systems. 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.

A later innovation in railway traction was the adoption of the Drumm nickel-zinc battery for two-car trains on the Dublin-Bray suburban line in 1932. The train sets worked successfully until 1949.¹⁰

Notes

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

² Transferred to Belfast Corporation.

³ Acquired by Dublin United Tramways.

⁴ The short Lucan & Leixlip Electric Railway was an extension of the Lucan line.

⁵ Owned by the Great Northern Railway (Ireland).

⁶ H.D. Gribbon, *The history of water power in Ulster* (Newton Abbot: David & Charles, 1969), pp.147-155.

⁷ The electrification scheme was designed by Horace F. Parshall (1865-1932), an American engineer who settled in Britain in the early 1890s. He also designed the Central London Railway, the electrification of Glasgow tramways, and the power stations of the Lancashire Electric Power Co.

⁸ W. Tatlow, "Electricity supply in Dublin and surrounding districts", *Journal of the Institution of Electrical Engineers* Vol.56, 1918.

⁹ Electricity Supply Board, *Annual Report 1928-29*, Appendix III.

¹⁰ "The ingenious Drumm battery train", Mary Mulvihill, *Ingenious Ireland* (Dublin: Four Courts Press, 2013), pp.142-143.

The limitations of DC supply systems became apparent by 1900 and in the search for economies of scale, the introduction of more efficient prime movers became a priority. Belfast added turbines at the East Bridge Street power station by 1912 but only added AC to the distribution network a decade later when the East Harbour power station entered service. Cork installed a 1,500kW turbine in 1917 to cope with wartime demand.²⁹

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.

Belfast, as the largest industrial centre in Ireland, had many establishments generating their own power and light. The two large shipyards, Harland & Wolff and Workman and Clarke, were self-sufficient in electricity. A central powerhouse at Workman & Clarke had a capacity of 1,500kW in 1912. Inglis & Co., with a large bread and cake bakery employing 500, used diesel engines for generating power for the works.³⁰

In Dublin the quays of the Port and Docks Board were lit by electricity generated by the Board (675kW in 1917).³¹ The Guinness brewery remained independent of the public system. By 1930 the company had a generating capacity of 1,910kW³² and as late as 1946-48 built a new power station.³³

Among the many isolated industrial establishments generating their own electricity were Arklow and Clifden. Kynoch's built a self-contained explosives plant in Arklow which became a major supply centre in World War I.³⁴ Clifden was noted for the transmission station of the Marconi Wireless Telegraph Co. Ltd which provided a transatlantic link between 1907 and 1923. A peat-fired generating plant (300kW) was built to serve the transmitters.³⁵

Hotels were early in adopting electric lighting as one of the amenities of high-class hospitality. City hotels such as the Grand Central in Belfast and the Shelbourne in Dublin noted "electrically lighted throughout" in their advertising.³⁶ These hotels were able to use the public supply while more isolated railway hotels such as the Great Northern in Bundoran, County Donegal and the Southern Hotel at Kenmore, County Kerry depended on their own generating plant.³⁷

Other large institutions of a different type were also introducing electricity. The Antrim District Asylum (later Holywell Hospital) located on the edge of Antrim town, had all the modern facilities of the time when opened in 1899. A much larger hospital complex, built at Portrane, County Dublin (later St Ida's Hospital), also included a powerhouse. This hospital opened in 1903 with accommodation for 1,200 patients.³⁸

²⁹ Rynne, *Industrial Ireland* (2006), p.69.

³⁰ Institute of Mechanical Engineers, *Proceedings* 1912. Belfast summer meeting has brief notices.

³¹ W. Tatlow, "Electricity supply in Dublin and surrounding districts", *Journal of the Institution of Electrical Engineers* Vol.56, 1918, p.117.

³² *The Engineer* Vol.149, 1930, p.654.

³³ Christine Casey, *Dublin: The Buildings of Ireland* (New Haven: Yale University Press, 2005), p.651.

³⁴ Anthony Cannon, "Arklow's explosive history: Kynoch 1895-1918", *History Ireland*, Vol.14(1), 2006. Wayne D. Cocroft, *Dangerous Energy: the archaeology of gunpowder and military explosives manufacture* (Swindon: English Heritage, 2000).

³⁵ Donal Clarke, *Brown Gold: A history of the Bord na Móna and the Irish peat industry* (Dublin: Gill & Macmillan, 2010), pp.13-14.

³⁶ *Bradshaw's April 1910 Railway Guide* (reprinted Newton Abbot: David & Charles, 1968), pp.1079-1080.

³⁷ Oliver Carter, *An illustrated history of British railway hotels 1838-1983* (St Michael's, Lancs: Silver Link Publishing, 1990), pp.49-54.

³⁸ Fingal County Council, *St Ida's Hospital and Portrane Demesne Architectural Conservation Area* (2013), 89pp. (available online)

Throughout Ireland large country houses and estates added electricity. Birr Castle, County Offaly, was one of the earliest installations with a water-powered turbine c.1879.³⁹ Later extensions provided a service to the town. The model village at Shillelagh, part of the Earl of Fitzwilliam's estate, received an electricity supply in 1905. This was first powered by a diesel engine, but hydro-electric power was added in 1914 and extended in 1926/27.⁴⁰ By 1929, sales of 58,736kWh from the estate's power plant were higher than sales by the Wicklow Urban District.⁴¹

Technical education in Ireland was actively supported by the state with the formation of the Department of Agriculture and Technical Instruction in 1900. The Royal College of Science in Dublin was expanded and moved into a grand new building in Merrion Street, opened by King George in 1911.⁴² Among the new facilities was an electro-technics laboratory. By 1912 there were also municipal technical institutes in Dublin, Belfast, Londonderry, Limerick and Cork that would provide varied levels of training for personnel in the electricity supply industry especially after 1922.

World War I had many effects on the Irish economy and society. Shipping losses as a result of submarine warfare in the Irish Sea disrupted coal supplies from Britain and highlighted Irish dependence on imported energy. The Board of Trade and other agencies appointed committees to investigate alternative energy sources, particularly hydro-electricity and peat. Reports from these committees would have an influence on postwar state policies.

Government authority in Ireland, already threatened by opposition to Home Rule in 1914, was further disrupted by the Dublin Easter Rebellion of April 1916 and the 24-hour national general strike over conscription two years later. An independent Irish parliament or Dáil Éireann was established by the Sinn Féin after their victory in the 1918 general election. The republican government extended its administration throughout the country, often superseding the official government in Dublin Castle. Over the next three years civil government was upset by unrest and war as the future of Ireland was being settled.⁴³

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.

The Electricity Commissioners, beginning with the appointment of Sir John Snell as chairman in January 1920, had however little opportunity to act in Ireland. Civil unrest, stemming from the longstanding issue of Home Rule limited government activity and many electricity undertakings were inhibited from planning new developments. Among the final actions of the Electricity Commissioners in Ireland were

³⁹ C.J.T. Carson, *Technology and the Big House in Ireland, c.1800-1930* (Cambria Press, 2009). The large telescope built at Birr Castle by the 3rd Earl of Rosse in the 1840s made important contributions to astronomy. Sir Charles Parsons (1854-1931) spent his early life here before moving to England and developing the steam turbine.

⁴⁰ "Hydro electric power house", Shillelagh village interpretive panel, www.wicklowuplands.ie. projects (website)

⁴¹ *Electricity Supply Board, Annual Report 1928-29*, Appendix III. Sales of electricity by Wicklow Urban District amounted to 49,458kWh.

⁴² Clara Cullen and Orla Feely eds. *The Building of the State: Science and engineering with government on Merrim Street* (Dublin: University College Dublin, 2011). Available online at www.ucd.ie

⁴³ The British retreat from Ireland is clearly and succinctly described in A.J.P. Taylor, *England 1914-1945* (London: Folio Society, 2000, reprinted from 1965 Oxford History of England, Vol. XV), pp.133-139.

approval of extensions to the power stations in Belfast and Londonderry as well as work on the transmission lines of non-statutory electric light and power companies in Cavan and Tullamore.

The Government of Ireland Act passed in December 1920 proposed the transfer of the administration of public services to the governments of Northern Ireland (6 counties) and Southern Ireland (26 counties). This transfer of power took place on 1 January 1922 for Northern Ireland and 1 April 1922 for Southern Ireland.⁴⁴ All decision-making and future legislation would now be in the new capital cities of Belfast and Dublin.

Summary

From 1882 to 1922 electricity undertakings in Ireland followed the same rules and regulations as the other parts of the United Kingdom. Local authorities were prominent in early development and four undertakings were firmly established by 1897. Company formations were slower, the Cork company only beginning supply in 1897.

IRELAND: ELECTRICITY UNDERTAKINGS		
	1897	1912
<i>Local Authorities</i>	4	10
<i>Statutory Companies</i>	3	4
<i>Non-Statutory Companies</i>	2	13
<i>Total</i>	9	27

Sources: The Gas Works Directory and Statistics, 21st Edition, 1897 and Table 2.

By 1912 the number of local authorities had grown to ten undertakings with new entrants in Dundalk, Limerick, two Dublin suburban districts and two rural areas. Only one statutory company, at Queenstown (Cobh) was established.

Ireland was different, however, in two respects. One was the number of non-statutory electricity companies. The other was the failure to develop power companies covering areas beyond a single town. Limited industrialisation, the general economic conditions and the widespread gas supply were among the factors inhibiting development on a larger scale.

State intervention was clearly needed to build larger-scale systems. This only began after independence with the two divisions of Ireland taking different pathways.

Note on Sources

The ESB Archives is very clear in stating that it does not have records of the undertakings that were established before 1927. Legislation before 1920 was all reported in the British Parliamentary Papers, especially in the various annual reports of the Board of Trade.

Garcke's *Manual of Electrical Undertakings*, published in London from 1896, is a rich source of material on local authorities and companies. Only a few odd copies appear in the collections of major Irish

⁴⁴ Electricity Commissioners, *Second Annual Report 1921-1922* (London: HMSO, 1922), p.66.

libraries. The most complete collections of the *Manual* are in Bristol (Western Power Electricity History Society) and Manchester (Museum of Science and Industry).

More detailed knowledge of early electricity supply in Ireland will require careful searching in local libraries and archives and detailed research in old newspapers. These sources will be an essential foundation for much needed work on the development of the non-statutory companies that are a distinctive part of Irish electrical history.

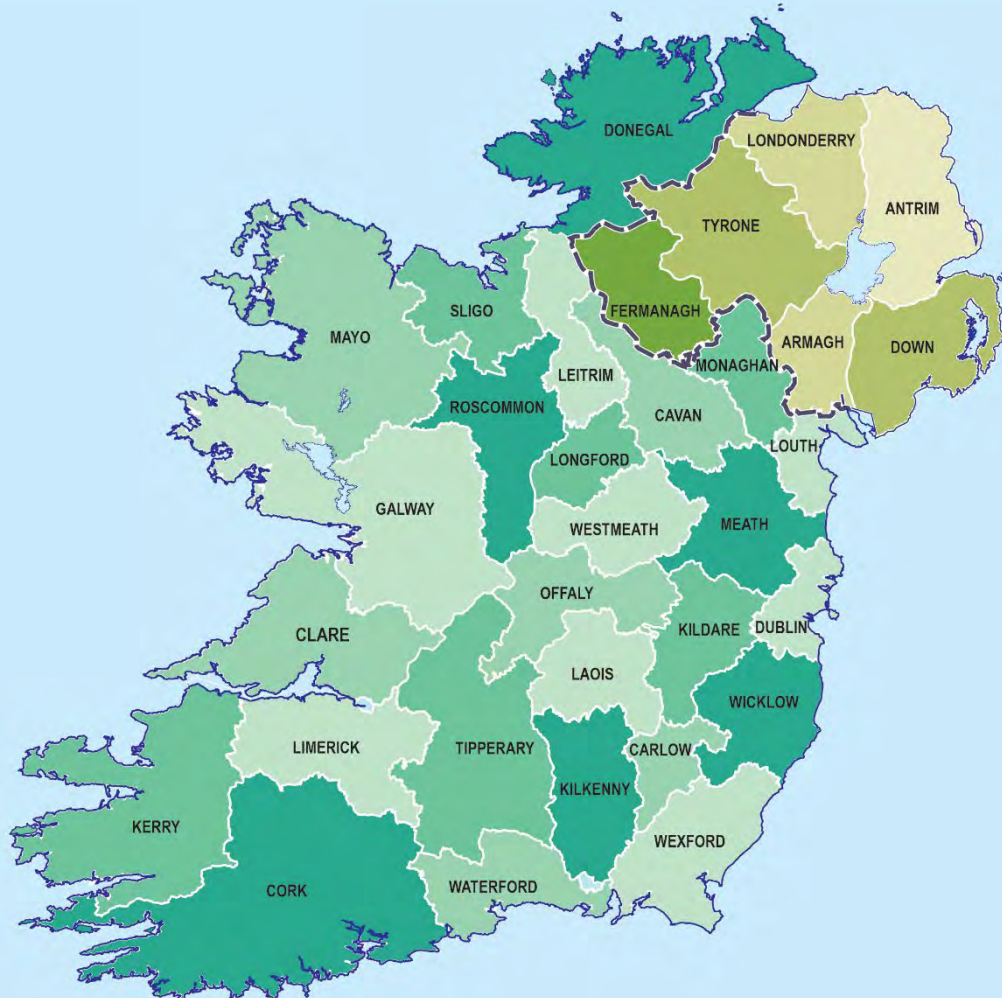


PIGEON HOUSE STATION, DUBLIN

Dublin Corporation opened the Pigeon House generating station with a capacity of 3,000kW in 1903. Transferred to the Electricity Supply Board in 1929, the station was subsequently rebuilt and extended to 95,000kW to balance the hydro-electric supply from Ardnacusha. Summer droughts in the Shannon catchment area could reduce hydro-electric output by one-third of the average. At its peak in the 1940s the Pigeon House station generated nearly half the national electricity output. Closed in 1976, many of the buildings await redevelopment.

Corporation of Dublin, Town Planning Department, "The Development of the City of Dublin", Ordnance Survey of Ireland, 1:25,000, 1954.

ELECTRICITY IN IRELAND



**PART TWO:
IRISH FREE STATE-EIRE-REPUBLIC OF IRELAND**

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ARDNACRUSHA

Opened in 1929 as the core of the Free State's electrification scheme. Building the power station and the head and tail races was a major civil engineering project. The branch railway from the main Limerick-Galway line transported most of the materials and equipment that arrived at the city docks.

Ordnance Survey of Ireland, One Inch Map Series, Sheet 143, revised 1951 (Author's collection).

Irish Free State-Eire-Republic of Ireland

Nation Building and Electricity 1922-1944

With a population of 2.9 million, the newly formed Irish Free State had many characteristics that were different from Britain. The first census taken in 1926 showed a continued decline in population (-5.3 percent from 1911), a low density (112 persons per square mile)¹ and a very high proportion living in rural areas (61.1 percent).² Dublin (population 418,981 in 1926)³ was the largest urban centre and had a powerful influence throughout the country. The national economy was dominated by agriculture which accounted for 53.0 percent of the labour force.⁴ In the northwestern counties of Leitrim, Mayo and Roscommon over 80 percent of the labour force was occupied in agriculture. The export trade (mainly with Britain) largely consisted of live animals and agricultural products.

Economic diversification was the long-term goal with industrial development powered by electricity (not steam coal) as one element. Modernisation and expansion of the electricity supply system was seen as one of the priorities of the Irish Free State. Such goals were seen as part of new state development elsewhere, as expressed by Lenin in 1920: "Communism is Soviet power plus the electrification of the whole country".⁵

One way of achieving these goals was developing water power for generating electricity. Investment in waterpower would use indigenous resources, reduce imports of coal, foster industrialisation and create employment in construction. The waterpower resources of Ireland had already been investigated by a sub-committee of the Water Resources Committee appointed by the Board of Trade in 1918.⁶ George Fletcher who had been a member of the sub-committee, saw the possibilities: "It is clear that water power combined with electrical transmission will play a very important part in Ireland's industrial future."⁷

The challenge of translating these ideals into reality was taken up by the young engineer, Dr T.A. McLaughlin (1896-1957)⁸ with his studies on Shannon water power development and national electrification. His work in Berlin prompted Siemens-Schuckert to make a preliminary submission to the

¹ Saorstát Éireann/Irish Free State, *Official Handbook* (Dublin 1932; also London: Ernest Benn), p.23. Comparative figures for other areas were Scotland 164, Northern Ireland 238, Wales 295, England 699.

² *Census of Ireland 1921*, Vol.I (available online at [www://eso.ie/census/](http://eso.ie/census/))

³ *Census of Ireland 1926*, Vol.X, General Report (1934), p.7. "Dublin" included the City and the four adjacent Urban Districts of Dalkey, Dun Laoghaire, Pembroke and Rathmines.

⁴ *Census of Ireland 1926*, Vol.X, p.24. Compare with Northern Ireland 26.1 percent, Scotland 8.5 percent, England and Wales 6.7 percent.

⁵ *The Oxford Dictionary of Quotations* (Oxford University Press, 3rd edition, 1979), p.313.

⁶ *Report of the Water Power Resources of Ireland Sub-Committee* (Dublin, HMSO, 1921), 23pp. Sir John Purser Griffith (1848-1938) former Chief Engineer of Dublin Port and Docks Board, was chairman of the Ireland sub-committee. Reports of the full committee, under the chairmanship of Sir John Snell, provided some of the inspiration for hydro-electric power development in North Wales and the Scottish Highlands in the 1920s. See A.H. Gibson, "A review of the water power problem in Great Britain and Ireland", *Transactions of the World Power Conference 1924* Vol.3, (London: Lund Humphries, 1925), pp.372-391.

⁷ George Fletcher ed., *Ireland: with maps, diagrams and illustrations* (Cambridge: Cambridge University Press, 1922), p.251. This descriptive study was also accompanied by four volumes each covering a province. A later paper discussed the Shannon Scheme: George Fletcher, "The Shannon Scheme and its economic consequences", *Journal of the Royal Society of Arts* Vol.77, (March 1929, pp.478-496. Fletcher was Assistant Secretary of the Department of Agriculture and Technical Instruction from 1901 to 1927 and had a major influence on the development of technical education. He was a member of the committee of inquiry on peat resources and water power. See: Susan M. Parker, "Fletcher, George (1862-1934)", *Dictionary of Irish Biography* (available online).

⁸ Marie Coleman, "McLaughlin, Thomas Anthony", *Dictionary of Irish Biography* (Royal Irish Academy/Cambridge University Press-- available online; Brendan Delany, "McLaughlin, the genius of the Shannon Scheme and the ESB", Chapter 1 in A. Bielenberg, ed. *The Shannon Scheme and the electrification of the Irish Free State* (Dublin: The Lilliput Press, 2002), pp.11-27.

Irish government in February 1924. With the support of Patrick McGilligan (1889-1979)⁹, Minister of Industry and Commerce¹⁰, the government invited Siemens to submit a detailed proposal which was received in October 1924. A committee of experts drawn from Norway, Sweden and Switzerland reviewed the plans in detail and presented a favourable report early in 1925.¹¹ Opposition to the Shannon plans came from two directions: engineers who favoured more modest development of the River Liffey and others who felt the estimated cost of £5.5 million (about 20 percent of national revenue) should be diverted to other projects.¹² The government held firm and the Shannon Water Power Act was passed by the Oireachtas¹³ on 4 July 1925. A contract with Siemens-Schuckert for the civil engineering works was signed in August.

Construction work began in Autumn 1925 and lasted four years. The principal features (**Figure 1**) were an intake weir on the Shannon south of Killaloe, a 12.7km¹⁴ headrace or canal to the power station at Ardnacrusha (utilising the full 30m gradient of the river) and a 2.4km tailrace to the river on the northern outskirts of Limerick.¹⁵ Three 30,000kW turbines were installed in 1928-29 and a fourth of 25,000kW was added in 1933. Limitations of water supply and storage in the Shannon basin did not allow for the completion of the full scheme which called for six turbines. Two locks beside the power station replaced the old canal.

The formal opening by President W.T. Cosgrove on 22 July 1929 was well publicised at home and abroad.¹⁶ Before the opening the *Opunake Times* (New Zealand) had reported: “Today huge, red-painted electric standards stretch spider-like from the Shannon works, covering the country with a network of cables”. After a long description of the construction site, the article concluded that when completed “...driven by Shannon power, electric lights will blaze and the wheels of industry will hum throughout Ireland”.¹⁷ Most reports also commented on the hopes for economic salvation and for healing the wounds of the war of independence. More recent studies of the Shannon Scheme have emphasised its role in nation-building.¹⁸

Electrification added new standardised elements in the landscape with steel lattice transmission towers, wooden poles and substation buildings in towns on the system. Ardnacrusha and the large city substations in Dublin (Fleet Street) and Cork (Caroline Street) were notable examples of the new architecture. All these elements showed the imprint of the new state beyond the green letter boxes and changed place names.

⁹ David Harkness, “McGilligan, Patrick”, *Dictionary of Irish Biography* (available online).

¹⁰ The Department of Industry and Commerce became responsible for all the electricity legislation dating back to 1882, including supervision of 21 Electric Lighting Orders (16 local authorities and 5 companies) transferred to Dublin by the Electricity Commissioners in 1922.

¹¹ *The Electrification of the Irish Free State: The Shannon Scheme: Report of the Experts appointed by the Government* (Dublin: Stationery Office, 1925; available online at www.opac.oireachtas.ie)

¹² Paul Duffy, “The pre-history of the Shannon Scheme”, *History Ireland*, Vol.12(4), 2004. Available online.

¹³ The legislature of Ireland, consisting of the President of Ireland, Dáil Éireann (lower house), and Seanad Éireann (upper house).

¹⁴ All the work by Siemens-Schuckert used metric measurements and the Electricity Supply Board (ESB) continued this usage for the transmission system. Older British terms such as [Board of Trade] “units” for kilowatt hours (kWh) lasted for decades.

¹⁵ Construction details are clearly covered in Paul Duffy, “Ardnacrusha: Birthplace of the ESB”, *North Munster Antiquarian Journal* Vol.29, 1987, pp.69-72. Available online.

¹⁶ The ESB established a public relations department on 1 July 1928 and a National Advertising Campaign began on 1 September. *Second Annual Report of the Electricity Supply Board 1928-29*, p.18.

¹⁷ *Opunake Times*, 5 February 1929, p.4. Available online: www.paperspast.natlib.govt.nz

¹⁸ Andy Bielenberg, ed. *The Shannon Scheme and the electrification of the Irish Free State* (Dublin: The Lilliput Press, 2002); McKayla Kay Sutton, “Illuminating the Irish Free State: Nationalism, national identity and the promotion of the Shannon Hydro-Electric Scheme”, PhD dissertation, Marquette University, Milwaukee, 2014. Available online.

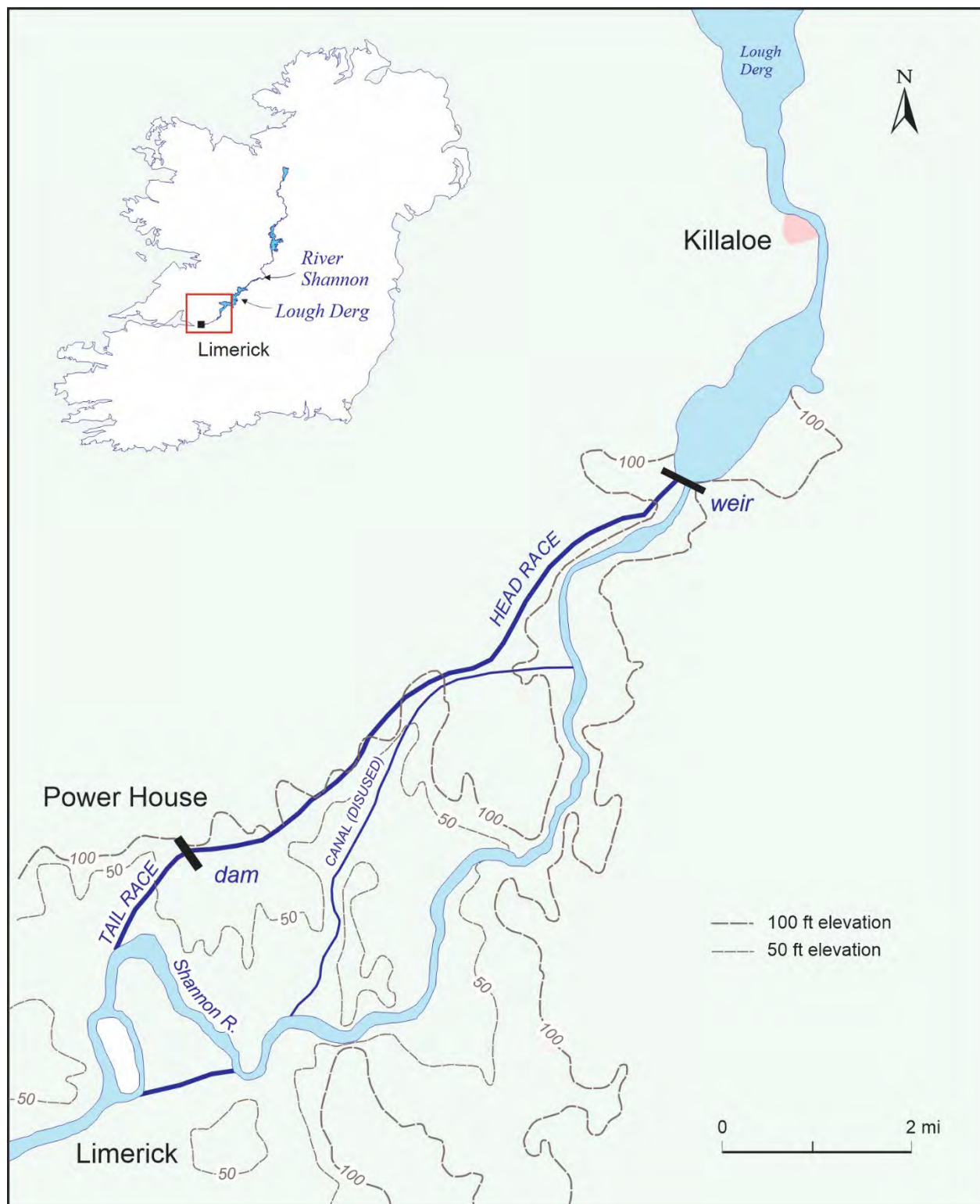


Figure 1 ARDNACRUSHA POWER SCHEME.

Building the national transmission system by Siemens-Schuckert began after the signing of a contract with the government in June 1926. The system included a main line at 110kv connecting Ardnacrusha with the principal load centres in Dublin and Cork, four rings or loops at 38kv providing service to other towns, and 10kv lines to link up the smaller centres. Steel lattice towers, with a narrow base, carried the higher-voltage lines, with wooden poles for the remainder. With the use of sleepers to support the base of the towers, construction costs were lower than with wide-base towers anchored in concrete (the normal practice in Britain). Also differing from British practice was the payment of compensation to landowners for building the towers in place of an annual rental fee. Based on experience in Sweden, this approach worked well and avoided many of the British difficulties with obtaining wayleaves. The cost of the electrical work covering the transmission system and installation of generators in the powerhouses was estimated at £1,770,000, about one third of the total expense of the scheme.¹⁹

Operation of the new Irish electricity system was entrusted to a state-sponsored organization, the Electricity Supply Board, created by legislation in 1927. Early decisions by the Board were to sell directly to consumers and to acquire all existing electricity undertakings. These moves were opposed by the old established operators such as Dublin Corporation. "The ESB, however, backed by the government, regarded the proper development of a national electricity supply as something which should not be subject to municipal boundaries or local politics."²⁰ In the development of a national system the Irish Free State was twenty years ahead of Great Britain.

Preparing a national inventory of electricity undertakings was one of the early tasks of the Board. Four types of organisations generated and distributed electricity: authorised local authorities and authorised private companies (both types working under Electric Lighting Orders); permitted undertakings (working with permits issued by the Department of Industry and Commerce); and the Dublin United Tramways empowered under statute to generate electricity for the tramway system. The relative size of each of these types of undertaking is shown in **Table 1**.

Table 1 IRISH FREE STATE TYPES OF ELECTRICITY UNDERTAKINGS 1928/29.

	<i>NO.</i>	<i>STAFF</i>	<i>CONSUMERS</i>	<i>SALES (kWh)</i>	<i>% OF SALES</i>
<i>Authorised local authorities</i>	16	619	24,208	34,159,426	50.5
<i>Authorised private companies</i>	5	170	6,002	9,604,608	14.2
<i>Permitted undertakings</i>	157	292	13,915	5,253,486	7.7
<i>Statutory (Dublin United Tramways)</i>	1	-	-	18,559,466	27.6
<i>Total</i>	179	1,081	44,125	67,576,986	100.0

Source: Compiled from Electricity Supply Board *Annual Report* 1929, Appendix III.

Figure 2 and **Table 2** show more details of the electricity supply industry in the Irish Free State before the inauguration of the Shannon Scheme. The general pattern reflects the effects of 40 years of uncoordinated development. While the map appears to show widespread establishments supplying electricity, most were very small and of minor significance. The existence of so many establishments did, however, show the potential interest in local electricity supply which encouraged the efforts of the ESB in canvassing urban consumers.

¹⁹ *The Engineer*, Vol.144, 1927, p.618.

²⁰ Michael Shiel, *The Quiet Revolution: The electrification of rural Ireland* (Dublin: O'Brien Press 1984; reprinted 2003), p.21.

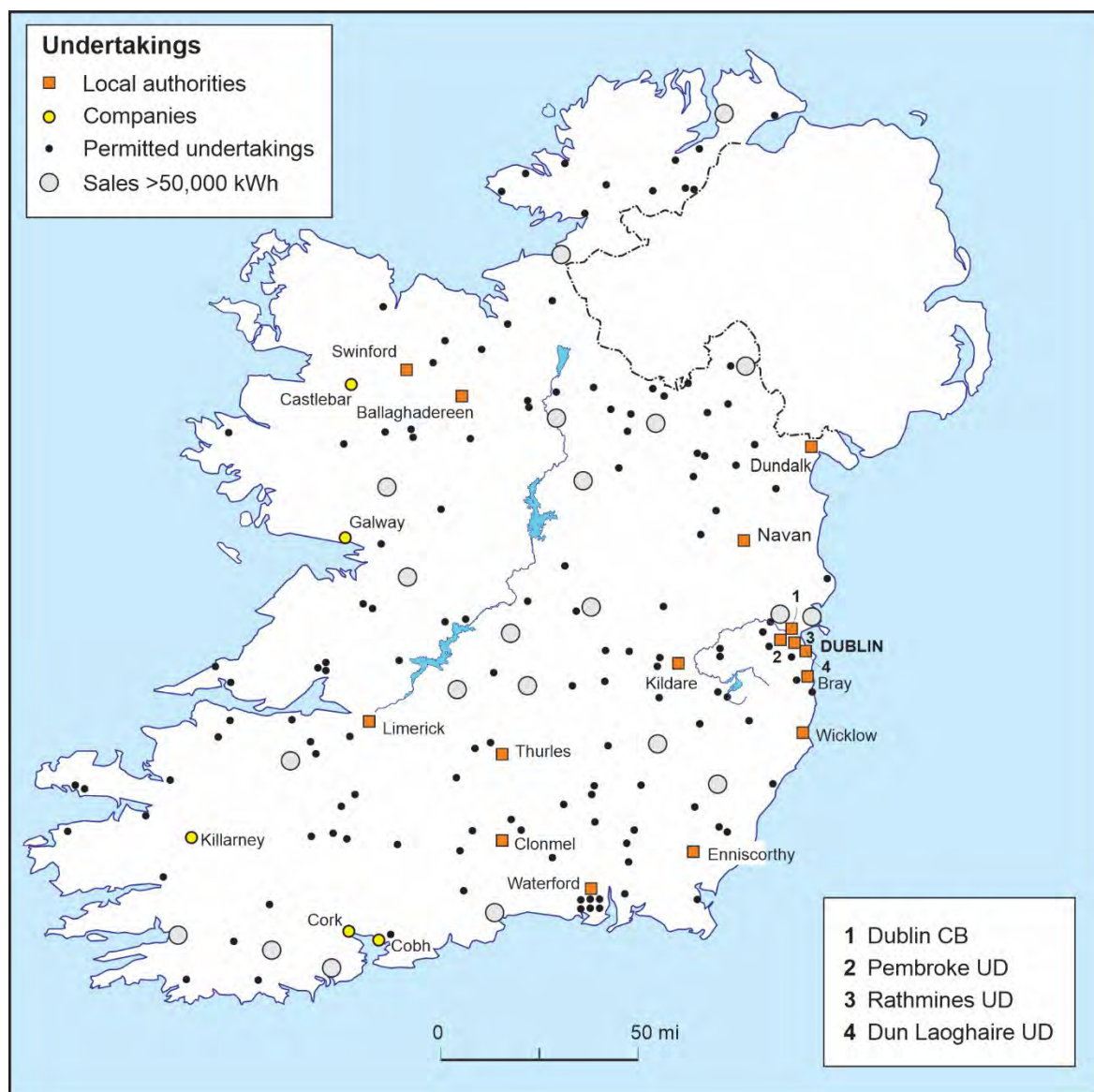


Figure 2 IRISH FREE STATE ELECTRICITY UNDERTAKINGS 1928-1929.

A very high proportion of the sales was concentrated in the Dublin area. In 1928/29 the four local authorities and the tramways company accounted for 73.3 percent of all national sales of electricity. The Cork Electricity Supply Co. accounted for another 13.6 percent, leaving only 13.1 percent to be divided among the other 173 undertakings.

Sixteen local authorities accounted for half the national sales. Eight of these had been operating in 1912; the rest in Clonmel, Dun Laoghaire, Enniscorthy, Navan, Swinford, Thurles, Waterford and Wicklow had been developed later. Dublin Corporation was clearly the largest organisation with a modern 50Hz AC system; the others were much smaller and mostly DC.

Table 2 IRISH FREE STATE ELECTRICITY UNDERTAKINGS 1928/29.

<i>UNDERTAKING</i>	<i>COUNTY</i>	<i>SYSTEM</i>	<i>GENERATING CAPACITY kW</i>	<i>PER CAPITA CONSUMPTION kWh</i>
<i>Authorised Local Authorities</i>				
<i>Ballaghadereen: Co Bd of Health</i>	Roscommon		?	31.8
<i>Bray UD</i>	Wicklow	DC	290	40.8
<i>Clonmel Corporation</i>	Tipperary	DC	260	16.6
<i>Dublin Corporation</i>	Dublin	AC	22,000	87.1
<i>Dundalk UD</i>	Louth	DC	1,080	83.4
<i>Dun Laoghaire UD</i>	Dublin	AC	375	18.9
<i>Enniscorthy UD</i>	Wexford	DC	90	11.5
<i>Kildare: Co Bd of Health</i>	Kildare		?	31.5
<i>Limerick Corporation</i>	Limerick	DC	590	24.5
<i>Navan UD</i>	Meath		?	26.8
<i>Pembroke UD</i>	Dublin	DC	1,840	68.4
<i>Rathmines UD</i>	Dublin	DC	1,930	19.2
<i>Swinford: Co Bd of Health</i>	Mayo		?	19.3
<i>Thurles UD</i>	Tipperary	DC	130	32.1
<i>Waterford Corporation</i>	Waterford		-	-
<i>Wicklow UD</i>	Wicklow	DC	60	4.1
<i>Authorised Private (Company)</i>				
<i>Castlebar : J. Burke & Sons Ltd</i>	Mayo		?	17.0
<i>Cobh : Cork ES Co</i>	Cork	DC	?	14.5
<i>Cork City : Cork ES Co</i>	Cork	DC	6,500	112.9
<i>Galway : Galway EL Co</i>	Galway	DC	?	30.5
<i>Killarney : Kerry ES Co</i>	Kerry	AC	?	24.7

Source: Electricity Supply Board, *Annual Report 1928/29*, Appendix III.

There were only five authorised companies, with Joseph Burke & Sons in Castlebar (Electric Lighting Order 1914) the only addition since 1912. The Cork Electric Supply Co., with operations in Cobh (renamed from Queenstown) and Cork City, was the largest company and operated a DC system.

Permitted undertakings were the most numerous type, with 157 listed in 1928/29.²¹ They were equivalent to the non-statutory companies in Great Britain and worked outside the limitations of the earlier electricity legislation. This kind of organisation had expanded rapidly after the First World War. Establishments in this group were very variable in size, ranging in sales from 988 kWh in Finglas, County Dublin (Mrs McDowell) to 156,626 kWh in Bandon, County Cork (Bandon Milling & Rolling Co.). Several places such as Bailieboro, County Cavan; Dingle, County Kerry; and Gort, County Galway; had two competing electricity suppliers. Waterford, where the corporation was struggling to develop a municipal system, had seven permitted undertakings that supplied only 29 consumers among them. Most of the undertakings used producer gas engines or diesel engines to generate DC power.

Limerick Corporation was the first local authority to be taken over by the Electricity Supply Board, on 31 May 1928. By the end of March 1929 another 11 local authorities had been acquired including all those in the Dublin area. Company operations in Castlebar, Cobh, Cork and Galway were taken over in 1930.

²¹ Electricity Supply Board (ESB) *Annual Report 1928-29*, Appendix III. Most details in the following pages have been derived from the ESB *Annual Reports* (available online).

The final acquisitions of the authorised undertakings were Navan (1931), Kildare (1933-34), Ballaghaderreen (1934-35) and the Kerry Electric Supply Co. in Killarney (1937-38). Permitted undertakings were also taken over by the ESB as the transmission system was extended.

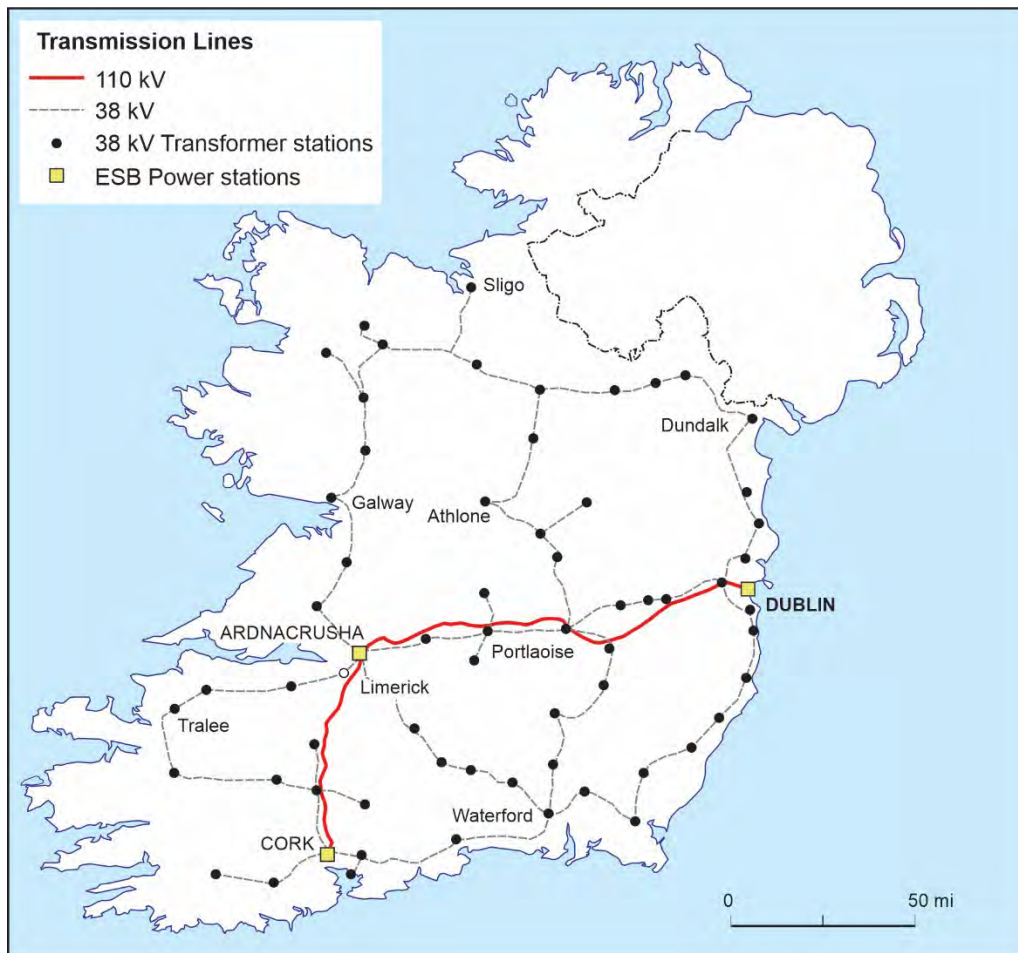


Figure 3 ELECTRICITY SUPPLY BOARD SYSTEM 1930-31.

The formal opening of the Shannon Scheme on 22 July 1929 began a total transformation of the supply industry from very fragmented establishments to a national system. The changes are reflected in the pattern shown in **Figure 3**. At the centre of the system was the hydro-electric power station at Ardnacrusha (capacity 63,000kW). Transmission lines, approximately 2,236 miles in length, radiated from here to serve most of the state. High-voltage lines (110kv) linked the power station to the main load centres of Cork and Dublin while a network of 38kv brought connections to other towns. Lower-voltage lines (10kv) provided service to other places in the urban hierarchy. By 1931, 151 towns had local distribution systems all connected to the national transmission grid.

While the generating and transmission grid had been built by Siemens-Schuckert, the ESB developed the local town systems in places which probably had no electricity or a very limited supply. From its

formation in August 1927, the ESB had grown from a very small organisation of 250 employees to one with 1,500 staff by 1931. The number of permitted undertakings had been reduced from 157 in 1929 to 115 in 1931—now mostly located in areas still beyond the lines of the ESB.

Generation which had been dispersed among many undertakings was now highly concentrated. In 1930/31, 91.8 percent of the electricity generated by the ESB (total 119,842,716kW) came from the turbines at Ardnacrusha. Many power stations were closed, including that of Dublin United Tramways, as the new hydro-electric plant became fully operational. Since County Donegal was beyond the 38kv transmission system, a small diesel plant (380kW) was opened in 1930 to serve the Letterkenny area.

By 1935/36 the ESB was a well-established organisation with a staff of 1,809 and operations across the country. Electricity was provided in 212 towns and villages (with populations of 30 or more). Sales had reached 187.4 million kWh and there were 111,700 consumers. Generation was concentrated in two stations with most of the output from Ardnacrusha (93,500kW).²² Pigeon House, Dublin (54,000kW), closed briefly in 1930, was being modernised and extended to balance the hydro-electric output which fluctuated with the flow of water in the Shannon catchment area. An abnormal and prolonged drought in 1933/34 had reduced output at Ardnacrusha by nearly 30 percent.

Ardnacrusha was the largest single hydro-electric power station in the British Isles when opened in 1929 and retained this position until 1950 when the Sloy station (130,000kW) was opened by the North of Scotland Hydro-Electric Board. The relative size of Ardnacrusha in 1935/36 is shown in this table:

Station	Owner	Capacity (kW)	Output (million kWh)
<i>Ardnacrusha</i>	Electricity Supply Board	93,500	211.4
<i>Rannoch/Tummel</i>	Grampian ES Co.	82,300	148.3
<i>North Wales (3 stations)</i>	North Wales Power	45,700	93.2
<i>Galloway (2 stations)</i>	Galloway Water Power	58,520	83.0

Three other stations were opened in Galloway during 1936, raising the capacity to 103,250kW.

The coal-fired station at Ringsend, Dublin (54,000kW) was similar in size to Yoker, Glasgow (52,000kW), owned by the Clyde Valley Electric Power Co. As an auxiliary to the hydro-electric plant, Ringsend generated only 31.6 million kWh, compared with 169.2 million kWh at Yoker which served as a base-load plant.

Figure 4 and **Table 3** are an attempt to show the geographical pattern of apparent consumption using data for the 12 ESB Districts in 1935/36.²³ The results illustrate the sharp contrasts between Dublin (per capita consumption 237.0 kWh) and the least developed Sligo District which had only 10.5k Wh. The very high rural populations in most Districts strongly influenced the low consumption levels outside Dublin and Cork.

²² Ardnacrusha accounted for 86.6 percent of output in 1935/36, Pigeon House for 12.9 percent. The remaining 5 percent was generated in Cork, Letterkenny and some stations, notably Tuam, recently taken over by the ESB (*Annual Report*, Appendix VIII).

²³ The ESB published sales statistics only for the whole national system. Apparent consumption, used here, shows the transfers of high-tension current to each ESB District. The results are slightly exaggerated since they take no account of distribution losses from the sub-stations to the consumers' meters.

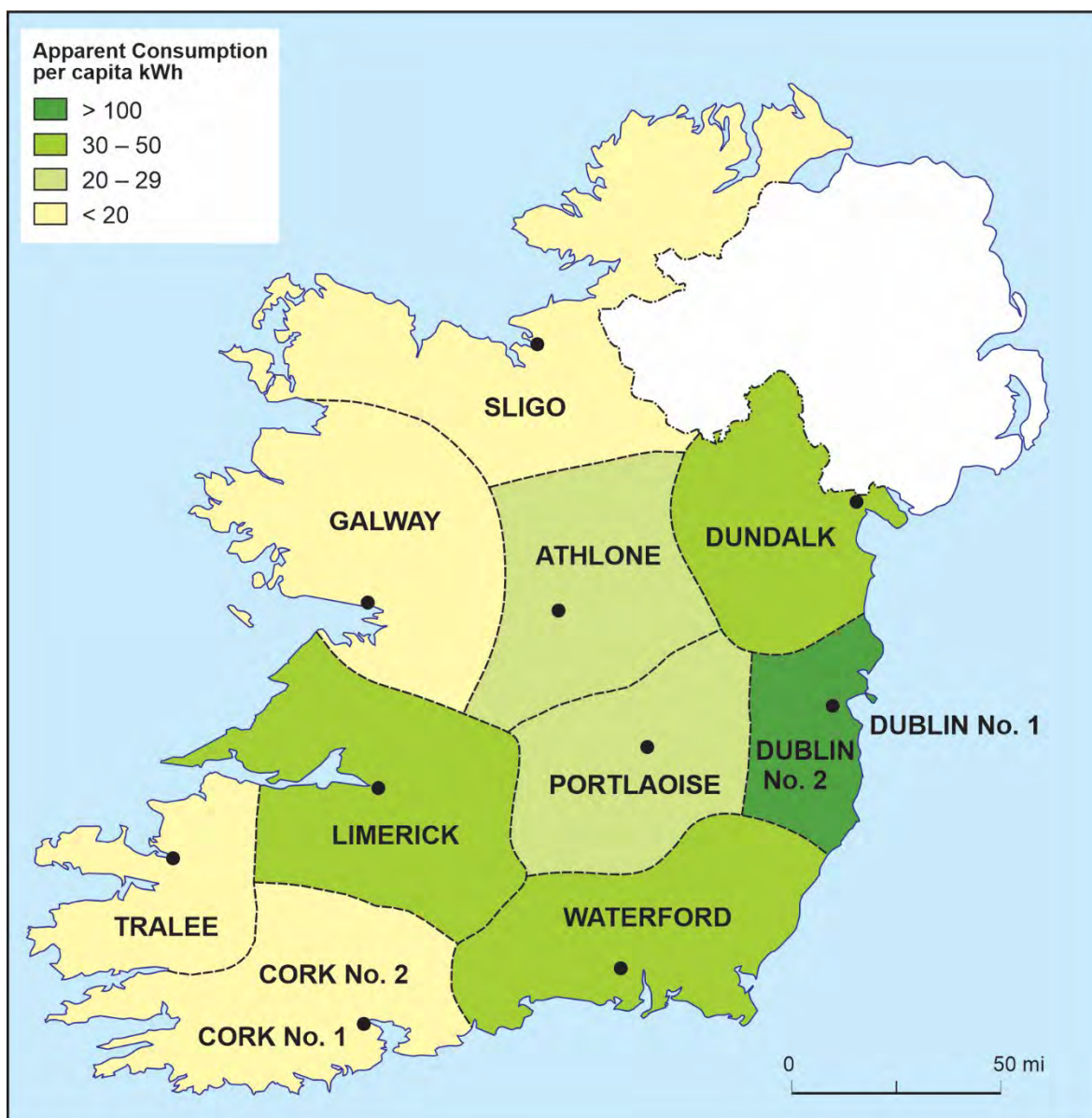


Figure 4 ELECTRICITY CONSUMPTIONS ESB DISTRICTS 1935-36.

The statistics also allow for comparison with other parts of the British Isles. Generally the Irish results were lower than for comparable areas in Britain where rural populations were small and industrial development substantially greater. Dublin had a similar population to Edinburgh (about 470,000) but its per capita consumption at 237.0 kWh was well below that of the Scottish capital at 406.3 kWh.²⁴ Cork and Ipswich (both with supply areas of 99,000 population) show similar differences with Cork at 233.9 kWh and Ipswich at 389.1 kWh.

²⁴ Details for Great Britain are taken from the Electricity Commissioners, *Engineering and Financial Statistics 1935/36*.

Table 3 IRISH FREE STATE APPARENT ELECTRICITY CONSUMPTION 1935/36.

<i>DISTRICT</i>	<i>kWh SUPPLIED AT HT¹ (000)</i>	<i>POPULATION 1936 CENSUS (000)</i>	<i>PER CAPITA kWh</i>
<i>Dublin No.1</i>	112,087	472.9	237.0
<i>Cork No.1</i>	21,080	99.0	212.9
<i>Athlone</i>	4,714	221.4	21.3
<i>Cork No.2</i>	3,695	256.9	14.4
<i>Dublin No.2</i>	17,532	172.5	101.6
<i>Dundalk</i>	8,547	263.7	32.4
<i>Galway</i>	4,473	304.5	14.7
<i>Limerick</i>	9,860	270.0	38.3
<i>Portlaoighise</i>	8,960	304.9	29.4
<i>Sligo</i>	2,992	285.6	10.5
<i>Tralee</i>	2,419	139.8	17.3
<i>Waterford</i>	8,348	189.9	43.9

Note: ¹ Excludes losses between primary high tension (HT) transformers and the consumer's meter.

Sources: Compiled from Electricity Supply Board *Annual Report* 1935/36, Appendix J; and 1936 Census, Volume¹.

Given the very high rural populations in the Irish Districts, it is difficult to find comparable examples, but two areas, one in Wales and the other in Scotland, had similar characteristics of recent electrification. The Tralee District had a similar population (about 125,000) to Dumfries and Galloway where electrification, outside the town of Dumfries, began only in 1930. By 1935/6 that region had a per capita consumption level of 95.8 kWh compared with 17.3 kWh in Tralee. The Waterford District's population of about 190,000 was similar to that of South West Wales.²⁵ Per capita consumption in Waterford at 43.7 kWh was however higher than in South West Wales which reached only 33.4 kWh in 1935/36.

The late 1930s was a period of growth for the ESB. The number of places served was increased from 232 in 1935/36 to 327 in 1939/40 as permitted undertakings were acquired and new places were connected to the grid. Consumer numbers rose from 103,037 in 1934/35 to 160,382 in 1938/39 and 200,419 in 1941/42. Sales more than doubled, from 156.9 million kWh in 1934/35 to 357.2 million in 1941/42. Growing demand was reflected in the revival of plans to develop the waterpower potential of the River Liffey.

Although Ireland was a neutral country in World War II, the effects of the conflict were severe. This was particularly evident in energy requirements which were subject to major restrictions in supply. Some details of the wartime energy crisis are noted in **Table 4**.

The sharp reduction in coal imports from 2.9 million tons in 1939 to 1.0 million tons in 1942 affected all users but particularly the town gas industry and railway operations as both activities depended on high-quality coal.²⁶ Electricity generation was also affected by declining coal imports. A major drought in 1942 restricted output from the Shannon while the limited supplies of poor-quality coal from Britain also reduced the ability of the Pigeon House station to make up the deficiency. Electricity generation by the ESB fell from 450.4 million kWh in 1941/42 to 413.7 million kWh in 1942/43. With this substantial decline in output, electricity rationing and other restrictions had to be implemented. Problems of supply in

²⁵ The supply areas of Milford Haven Urban District and the West Cambrian Power Co.

²⁶ Donal Clarke, *Brown Gold: A history of the Bord na Móna and the Irish peat industry* (Dublin: Gill & Macmillan, 2010). Chapter 3.

County Donegal, still isolated from the national network, did however lead to some cross-border relations. The Electricity Board for Northern Ireland provided a bulk supply at Strabane/Lifford in 1943 for the Letterkenny area.²⁷

Table 4 EIRE/IRELAND WARTIME ENERGY CRISIS.

	<i>Primary Energy Supply³</i>					
	<i>ELECTRICITY GENERATED¹ m kWh</i>	<i>PERCENT GENERATED BY IMPORTED COAL²</i>	<i>IMPORTED COAL m TONS</i>	<i>IMPORTED PETROLEUM PRODUCTS m GALLONS</i>	<i>PEAT m TONS</i>	<i>IRISH COAL m TONS</i>
1938	314.4	23.3	2.5	70	3.3	0.1
1939	377.6	23.7	2.9	67	4.2	0.1
1940	407.0	48.0	2.8	60	4.2	0.1
1941	435.8	40.0	1.5	38	5.7	0.2
1942	450.4	46.5	1.0	30	5.1	0.2
1943	413.7	28.9	1.0	25	5.1	0.2
1944	441.6	37.2	0.7	32	5.4	0.2
1945	404.9	30.2	0.9	63	4.7	0.2
1946	482.2	33.7	1.5	110	4.7	0.4
1947	570.3	35.3	1.7	133	3.8	0.2
1948	618.3	31.5	1.6	145	4.0	0.2

Notes:

¹ Annual reports, Electricity Supply Board.

² Generation at Pigeon House station, Dublin.

³ Donal Clarke, *Brown Gold: A history of the Bord na Mona and the peat industry in Ireland* (Gill & Macmillan, 2010), Table 3.2. p.45, Table 5.1. p.91.

Ireland was also cut off from its continental supplies of new equipment and spare parts. While work on the Liffey scheme was delayed, engineers were forced to use their ingenuity to fabricate replacement parts. All these wartime difficulties prompted more efforts at national self-sufficiency with planning for more hydro-electric development and the use of peat for electricity generation.²⁸

Growth and Development 1945-1959

Two major themes dominated the work of the Electricity Supply Board (ESB) after World War II. First was the development of new power stations to meet the rising demand. Most new stations would use local energy resources of water and peat to power the generators. Second was the extension of supply to serve rural areas where about 60 percent of the national population lived.

Figure 5 and **Table 5** show details of the five power stations operating in 1948/49. Generating capacity had been raised from 154,000kW in 1935/36 to 266,100 by extensions at Pigeon House and the completion of the hydro stations at Golden Falls and Pollaphuca on the River Liffey. The national transmission network had been expanded by 110kv lines from Ardnacrusha to Carrick-on-Shannon and from Dublin to Dundalk and Cork via Waterford. Some lesser extensions of the 38kv network had also taken place since the 1930s.

²⁷ Michael Shiel, *The Quiet Revolution* (2003), pp.96-97.

²⁸ P.G. Murphy, "Electricity supply in Eire", *Journal of the Institution of Electrical Engineers*, Vol.91(1), 1944, pp.89-94.

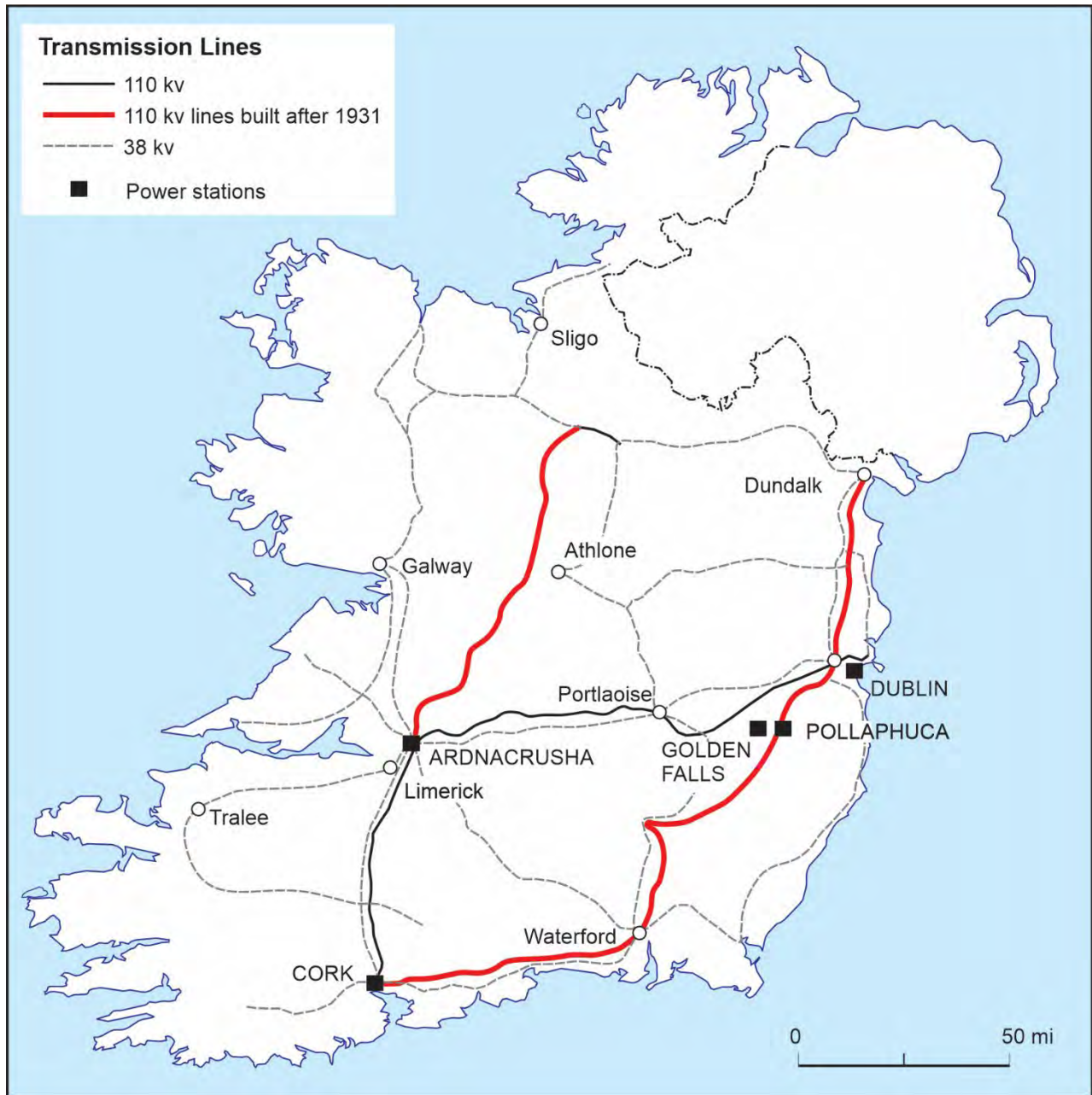


Figure 5 ELECTRICITY SUPPLY BOARD SYSTEM 1948-49.

Table 5 REPUBLIC OF IRELAND ELECTRICITY SUPPLY BOARD POWER STATIONS 1948/49.

<i>Hydro</i>	<i>River</i>	<i>Capacity kW</i>	<i>Year opened</i>
<i>Ardnacrusha</i>	Shannon	90,600	1929
<i>Pollaphuca</i>	Liffey	30,000	1944
<i>Golden Falls</i>	Liffey	<u>4,000</u>	1943
Total		124,600	
Coal-fired	County		
<i>Pigeon House</i>	Dublin	95,000	1903
<i>Cork (Albert Street)</i>	Cork	<u>6,500</u>	1898
Total		101,500	
GRAND TOTAL		226,500	

Source: Electricity Supply Board *Annual Report* 1948/49, Appendix VII.

Over the next decade from 1949 the ESB opened 18 power stations, adding 465,700kW to generating capacity. Nearly two-thirds of this capacity used local energy sources. Six hydro-electric stations were built (90,000kW). Leixlip completed the Liffey development and the resources of the River Erne (where most of the catchment area was in Northern Ireland)²⁹ and the River Lee in County Cork³⁰ were all harnessed for power generation.

Eight peat-fired power stations (166,200kW) made a distinctive contribution to electricity generation in the British Isles. This use of peat as a fuel had been pioneered by Sir John Purser Griffith noted earlier for his advocacy of hydro-electric development on the River Liffey.³¹ In 1924 he began mechanised turf extraction in the large bog at Turraun, County Offaly (purchased earlier in 1910) using German excavating equipment. Two miles of narrow-gauge railway together with an extensive electrical system were built, all powered by a peat-fired generating station. The plan to sell the dried turf in Dublin was unsuccessful and Griffith sold the property to the newly developed Turf Development Board in 1936. Turraun was used by the Board for research on peat and the development of machinery for harvesting.³²

The wartime electricity supply crisis gave new impetus to developing peat as a modern energy source. Bord na Móna,, established by the Turf Development Act 1946, began work on the bog at Portarlinton, first with a drainage scheme and then extraction with new purpose-built machines. Sod peat (10 inches x 3 inches x 3 inches) was excavated by mechanical diggers, then dried on the surface to reduce moisture content to around 30 percent. The dried turf was then transported to the power station by a network of light railways.³³ After further drying at the plant, the sods were burned on a conventional chain grate furnace to raise steam in the boilers. Three stations at Portarlinton, Allenwood and Lanesborough used this method of peat extraction and firing.

Ferbane power station and subsequent peat-fired stations used a different method. Milled peat, skimmed from the surface of the bog, was cheaper to produce, requiring only a short time for surface

²⁹ Michael Kennedy, "The realms of practical politics: North-South co-operation on the Erne Hydro-Electric Scheme, 1942-1957", Queens University Belfast, Centre for International Borders Research, Mapping Frontiers. Plotting pathways: Routes to North-South co-operation in a divided Ireland. Working Paper No.25, 2006.

³⁰ Kieran McCarthy and Seamus O'Donoghue, *Generations: Memories of the Lee hydro-electric scheme, County Cork* (Dublin: The Lilliput Press, 2008).

³¹ Ronald Cox, "Griffith, Sir John Purser", *Dictionary of Irish Biography*. Available online.

³² Donal Clarke, *Brown Gold: A history of the Bord na Móna and the Irish peat industry* (Dublin: Gill & Macmillan, 2010) pp.317-318.

³³ The process of peat extraction and the electrified light railway serving the Portarlinton power station were described in *The Engineer*, Vol.194, 1952, pp.253-254. See also: *Portarlinton generating station 1946-1988: a pictorial history* (Dublin: ESB, 2005).

drying. Although the calorific value of milled peat (3,370 Btu/lb at 55 percent moisture) was lower than sod peat (5,500 Btu/lb at 34 percent moisture)³⁴ this form of peat production became dominant from the late 1950s. Output of milled peat for electricity generation rose from 190,000 tons in 1956 to 1,461,000 tons in 1960. At the power station the milled peat was blown into the boiler furnace in the same way as pulverised coal.

As well as the large peat-fired stations, there were four small stations each with a capacity of 5,300kW. These were built in the west of Ireland and were fired by hand-won peat sods. Although the small stations were high-cost operations, they provided off-farm employment and contributed to local power supplies.³⁵

Peat-fired power stations made an important contribution to electricity generation, rising from 6.9 percent in 1950/51 to 36.0 percent in 1955/56. The relative costs of this output in 1958/59 varied from 3.32d per kWh at the small stations to 1.58d/kWh at Port Arlington (sod peat) to 1.03d/kWh at Ferbane (milled peat). Ardnacrusha, then 30 years old, was generating power at only 0.26d/kWh.

A small coal-fired power station at Arigua, County Roscommon (capacity 15,000kW) was opened by the ESB in 1958. Using the semi-bituminous fuel from the local mines, this station made a limited contribution (1.4 percent) to the national generation.

The development of local energy resources had a significant effect on power generation. In 1948/49, 41.3 percent of electricity generated was produced from local resources. By 1953/4 the proportion had increased to 68 percent. This proportion declined slightly to 64.5 percent in 1958/59 as imported coal and oil became cheaper and more readily available.³⁶

From the formation of the ESB in 1927, the primary goal was to electrify the towns and villages. For the larger places this had been mostly accomplished by 1940. Towns and villages, however, represented only 42.7 percent of the total population.³⁷ The other 57.3 percent at the time of the 1936 census (about 1.7 million people), living in rural areas were still largely without general electricity supply. Ireland had a much higher proportion of rural population than other parts of the British Isles.³⁸ Eight Irish counties in 1936 had over 80 percent of their population living in rural areas. The complex structure and dispersed nature of rural settlement presented many difficulties for any plans for widespread electrification.³⁹

Drawing on experience from Britain, Canada (notably the Hydro-Electric Power Commission of Ontario) and the United States, plans by the ESB were supported by the government as reflected in a White Paper 1944 and the Electricity (Supply) (Amendment) Act 1945. These authorised a rural electrification programme and provided a subsidy to help in promoting the scheme.

³⁴ The calorific values for the different kinds of peat were given in British Thermal Units for each power station. See Electricity Supply Board, *Generation and Transmission System* (Dublin, July 1958), 80pp. plus maps.

³⁵ The peat supply at these stations was not part of the Bord na Móna operations. Building these small stations was a political decision for social reasons. See: Donal Clarke, *Brown Gold* (2010), pp.142-143.

³⁶ Calculated from Central Statistics Office, *Statistical Abstract of Ireland*, various dates.

³⁷ Calculated from Table 9, Census of Ireland, 1936. Volume I. Towns and villages were defined to include all county burghs, municipal burghs, urban districts, places defined as towns in the Towns Improvement (Ireland) Act 1854 and clusters of 20 or more houses.

³⁸ Northern Ireland (1937 census) 47.0 percent, Scotland (1931) 30.6 percent, Wales (1931) 29.3 percent, England (1931) 19.4 percent.

³⁹ F.H.A. Allen, Kevin Whelan and Matthew Stout, eds. *Atlas of the Irish Rural Landscape* (Toronto: University of Toronto Press, 1997).

The ESB quickly established a separate Rural Electrification Office to organise and manage the scheme. At the core of the planning was the progressive development of small areas, each of which would have a network of lines linking all properties to the lower-voltage 10kv sections of the grid. Rural parishes which had some community of interest formed the basis of the small areas and 792 areas were defined. The most economically viable areas were selected first, after an initial canvas of residents had taken place. Once an area was accepted, a second canvassing followed. Details of the consumers shaped the costing of the project and the possible layout of the area scheme. After a detailed field survey, a work crew would begin erecting the poles, stringing the wires and installing the transformers. Private contractors installed all the indoor wiring. When all the work was completed, a formal switching-on ceremony was held, and the work crew would move on to another area. All stages were well publicised to maximise the number of people signing agreements to an electricity supply.⁴⁰

The first pole of the Rural Electrification Scheme was raised at Kilsallaghan, County Dublin on 5 November 1946. Work began on the second area at Patrickswell, County Limerick in February 1947. The annual reports of the ESB tabulated the programme of work on the scheme: 7 areas completed in 1947/48, 30 more areas in 1948/49, 60 areas in 1953/54 and an annual maximum of 90 areas in 1955/56. The final area (No.792) at Ballycroy, County Mayo was completed in April 1964. By this time over one million poles had been erected and some 296,000 new customers had been added. Electricity supply now reached 81 percent of rural Ireland. Work on extending the supply to the most remote areas continued until completion in the late 1970s.

Rural life was transformed by electricity: the oil lamps was replaced by the light bulb and the broom by the vacuum cleaner. Electric pumps removed the drudgery of carrying pails of water and a piped supply improved standards of health and sanitation.

Figure 6 and **Table 6** show the structure of generation and transmission facilities owned by the ESB in 1958/59. The pattern reflected a more complex organisation than a decade earlier. There were now 22 power stations using a mix of primary energy. Pigeon House, Dublin, now reduced to standby status, was still the largest plant. Five stations—Ardnacrusha, Erne, Ferbane, Ringsend and Marina--accounted for 76.8 percent of the electricity generated; all but the original Shannon station had been opened since 1949. Ringsend, Dublin and Marina, Cork (which replaced the original Cork station closed 1953/54) used imported coal and oil.

The national transmission system was extended in parallel with the generating stations. New 110kv lines connected the Erne power station to Dublin and via Carrick-on-Shannon to Drogheda. Other new lines at this voltage linked Ardnacrusha with County Mayo and Tralee. The 38kv network was also extended, especially in County Donegal, now finally connected with the rest of the system. Another significant extension now included the developing Shannon airport.

The period from 1945 to 1959 was one of substantial growth for the ESB. Sales of electricity grew from 319million kWh in 1944/45 to 1,540.4million kWh while the customer base expanded from 228,000 to 591,000. Eighteen power stations were built. The transmission network increased from 6,450.8 to 10,620.0 km and rural electrification added another 61,371 km of 10kv and low-voltage lines. To service

⁴⁰ Michael Shiel, *The Quiet Revolution* (reprinted 2003). See also: "Banishing the Banshee", (ESB, 1991),, a 47-minute film celebrating the 50th anniversary of the scheme. (Available on the ESB Archives website).

all these operations, the ESB staff rose from 2,444 in 1945 to 5,359 in 1959. The ESB was served by only one chairman from 1930 to 1960, R.F. Browne providing continuity and stability.⁴¹

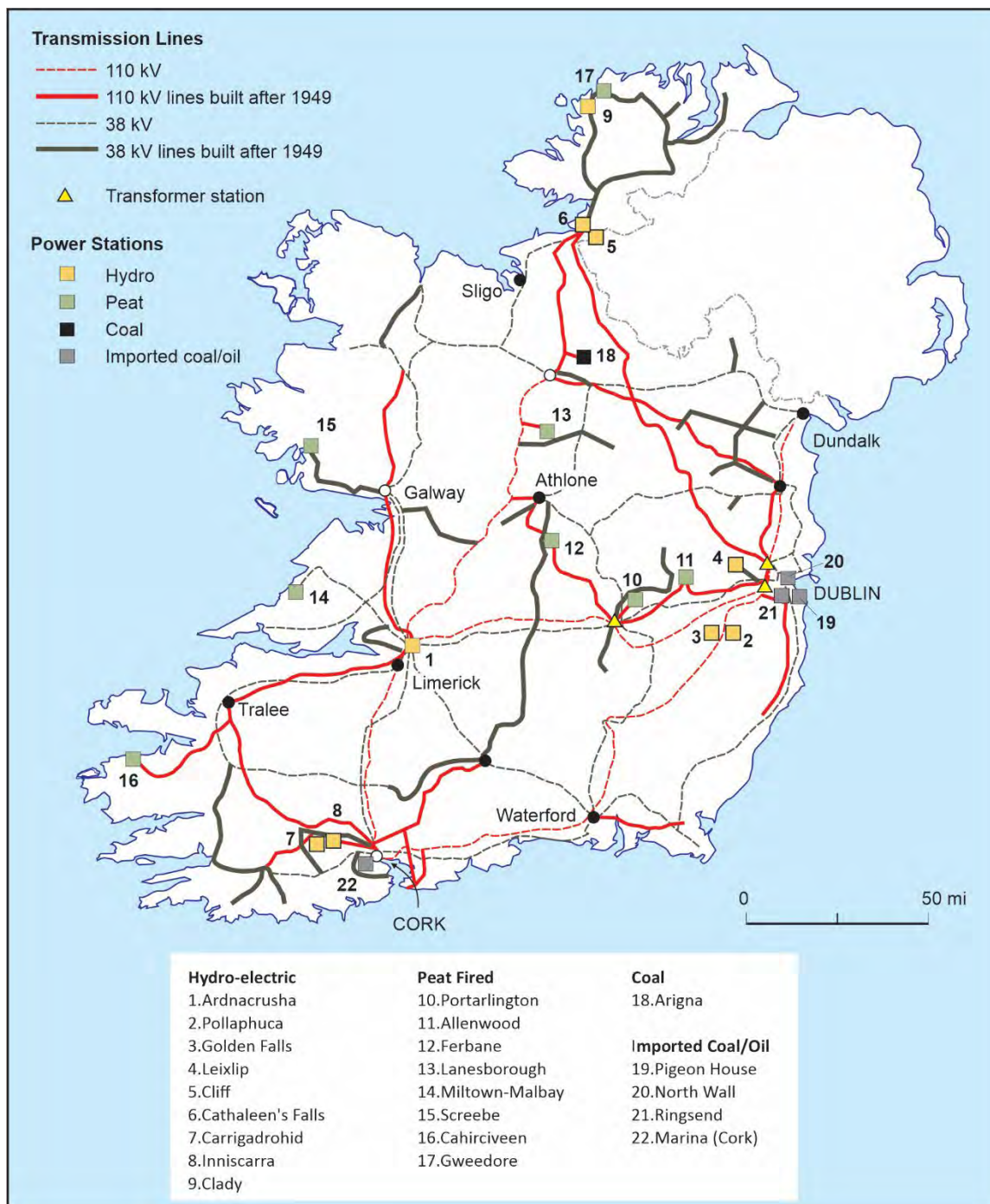


Figure 6 ELECTRICITY SUPPLY BOARD SYSTEM 1958-59.

⁴¹ Paucic J. Dempsey, "Browne, Richard Francis, 1892-1965", *Dictionary of Irish Biography* (Available online).

Table 6 REPUBLIC OF IRELAND ELECTRICITY SUPPLY BOARD POWER STATIONS 1958/59.

		<i>CAPACITY kW</i>	<i>COMMISSIONED</i>
Hydro-Electric	River		
<i>Ardnacrusha</i>	Shannon	85,000	1929
<i>Pollaphuca</i>	Liffey	30,000	1944
<i>Golden Falls</i>	Liffey	4,000	1943
<i>Leixlip</i>	Liffey	4,000	1949
<i>Cliff</i>	Erne	10,000	1950
<i>Cathaleen's Falls</i>	Erne	45,000	1951
<i>Carrigadrohid</i>	Lee	8,000	1957
<i>Inniscarra</i>	Lee	19,000	1957
<i>Clady</i>	Clady	4,000	1957
Sub-Total		209,000	
Peat-fired: machine-cut	County		
<i>Portarlinton</i>	Leix	25,000	1950
<i>Allenwood</i>	Kildare	40,000	1952
<i>Ferbane</i>	Offaly	60,000	1957
<i>Lanesborough</i>	Longford	20,000	1958
Sub-Total		145,000	
Peat-fired: hand-won	County		
<i>Milltown-Malbay</i>	Clare	5,300	1957
<i>Screeb</i>	Galway	5,300	1957
<i>Cahirciveen</i>	Kerry	5,300	1957
<i>Gweedore</i>	Donegal	5,300	1958
Sub-Total		21,200	
TOTAL		166,200	
Coal-fired	County		
<i>Avigna</i>	Roscommon	15,000	1958
Coal & Oil Fired			
<i>Pigeon House</i>	Dublin	95,000	1903
<i>North Wall</i>	Dublin	44,500	1949
<i>Ringsend</i>	Dublin	90,000	1955
<i>Marina</i>	Cork	60,000	1954
Total		289,500	
GRAND TOTAL		679,200	

Source: Electricity Supply Board *Annual Report* 1958/59, Appendix?

Figure 7 illustrates the general progress of electrification as reported in the 1961 Census. The question: "Is an electricity supply laid on to the dwelling?" was asked for the first time in an Irish census schedule.⁴² The final tabulations showed that 83.5 percent of all private dwellings had an electricity supply with the highest proportion in County Dublin at 97.1 percent and the lowest in County Leitrim at 49.5 percent.

⁴² The results were published in the 1961 Census of Ireland, Volume 6 (1964): Tables 22A, 22B, 22C, 23, 37. In previous censuses the questions on amenities of dwellings had always been about water supply and sanitary facilities. The electricity supply question was repeated in the 1971 census. British censuses never included any questions about electricity.

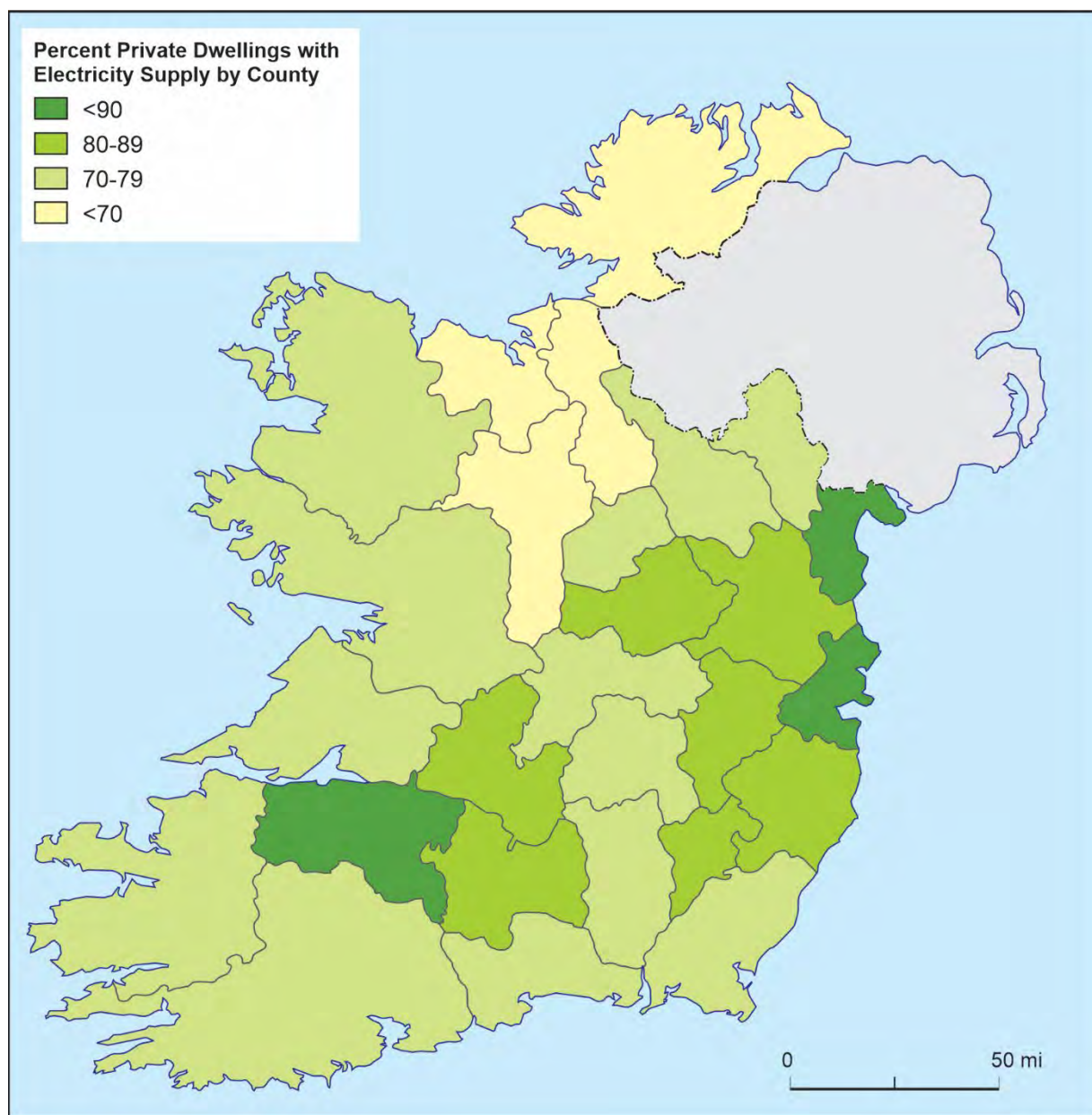


Figure 7 IRELAND: ELECTRIFICATION 1961.

Variations in the level of electrification for a group of counties are noted in **Figure 8**. All the towns in this region had over 90 percent of the private dwellings with electricity and two rural districts in County Limerick had reached this level. Three rural districts reported less than 60 percent—Ballyvaghan (49.3 percent) and Killadysert (23.8 percent) in County Clare and Glin (38.0 percent) in County Limerick. Further research is needed to explain the low values in some areas.

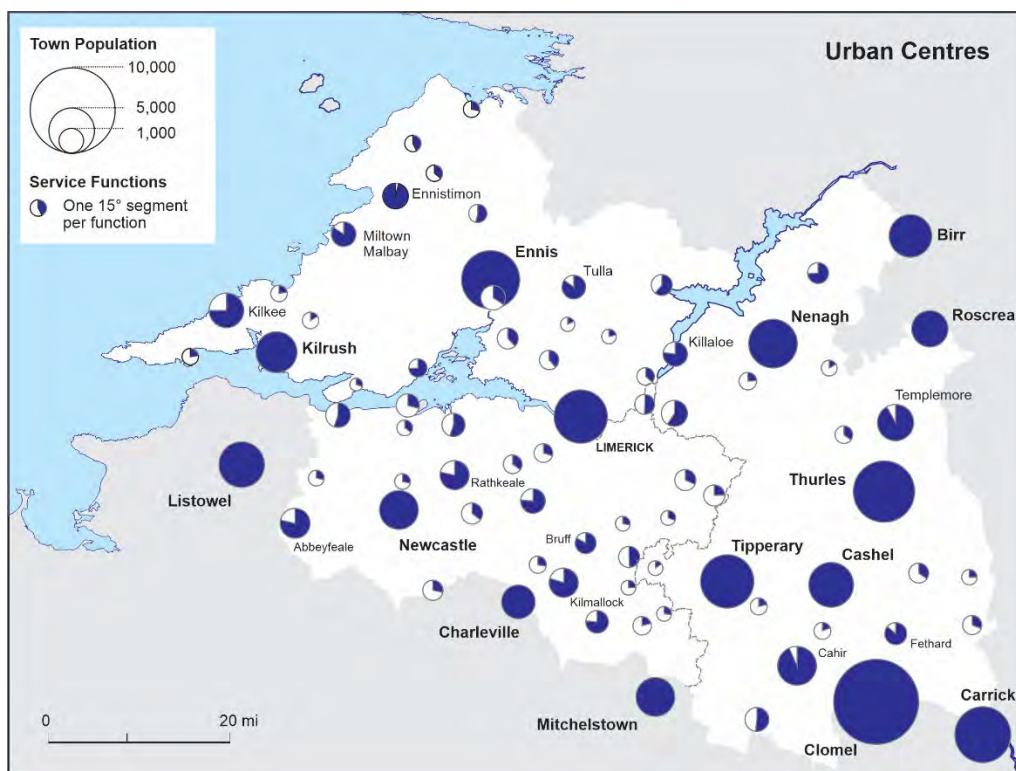
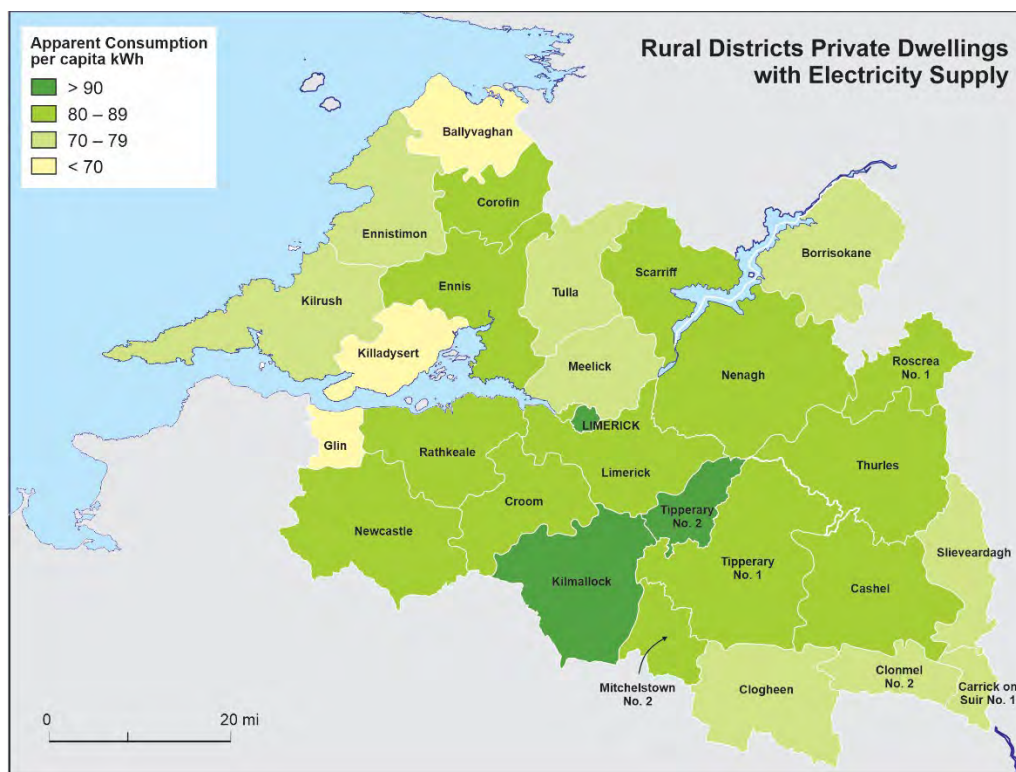


Figure 8 ELECTRIFICATION IN THE LIMERICK REGION 1961.

Summary

Ireland was early in developing a modern integrated national electricity system which came into operation in 1929-30. Before independence the growth of electricity supply had been limited and slow, especially outside the cities of Dublin and Cork. The new Irish Free State began investing in electricity as a means of reviving a divided and impoverished country. Legislation in 1925 authorised the contract with Siemens-Schuckert for building the Shannon hydro-electric scheme and a national transmission system. Further legislation in 1927 created the Electricity Supply Board which would not only operate the system but would also take over all electricity undertakings throughout the country.

Table 7 SUMMARY OF DEVELOPMENT IN THE IRISH FREE STATE/REPUBLIC OF IRELAND.

YEAR	NUMBER OF UNDERTAKINGS ¹	LOCAL AUTHORITY UNDERTAKINGS	NUMBER OF POWER STATIONS	GENERATING CAPACITY (kW)	PER CAPITA CONSUMPTION (kWh)
1900	8	4	8	..	..
1912	12	8	12	..	..
1928/29	21	16	21	40,000 ²	22.7
1935/36			3	154,000	63.0
1948/49	..	..	5	226,100	192.6
1958/59	..	..	22	689,700	534.6

Notes:

¹ Excluding all non-statutory and permitted undertakings.

² An estimate that does not include the Dublin United Tramways power station (capacity 9,650 kW).

The results of this state intervention were impressive (**Table 7**). Between 1930 and 1936 generation was concentrated in two stations, with the Cork plant on standby. Supply was provided in 212 towns and villages and per capita consumption was tripled.

Continued growth in demand was matched with further investment in generating capacity. An emphasis on local energy resources was reflected not only in nine hydro-electric schemes but also in the innovative peat-burning power stations that entered service from 1950. Shortly after the end of the war the Electricity Supply Board began a very ambitious programme of rural electrification which gradually transformed life and work in large parts of the country.

Electrification was a much slower process than the enthusiastic promoters of the 1920s expected. Much effort and expenditure were needed to reach out to potential consumers. The results of these efforts were reflected in the statistics gathered by the 1961 Census: 97.1 percent of private dwellings in urban areas were connected to an electricity supply. In rural areas the proportion was 71.1 percent and two-thirds of all dwellings on farms now had a supply of electricity. The 1961 Census also marked the beginning of a sustained growth of population in Ireland. By 1971 the population was slightly larger than in 1926; a decade later the population exceeded the 1901 total. The state development of electricity supply was certainly one of the factors in this economic and social revival.

Electricity in the Republic of Ireland from 1959

Since the 1960s the demography and economy of the state have been transformed. After generations of outward migration, the population grew from 2.88 million in 1966 to 4.76 million in 2016. Agricultural employment as a proportion of the total labour force declined from 31.1 percent in 1966 to 7.1 percent

in 2016 as new economic opportunities emerged. Urban places expanded from 46.4 percent of the population to 62.7 percent between the censuses of 1966 and 2016. Dublin City and County Dublin combined grew substantially in population from 795,000 to 1,345,000 over the same period.⁴³ Public transport in this metropolitan area was improved by the return of electric traction, first by the electrification of the suburban railway system (DART, 1984-) and then by two light rail transit lines (Luas, 2004-).

Table 8 COMPARATIVE ELECTRIC POWER CONSUMPTION kWh PER CAPITA.

	<i>REPUBLIC OF IRELAND</i>	<i>% OF UK</i>	<i>UNITED KINGDOM</i>
1960	695.0	28.8	2,412.1
1965	1,134.4	34.0	3,330.2
1970	1,750.9	42.0	4,166.9
1975	2,175.2	48.4	4,492.4
1980	2,868.3	61.2	4,683.9
1985	3,114.9	64.5	4,826.7
1990	3,767.5	70.3	5,356.5
1995	4,535.2	81.1	5,575.8
2000	5,796.0	94.8	6,114.5
2005	6,241.7	99.5	6,270.9
2010	5,927.8	104.0	5,700.8

Source: World Bank data.

All the measures of electrification showed substantial increases from the 1960s. **Table 8** illustrates the rise of per capita electricity consumption from 1960 to 2010.⁴⁴ The Republic which had a low level of consumption in 1960 achieved parity with the United Kingdom by 2010. Northern Ireland which traditionally had higher per capita consumption than the Republic became a laggard from the 1980s. In 2010 Northern Ireland's per capita consumption was 4,808.0kWh or only 84.3 percent of the United Kingdom.

Organisation

Three aspects of change in the Irish Republic are explored in the following sections: Organisation, Transmission and Interconnections, and Power Stations.

From its formation in 1927 until the late 1990s, the Electricity Supply Board controlled virtually every aspect of electricity supply in the Republic. Some details of the growth of the ESB are noted in **Table 9**.

The monopoly position was increasingly challenged by privatisation in Britain from 1990 and Northern Ireland from 1992 and by the adoption of liberalising policies for electricity markets by the European Union. A directive from Brussels in 1996 required that "...at least 26 percent of member countries' electricity sales should be open to competition."⁴⁵

⁴³ Population statistics from Census of Ireland 1966 and 2016.

⁴⁴ Electric power consumption (kWh per capita) from World Bank data online at www.data.worldbank.org

⁴⁵ European Parliament, "Internal Markets in Electricity", Directive 96/92EC, December 1996.

Table 9 ELECTRICITY SUPPLY BOARD, 1929-1959.

	<i>SALES m kWh</i>	<i>CUSTOMERS</i>	<i>STAFF</i>
1929/30	43.2	48,606	1,602
1939/40	318.6	172,545	2,328
1949/50	626.1	310,369	3,271
1959/60	1,692.2	610,946	5,451
1969/70	4,411.6	786,500	11,291
1979/80	8,560.3	1,043,428	11,912
1990 ¹	11,768.0	1,278,870	9,733
1995	14,699.1	1,407,772	9,442
1999	18,598.0	1,577,162	9,319

Note: ¹ Change to Calendar Year in 1980s.

Source: Partly based on *Annual Report 1995*, Appendix III, p.62. The last year for which these cumulative statistics were published.

This policy was implemented in Ireland by the Electricity Regulation Act 1999. A Commission for Electricity Regulation⁴⁶ was established and over the next seven years a new organisational structure emerged as parts of the former work of the ESB were taken up by other companies or independent agencies.

Among the many changes were:

Generation: The ESB was committed to reduce its share of generation to 60 percent by 2005.⁴⁷ This was achieved by the sale of some power stations and by new plant built by other companies.

Transmission: While the ESB continued to own and maintain the high-voltage system, operation of the grid was transferred to Eirgrid (a state-owned company) in 2006.

Distribution: All the lower-voltage lines and links with the final consumer were retained by the ESB but subject to the oversight of the Commission for Utility Regulation.

Supply/Sales: The ESB sold all its 120 retail outlets to the Royal Bank of Scotland in 2005 and was pledged to full market opening by 2007.⁴⁸ New entrants such as Bord Gáis became retailers of electricity. The ESB later established a separate retail operation as Electric Ireland.

The opening of the Single Electricity Market covering both parts of Ireland in 2007 was the culmination of the liberalising policies. A wholesale market was now in operation.

Concerns about global warming and climate change have added a new agency, the Sustainable Energy Authority (2002-). With a mandate to promote and assist the development of sustainable energy, its policies have had profound effects on the generation of electricity.⁴⁹

⁴⁶ When gas regulation was added, the official title was changed to Energy Regulation. The present name dates from 2017. See Commission for Regulation of Utilities, *Annual Report*, 2017.

⁴⁷ ESB, *Annual Report 2000*, p.10.

⁴⁸ ESB, *Annual Report 2005*, pp.3,10.

⁴⁹ The Sustainable Energy Authority has an extensive range of publications including: *Renewable Energy in Ireland*, 2019 Report, 52pp; *Energy Scarcity in Ireland 2020*, 93pp. These are available online at www.seai.ie

The Department of Environment, Climate and Communications is currently the supervisory body for most of the electricity sector.⁵⁰ Organisations under its aegis are:

- ESB Networks
- Eirgrid
- Commission for the Regulation of Utilities
- Bord na Móna
- Sustainable Energy Authority

During the two decades of profound organisational change in the structure of electricity supply, the ESB Group⁵¹ has successfully managed to retain its identity and develop new ventures. It has invested in Northern Ireland, building a new power station at Coolkeeragh and acquiring NIE Networks. ESB was a pioneer in developing CCGT power stations in Britain, at Corby in 1994. A much larger station at Carrington, Manchester, was opened in 2016. ESB Energy has also entered the very competitive British market as an electricity supplier. Another subsidiary, ESB International, has a significant place in global engineering consulting work with many projects.⁵² As one of the older electricity companies, ESB has also maintained its heritage with an impressive archive now housed in Dublin.⁵³

Transmission and Interconnections

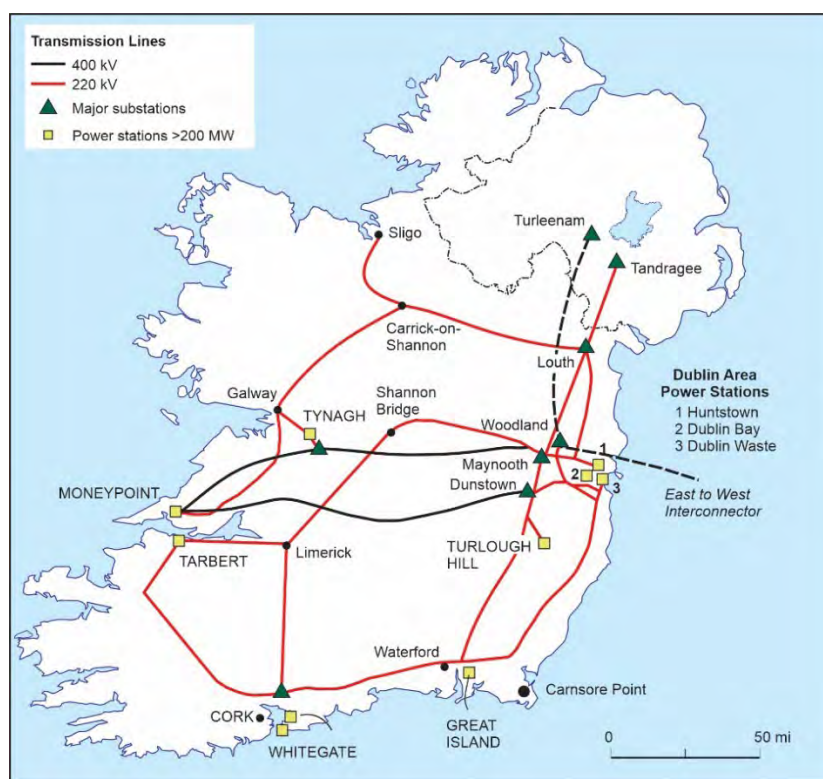


Figure 9 REPUBLIC OF IRELAND: MAIN TRANSMISSION LINES 2020.

⁵⁰ Department of Environment, Climate and Communications, *Annual Report 2020*, Appendix IV

⁵¹ ESB is a statutory company with 95 percent of the capital held by the state and the remaining portion held by an employees trust.

⁵² ESB International was formed in 1975 with a staff of 75; the consulting group now has offices also in the Middle East and Southeast Asia.

⁵³ The archives has a purpose-built centre opened in 2020 and supports a very extensive website that includes all Annual Reports since 1927/28. See www.esbarchives.ie

The original 110kv transmission grid begun in the late 1920s was reinforced 40 years later by a higher-voltage system at 220kv. This enhanced supply to Dublin, the major load centre of the ESB. A line from a new substation at Maynooth to Cork via Shannonbridge and Limerick was completed in 1967.⁵⁴ Further extensions in the 1970s connected with new power stations in the Shannon estuary and Waterford areas (**Figure 9**).

Further reinforcement was added in the 1980s at 400kv with two lines linking the new Moneypoint generating plant to the Dublin area. Two large substations were built at Woodland, County Meath and Dunstown, County Kildare.

An agreement for a cross-border interconnector was signed in 1967 and a line from Maynooth northward to Louth and then to Tandragee, County Armagh was brought into service in July 1970. Transformers at the Louth substation near Dundalk converted the different voltages of the two systems (220kv in the south, 275kv in the north). The interconnector with a capacity of 300mW had only a short life. Terrorist activity soon interrupted service and full power was not restored until March 1995.

The north-south interconnector was an essential part of facilitating the development of the Single Electricity Market. Planning for a higher-voltage line at 400kv which would have greater capacity began in 2007. The proposed line would connect with the substation at Woodland with the 275kv Northern Ireland grid at Turleenam, County Tyrone. Strong opposition has delayed any construction but there are hopes that work will begin in 2022.⁵⁵

The Woodland substation is also the Irish terminal of the East-West Interconnector opened in September 2012. This high-voltage DC cable (261 km) links with the British grid at Shotton in North Wales. With a capacity of 500MW, the cable connection allows for an interchange of power, improves reliability of the smaller systems, and underpins the competitive market structure.

Two other projects are in the planning stages. The Greenlink project, a private venture, proposes a link between the Great Island substation, County Wexford and the British grid at Pembroke, South Wales.⁵⁶ The 200-km cable will have a capacity of 500MW like its northern counterpart. With the planning stages completed the company expects to commission the line in 2024.

The Celtic Interconnector is a more ambitious project linking Ireland with France. With a capacity of 700MW, the 575-km cable will connect the Knockraha substation in County Cork with La Martyre substation in Brittany. The project is a co-operative scheme between Eirgrid and the Réseau de Transport d'Électricité (the operator of the French grid). A funding agreement with the European Commission was signed in 2020 and more detailed planning work is in progress with completion expected in 2026.⁵⁷

Operation of the grid transmission system was transferred from the ESB to the new state-owned company Eirgrid in 2006.⁵⁸ The detailed minute-by-minute control of power movement is the core function of Eirgrid. Other subsidiaries of the Eirgrid Group include the Single Electricity Market Operator

⁵⁴ ESB *Annual Report* 1967, p.12.

⁵⁵ Details of the project can be found on the Eirgrid website at www.eirgridgroup.com

⁵⁶ Details of the project can be found on the Greenlink website at www.greenlink.ie

⁵⁷ Eirgrid, *Celtic Interconnector: Connecting the electricity grids of Ireland and France* (2020). Available online.

⁵⁸ The ownership and maintenance of the transmission grid remains with the ESB. For details of the work of Eirgrid, see *Annual Electricity Transmission Performance 2019*, 45pp.

which manages the complex trading arrangements and SONI Ltd (the transmission system operator in Northern Ireland).

Power Stations

Development before Liberalisation

Generating capacity owned and operated by the ESB increased very substantially from 679 megawatts in 1958/9 to 4,600MW at the end of 1999. This growth reflected the increasing demand from Irish economic development. A wide range of primary energy inputs and technology was involved in planning and operating the power stations (**Table 10**).

Table 10 REPUBLIC OF IRELAND POWER STATION DEVELOPMENT 1958/59-1999.

	<i>COUNTY</i>	<i>COMMISSIONED</i>	<i>CAPACITY MW</i>
Hydro-Electric/Pumped Storage			
<i>Turlough Hill</i>	Wicklow	1974	292
Peat-Fired			
<i>Rhode</i>	Offaly	1960	80
<i>Bellacorrick</i>	Mayo	1962	40
<i>Shannonbridge</i>	Offaly	1964	125
Oil-Fired			
<i>Ringsend II</i>	Dublin	1966	180
<i>Great Island</i>	Wexford	1967	240
<i>Tarbert</i>	Kerry	1969	620
<i>Poolbeg¹</i>	Dublin	1971	510
Coal-Fired			
<i>Moneypoint</i>	Clare	1985	915
Gas-Fired			
<i>Aghada</i>	Cork	1980	270 ²
Closed Circuit Gas Turbine			
<i>Marina</i>	Cork	1979	96
<i>North Wall</i>	Dublin	1982	260
<i>Poolbeg</i>	Dublin	1994	463

Notes: ¹ Pigeon House B station in the planning stages. Converted to gas-firing 1984/5.

² Three 90MW Open Circuit Gas Turbines were added in the 1980s.

Source: ESB Archives

Hydro-electric development which had tapped most of the available resources was limited to the addition of one 10MW turbine at the Cliff power station on the River Erne. A pumped-storage scheme at Turlough Hill in the Wicklow Mountains, opened in 1974, was the last major hydro-electric project in the Republic. With a capacity of 292MW, the station was helpful in coping with peak demand especially in the Dublin area.⁵⁹

⁵⁹ F.H.A. Aalen, K. Whelan and M. Stout, eds. *Atlas of the Irish Rural Landscape* (Toronto: University of Toronto Press, 1997), pp.230-231.

NATURAL GAS IN IRELAND

This new source of energy revived the moribund town gas supply industry¹ and provided a basis for gas-fired electricity generation.

Gas Fields

The Kinsale Head gas field (50km offshore) was discovered in 1971. A terminal was built at Inch, County Cork and commercial operation began in 1978. Peak output was reached in 1995 and the field was finally abandoned in 2020. From the mid-1990s the output of Kinsale was supplemented by gas imports from Scotland.

Later exploration brought the discovery of the Corrib gas field (83km offshore) in 1996. Although work on the onshore facilities in Broad Haven, County Mayo began in 2004, local opposition caused many delays.² The terminal at Bellanaboy Bridge was eventually completed and gas began to flow into the national transmission network in December 2015.

Organisation

In preparation for the delivery of natural gas, legislation in 1976 created the Bord Gáis as a state corporation with powers to build transmission pipelines and distribution networks and sell gas directly to consumers. Given the high costs of converting equipment and appliances from town gas to natural gas, existing gas undertakings such as Limerick and the Alliance and Dublin company sold their operations to Bord Gáis.

Liberalisation policies in gas supply from 2003 resulted in a division of functions. Bord Gáis Energy Supply became the retail arm and Bord Gáis Networks operated the pipelines and distribution systems. Later changes included the sale of Bord Gáis Energy to Centrica Plc and the renaming of the state assets as Ervia and Gas Networks Ireland.³

Pipelines

As with electricity in the 1920s, the development of natural gas required substantial investment by the state in transmission pipelines from the gas fields to the major markets. The first trunk main, from Cork to Dublin, was laid in 1982. Other centres such as Limerick, Clonmel and Waterford were served by spur lines completed by 1986.⁴ A later spur line north of Dublin connected Drogheda and Dundalk to the network.

A second trunk line (350km) was built in 2002, westwards from Gormanston to Galway and then southwards, crossing the Shannon estuary to link up with the Limerick spur line at Bruff.⁵ This pipeline allowed the development of the isolated CCGT power station at Tynagh, using a disused lead-zinc mine site. Later work extended the pipeline from the Galway area to serve the Corrib gas field.

The first subsea pipeline, Interconnector 1, was completed in 1991 to reinforce the supplies from Kinsale Head gas field. This line connected with the British gas grid at Moffat in southwest Scotland. Interconnector 2, laid in 2003, added further supply to the Republic and to the Isle of Man and Northern Ireland via the South-North link completed in 2006.

Northern Ireland, without any indigenous gas resources, was also connected to the Scottish source in 1996, when a pipeline from Twynholm to Belfast entered service. A jointly owned line with ESB as a partner, was built in 2003/4 to provide supply to the new Coolkeeragh CCGT power station as well as to Londonderry. The South-North connector (2006) from Gormanston brought additional supplies. The most recent development has been the construction of the pipeline to serve Omagh and Enniskillen.⁶

Notes:

¹ The number of gas undertakings in Ireland from 76 in 1932, to 52 in 1958 and only 21 in 1982. See: Charles J. O'Sullivan, *The Gasmakers: historical perspectives on the Irish gas industry* (Dublin: T. O'Brien Press, 1987), p.148.

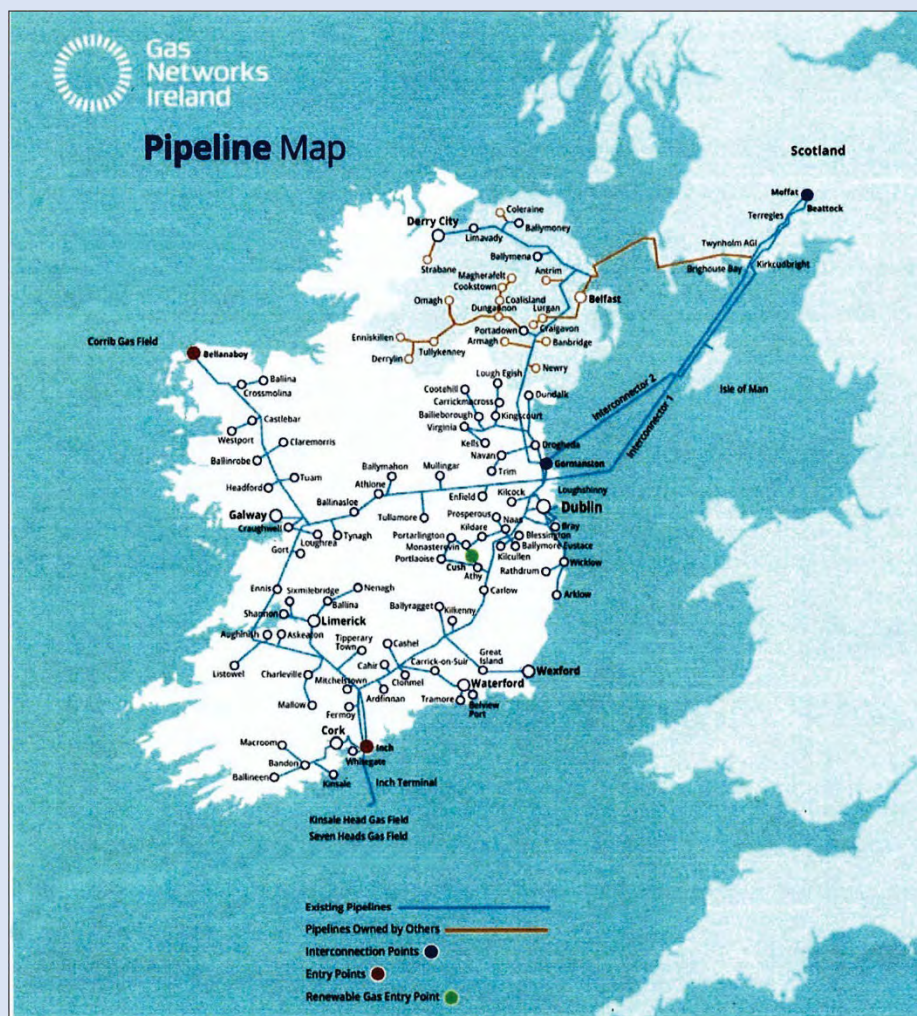
² See: Amanda Slevin, *Gas, Oil and the Irish State: Understanding the dynamics and conflicts of hydrocarbon management* (Manchester: Manchester University Press, 2016).

³ Ervia, Annual Report 2014.

⁴ O'Sullivan, *The Gasmakers* (1987), p.194.

⁵ www.RPSGroup.com, Projects: "Gas Pipeline to the West".

⁶ www.gastothewest.com Project details 2020. SGN Natural Gas owns and operates the 250-km trunk main and will operate the 500-km networks being constructed in other towns.



Source: *Energy Security in Ireland 2020 Report*, p. 36.

Peat-fired power station development ended in the 1960s with the completion of generating stations at Rhode, Bellacorrick and Shannonbridge. In 1963, when ten peat-fired stations were operating, their output represented 40.6 percent of all electricity generated.⁶⁰

Faced with the limitations of native energy resources, the next phase of ESB expansion was based on imported oil. Four stations, beginning with an extension of Ringsend, were opened between 1966 and 1971. Oil-fired generation accounted for 45 percent of total output in 1969 and 65 percent in 1973.⁶¹ The Middle East energy crisis later that year resulted in fuel-oil prices rising fivefold.

Ireland's vulnerability in the supply of imported energy prompted interest in nuclear power as an option for electricity generation. A Nuclear Energy Board had been formed in 1971 and some ESB staff had been training in nuclear operations at Harwell and Windscale in Britain. Prompted by the oil price shock, the government announced on 23 November 1973 that it had given the go-ahead for planning a nuclear station. Carnsore Point, County Wexford, was chosen as the best site for a 500MW station. Detailed

⁶⁰ Calculated from Table 363, *Statistical Abstract of Ireland 1963* (Dublin: Stationery Office, 1963), p.335.

⁶¹ ESB, *Annual Report 1973-74*, p.5.

plans were made and public inquiries held, but strong opposition and the high capital cost brought any development of the site to an end by 1981.⁶²

ESB staff then turned to the use of imported coal. Moneypoint, opened in 1985 near Kilrush, County Clare, was the largest station built by the ESB. The deep-water site allowed access for bulk carriers of 250,000 deadweight tonnes that could deliver coal from the cheapest world suppliers. In 1990 the station's output represented 44 percent of all electricity generated.⁶³ At peak output the station consumed 7,000 tonnes of coal per day or about 2 million tonnes per year.

When natural gas became available from the Kinsale field in the late 1970s, the ESB was an early adopter of the new energy source. The first use was in the Cork area where a Closed Circuit Gas Turbine (CCGT) unit (96MW) was added to the Marina power station. Opened in 1979, this was a pioneer CCGT operation, ten years ahead of Britain. The Aghada station, close to the pipeline terminal at Inch, was completed in 1980 with gas providing the energy for conventional steam turbines.

As the supply was extended to Dublin, gas became a major source of energy for the power stations in the harbour area. The older North Wall station was partly rebuilt as a CCGT plant in 1982 and Poolbeg was converted from oil-firing to gas in 1984/85. A new CCGT plant was built adjacent to Poolbeg and commissioned a decade later.

In 1999, at the end of its 70-year monopoly of electricity supply, the ESB owned 23 power stations with a total capacity of 4,017MW.⁶⁴ The four gas-fired stations represented 35.5 percent of the total. Hydro-electric stations, once the foundation of the Board, now accounted for 12.7 percent of the generating capacity.

Development after Liberalisation

Thirteen power stations were built between 2000 and 2015 (**Table 11**), six by the ESB and seven by independent companies. Under pressure for a more competitive system, the ESB later sold the two Open Circuit Gas Turbine stations at Tawnaghmore and Rhode together with the oil-fired stations at Great Island and Tarbert. Endesa, a Spanish utility company, bought these assets in 2009 and made plans for a CCGT station at Great Island. In 2012 the company withdrew from the Irish market and the four stations were acquired by SSE.⁶⁵

⁶² See: Veronica McDermott, *Going Nuclear: Ireland, Britain and the campaign to close Sellafield* (Dublin: Irish Academic Press, 2008), pp.135-139, 151-155, 164-168.

⁶³ ESB, *Annual Report 1989-90*, p.65.

⁶⁴

	No.	Capacity (MW)
<i>Hydro</i>	9	220
<i>Pumped storage</i>	1	292
<i>Peat</i>	6	425
<i>Coal</i>	1	915
<i>Oil</i>	2	740
<i>Gas</i>	4	1,425
<i>Totals</i>	23	4,017

⁶⁵ A merger of Scottish Hydro-Electric and Southern Electric in 1998. The Scottish company, earlier the North of Scotland Hydro-Electric Board, had some similarities with the ESB.

Table 11 REPUBLIC OF IRELAND POWER STATION DEVELOPMENT FROM 2000.

	COUNTY	FIRST COMMISSIONED	CAPACITY MW	OWNER
Peat				
<i>Edenderry</i>	Offaly	2000	118 ¹	Bord na Móna
<i>Lough Ree</i>	Longford	2004 ²	110	ESB
<i>West Offaly Power</i>	Offaly	2004 ²	135	ESB
Municipal Waste				
<i>Dublin Waste</i>	Dublin	2014	61	Covanta
Closed Circuit Gas Turbine				
<i>Huntstown I and II</i>	Dublin	2002/7	742	Independent
<i>Dublin Bay</i>	Dublin	2002	403	ESB
<i>Tynagh</i>	Galway	2006	400	Independent
<i>Aghada</i>	Cork	2010	435	ESB
<i>Whitegate</i>	Cork	2010	444	Bord Gáis
<i>Great Island</i>	Wexford	2015	431	SSE
Open Circuit Gas Turbine				
<i>Tawnaghmore</i>	Mayo	2003	104	SSE
<i>Rhode</i>	Offaly	2005	104	SSE
<i>Sealrock</i>	Limerick	2005	161	Independent

Notes: ¹ Partly converted to biomass. Two 58MW gas turbines (OCGT) added 2000.

² Closed in December 2020.

Edenderry Power, with a peat-fired station commissioned in 2000, was the first of the new entrants. The company was sold to Bord na Móna in 2006 and much of the peat-burning capacity was later converted to biomass. Two open circuit gas turbines were also added. The ESB stations were built as replacements for the early peat stations at Lanesborough and Shannonbridge. Both had a short life, being closed at the end of 2020.

The Dublin waste plant was developed by Covanta, a multinational corporation based in the United States. It was built on part of the site of the former Ringsend power station.

Huntstown in north Dublin was the first large independently owned CCGT station when opened in 2002. The isolated Tynagh station in County Galway redeveloped an earlier lead-zinc mine (1965-1981), using the water-filled open-pit workings for cooling the condensers. Whitegate power station was developed by Bord Gáis and located close to the oil refinery where distilled products could supplement natural gas supplies. The thermal efficiency of this plant, at 58.5 percent, was a notable example of CCGT technology.⁶⁶ Great Island, completed by SSE Thermal in 2015, used the site of the former oil-fired station built in the 1960s.

⁶⁶ "Whitegate Project", Jones Engineering Group, Dublin. Conventional power stations' thermal efficiency in the 1970s were commonly in the 30-33 percent range. Ballylumford B, an oil-fired station recently completed, had a thermal efficiency rating of 31.1 percent in 1977 (*Electricity Supply Handbook*, 1978).

Sealrock was built by Aughinish Alumina to supplement the power needs of Europe's largest alumina refinery (1983-) where bauxite is converted into alumina before refining into aluminium. Surplus power is sold to the grid.

While new entrants in thermal generation brought competition, it has been the emergence of wind power that has transformed the nature and structure of electricity supply. The first wind farm in Ireland, a small unit at Bellacorrick, County Mayo, built by Bord na Móna, opened in 1992. Capacity grew modestly to 493 MW in 2005 and then more quickly to 1,390MW in 2010, 2,451MW in 2015 and 4,351MW in 2020. All but 25MW at Arklow Bank has been developed onshore. By 2020 there were about 332 wind farms in the Republic. Much of this development has stemmed from policies and incentives organised by the Sustainable Energy Authority established in 2002.

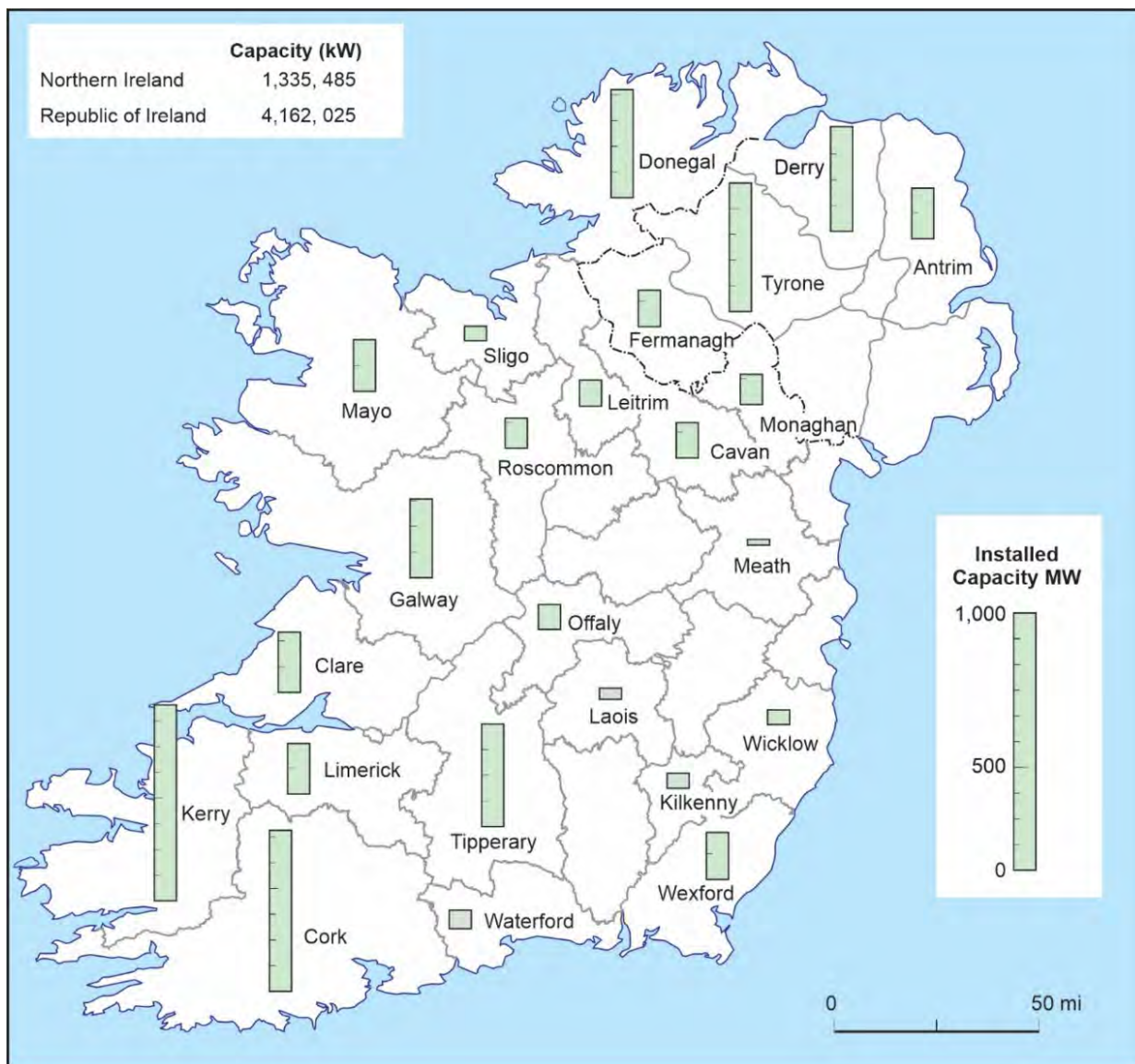


Figure 10 WIND FARM GENERATING CAPACITY 2020.

One of the very notable features in this shift has been the creation of dispersed pattern (**Figure 10**). Before liberalisation of the market, electricity generation in Ireland was concentrated in about 30 plants. By 2020 generation was scattered across the country in about 360 different operations, with many variations in size.

Table 12 REPUBLIC OF IRELAND ENERGY SOURCES USED IN ELECTRICITY GENERATION (PERCENTAGES).

	COAL	OIL	PEAT	GAS	WIND	OTHER RENEWABLES	TOTAL
2005	23	12	9	42	4	3	100.0 ¹
2020	2	1	3	51	36	7	100.0

Note: ¹ Includes remainder of 7 percent (imports of electricity). There were nil imports in 2020.

Source: Sustainable Energy Authority, *Energy in Ireland 2021 Report*, Table 12, p.40.

As illustrated in **Table 12**, the dominance of fossil fuels used in electricity generation has declined from 86 percent in 2005 to 57 percent in 2010. Wind power in this period grew from 4 percent to 36 percent. Further development of renewables is likely to reduce fossil fuels still further.

Unlike many former state electricity organisations, the ESB Group has managed to retain a strong identity and presence in electricity supply. Although Eirgrid has taken over the detailed operation of the transmission grid, the ESB owns and maintains all the wires and cables. The company also owns the transmission system in Northern Ireland. In 2020 the ESB owned power stations with an installed capacity of 5,638 MW, with a third of this capacity in Great Britain and Northern Ireland.⁶⁷ Much of the focus of new investment is now on wind power, not only in the Republic but also in other parts of the British Isles.

Note on Sources

The Electricity Supply Board is now one of the older organisations in the industry with a continuous record of annual reports and accounts from 1928. These are invaluable sources for any study of electricity in Ireland. In addition to the main activities of the Board, the annual reports also include many details about the permitted undertakings that were so important in the earlier stages of electrification. The appendices include maps of the transmission system from 1948 and until 1952 these also showed the lower-voltage 10kv lines.

The ESB has built up a substantial archive collection which is housed in a new building (opened in January 2020) at St Margarets Road, Finglas, Dublin 11.

Many items are also available on the ESB Archives website www.esbarchives.ie Major sections of the website cover:

- Shannon Scheme (39 four-page Progress Reports from Siemens-Schuckert 1926-1929 are included here);
- Rural Schemes (the interactive map and database “How the ESB electrified Ireland” are particularly innovative);

⁶⁷ ESB, *Sustainability Report 2020*, p.53.

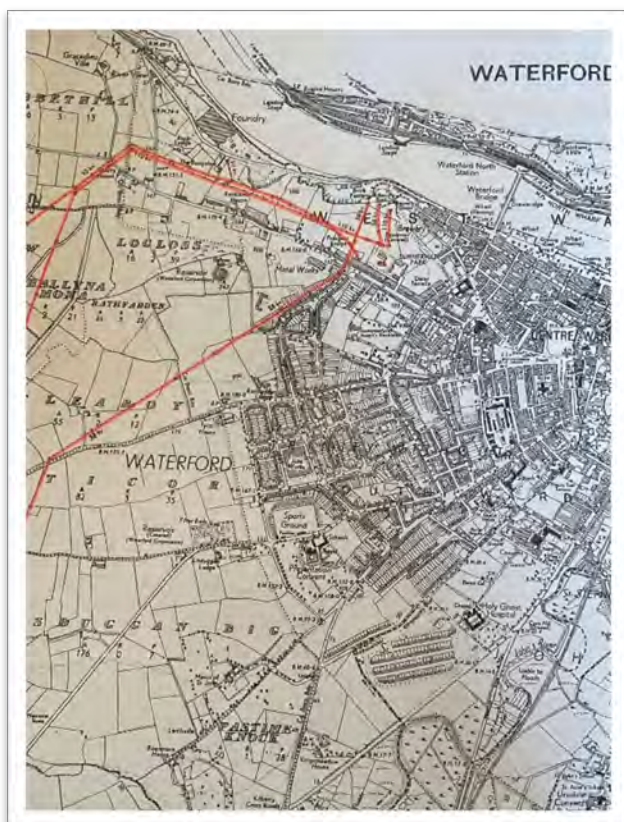
- Generation (details of power stations);
- Advertisements;
- Film (The film “Forty light years from Parteen”, ESB/RTE documentary 1967, 45 minutes, celebrated the 40th anniversary and included an interview with Thomas McLaughlin and Patrick McGilligan);
- Publications including all the Annual Reports from 1928, copies of books sponsored by the ESB, and public relations pamphlets from the 1920s to the 1960s.

Public relations were regarded as an important early activity of the Board in promoting the uses of electricity. The archival collection and comprehensive website are a unique and continuing aspect of the ESB role in nation-building.

The Bord na Móna which was closely associated with the peat-fired generating stations of the ESB also has an interesting and rich website on all aspects of peat extraction and usage (www.bordnamonalivinghistory.ie). The Bord also sponsored the publication of Donal Clarke, ***Brown Gold: A history of the Bord na Móna and the Irish peat industry*** (Dublin: Gill & Macmillan, 2010).

Other sources include: Central Statistics Office, ***Statistical Abstract of Ireland***, 1931-

The resources of the National Library and National Archives probably contain additional details on electricity supply.

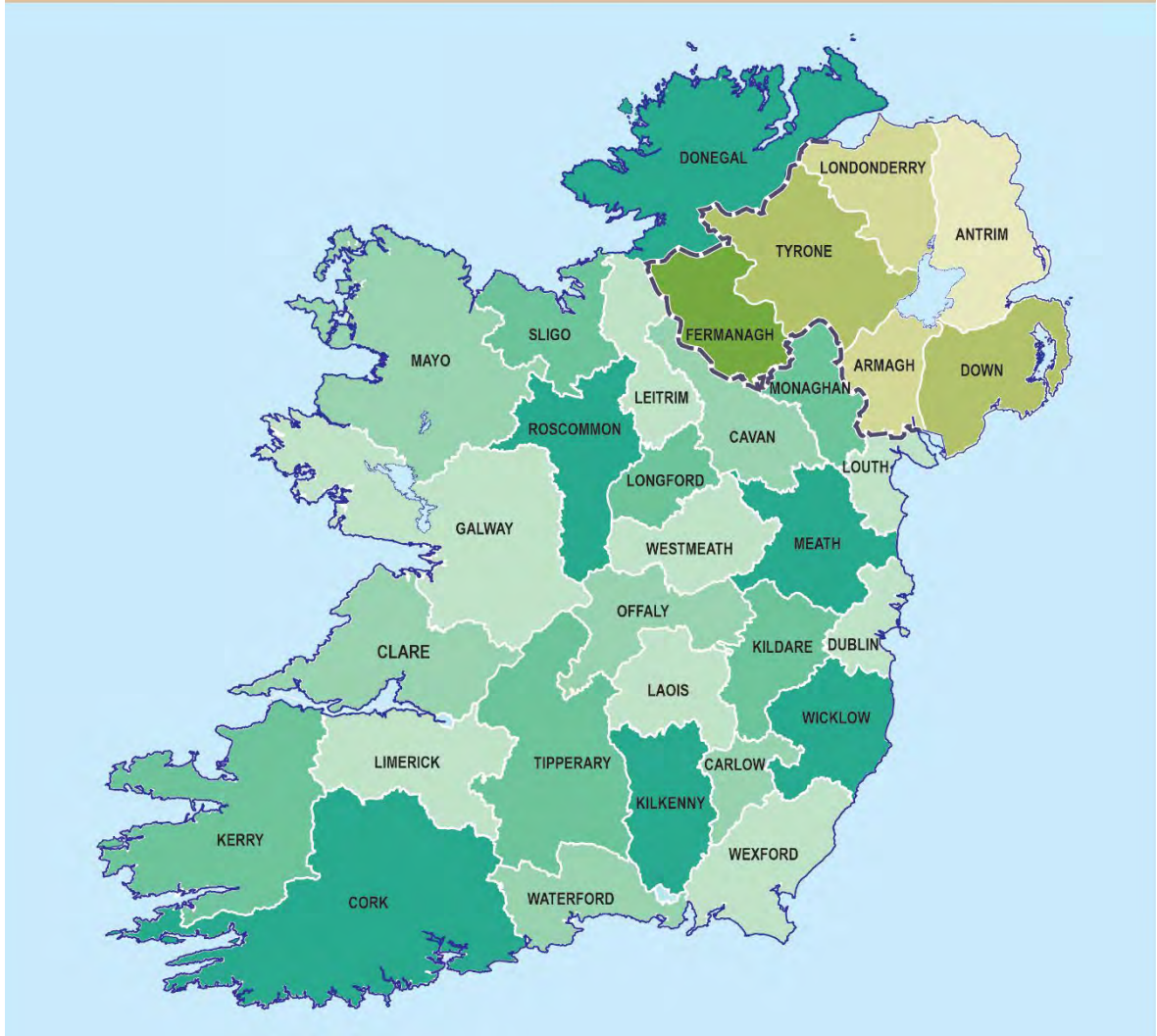


WATERFORD

Transformer stations, such as the one on Gracedieu Road, Waterford were the links to the national transmission system. The first lines (1929) at 38kv were reinforced by 110kv lines a decade later. Low-voltage 10kv lines provided supply to smaller towns and the later rural electrification schemes.

Ordnance Survey of Ireland, Six Inch Map Series, Waterford, 1950s revision (Author's collection).

ELECTRICITY IN IRELAND



PART THREE: NORTHERN IRELAND

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BELFAST

The East Bridge Street power station, opened in 1898, was extended later to service the electric tramway system. With a maximum capacity of 13,300kW in 1913, it remained in service until the late 1950s. From 1924 to 1936 the chimneys were used by the BBC for radio transmission.

Street map c.1960, scale 10 inches to 1 mile.

Northern Ireland

Section 1.2 of the Government of Ireland Act 1920 defined Northern Ireland as “...the parliamentary counties of Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone and the parliamentary boroughs of Belfast and Londonderry.”¹ Schedule 5 of the Act listed the constituencies for the election of members of Parliament—16 seats in Belfast, 32 in the counties and 4 for Queen’s University Belfast. The Act came into force on 3 May 1921, a General Election was held on 24 May and Parliament was opened by George V on 2 June. Forty of the seats were held by the Ulster Party (with 66.7 percent of the votes), the Sinn Fein took 6 seats (20.5 percent), and the Nationalist Party held the remaining 6 seats (11.8 percent). In all subsequent elections to 1969 the Ulster Unionists retained a majority.

With an area of about 5,240 square miles (18.4 percent of the united Ireland) the boundaries of the new state divided the old Province of Ulster and separated Londonderry from its traditional hinterland in County Donegal. The population of 1,250,000 (28.5 percent of the 1911 Census of Ireland) was similar in size to the city of Glasgow and its adjacent burghs. Results from the 1926 Census showed that Belfast County Borough (population 415,941) had 33.1 percent of the total with other urban places accounting for a further 17.7 percent. Manufacturing industry (38.8 percent of total employment) was dominated by textiles particularly linen and heavy engineering especially shipbuilding. While manufacturing industry was mostly located in or adjacent to the towns, the agricultural sector (26 percent of total employment) was widespread throughout the state.²

Electrification in Northern Ireland by 1920 was still very limited and mostly confined to Belfast and Londonderry with a scattering of small undertakings elsewhere. An outline of development after self-government is presented in three phases: local initiatives from 1922 to 1931, state intervention to the 1940s, and state co-ordination from 1948.

I Local Initiatives

The Electricity Commissioners in London had only a short period of influence in 1920 and 1921 before handing over their responsibilities to the new Ministry of Commerce in Belfast on 1 January 1922.³ A temporary power station of 12,000kW had been approved in 1920 at the Harland & Wolff shipyard providing power to Belfast Corporation while the Harbour power station was under construction. In the following year a loan of £246,000 was sanctioned for power station work in Belfast as well as approval of new generating stations to be erected in Lurgan Urban District (200kW) and for a non-statutory company in Ballycastle (25kW).

Unlike the Irish Free State which had grand plans for nation-building with a large-scale hydro-electric project, Northern Ireland’s Ministry of Commerce had only modest aims. A small unit called the Electricity Commissioners was formed in the Ministry to supervise the electricity supply industry.

¹ Government of Ireland Act 1920, 10 & 11 Geo 5, ch.67. For background on the framing of this legislation, see Cormac Moore, “The Government of Ireland Act 1920”, *History Ireland*, Vol.28 (6), 2020 (available online). Walter Lang (1854-1924), a staunch Unionist, had an important role in the drafting of the Bill.

² 1926 Census of Northern Ireland *General Report* (Belfast: HMSO, 1929) provides much detail on demographic and economic structure. Available online.

³ *Second Annual Report of the Electricity Commissioners 1921-22* (London: HMSO, 1922), p.66.



Figure 1 NORTHERN IRELAND: ELECTRICITY UNDERTAKINGS 1926/27.

Figure 1 shows the general pattern of development by 1926/27 when there were at least 36 electricity undertakings in operation.⁴ Belfast Corporation was by far the largest system which also included an extensive electric tramway network. Other municipal systems were located in Londonderry, Lurgan, Portrush and Portstewart. The other places were very small with many non-statutory companies. Companies were mostly local in capital and management. The Helens Bay company, established by the London electrical engineering firm of Johnson & Philips in 1924, was a rare example of outside influence.

⁴ The map was compiled from undertakings listed in the 1926/1927 index of *Garcke's Manual*. There were probably other companies not listed in this source. More research is needed.

The work of the Electricity Commissioners was generally confined to granting consents for new power stations and for Special Orders for some new places or the legitimising of non-statutory companies.

New development after 1927 included:

1. The provision of a bulk supply from Belfast to Lisburn in 1928 and in the following year the construction of an overhead line from Belfast to Lurgan and also one eastward to Holywood and Bangor. The Bangor Urban District (population 13,311 in 1936) only began a public electricity supply in May 1930.⁵ In 1931 the Belfast electricity supply area was extended to 54 square miles, more than double the size of the County Borough.⁶ This expansion of electricity supply had become possible after the opening of the Harbour power station (later renamed Belfast East) in 1923. Planning had begun in 1917 at the height of wartime demand. The station with an initial capacity of 27,000kW was designed by Sir John Snell and J.H. Rider of the London consulting firm of Preece, Cardew, Snell and Rider.⁷ The final completion of the plant was supervised by Johnstone Wright, appointed as Chief Electrical Engineer of Belfast Corporation in 1922.⁸ A new AC distribution system was also developed, with a network of rotary converter sub-stations feeding the existing mains. The conversion from DC to AC was a long process with final completion about 1961. Sales of electricity in Belfast rose from 31.6million kWh in 1923 to 68.5m kWh in 1931 and per capita consumption increased from 53kWh to 127kWh over the same period.⁹
2. The award of a large franchise area covering County Antrim and the eastern part of County Londonderry to the Antrim County Electricity Supply Co. in 1928 was the first step in larger-scale electrification. Early plans by the promoters for a barrage across the River Bann, about 16 miles north of the outlet from Lough Neagh, were suspended when government drainage schemes began to affect water levels. A proposed power station with four turbines (capacity 16,000kW) was abandoned and instead a bulk supply was to be taken from the Larne Company which built a new plant at Curran Point.¹⁰ Work on the distribution network for Antrim began in 1929.¹¹ By 1947, when the company was taken over by the Electricity Board for Northern Ireland, some 260 miles of 333kv transmission line had been erected. Sales in 1946/47 amounted to 27million kWh and some 14,500 consumers were connected.¹²
3. Although Johnstone Wright had prepared a comprehensive scheme for electrification throughout Northern Ireland in 1925, no government action was taken for another four years. In

⁵ *100 Years of Electricity in Northern Ireland: a short history from 1883* (Belfast: Northern Ireland Electricity Service, 1986), p.4.

⁶ Harold Briggs, *100 Years of Electricity in Belfast, 1895-1995* (Belfast: Northern Ireland Electricity plc, 1995), p.14.

⁷ Noted in the obituary of J.H. Rider (1864-1953) in *The Engineer*, Vol.196, 1953, pp.635-636.

⁸ Johnstone Wright (1883-1953) had earlier worked with Charles Merz as construction engineer with the Cleveland & Durham Electric Power Co., 1906-1919. After a short period in Bradford, he moved to Belfast and then, from 1927, to London. For the next 21 years he served the Central Electricity Board as Deputy Chief Engineer, Chief Engineer, General Manager and Chairman. Obituary in *Journal of the Institution of Electrical Engineers*, Vol.5, 1953, p.310.

⁹ Details from *The Engineer* Vol.149, 1930, pp.654-655.

¹⁰ Hugh D. Butler, *The United Kingdom: An industrial, commercial and financial handbook* (Washington: US Government Printing Office, 1930), p.905.

¹¹ "Electrical 'Ring Main' around Ulster", *The Times*, 21 August 1939, p.20; W. Cullen, "The electrification of Ulster," *Nature*, Vol.128, 1932, pp.717-718. The Antrim company became part of the British Electric Traction group in 1932.

¹² J.E. Jones, "The development of electricity supplies in Northern Ireland", *Journal of the Institution of Electrical Engineers*, Vol.96(1), 1949, pp.17-18.

1929 however, J.M. Kennedy¹³, a senior partner in the London consulting firm of Kennedy & Donkin, was commissioned to survey the potential for a regional electricity system for the area beyond the Antrim-Londonderry concession. The subsequent reports became the basis for a new phase of state intervention.¹⁴

Electricity generation in Northern Ireland was highly concentrated in Belfast which in 1930 accounted for 90 percent of installed capacity in the major power stations. (**Table 1**)

Table 1 NORTHERN IRELAND: MAJOR POWER STATIONS 1930.

UNDERTAKING	STATION	CAPACITY (kW)
<i>Belfast Corporation</i>	East Bridge St	13,300
<i>Belfast Corporation</i>	Harbour	60,750
<i>Londonderry Corporation</i>	Strand	5,000
<i>Larne EL&P Co.</i>	Curran Point	3,000
	Total	82,050

The small scale of other undertakings is illustrated by the following examples:

<i>Portadown Electricity Co.</i>	Co Armagh	500kW
<i>Portrush UDC</i>	Co Antrim	329kW
<i>Dromore EL&P Co.</i>	Co Down	184kW
<i>Donaghadee EL&P Co.</i>	Co Down	54kW
<i>Maghera (W.Fisher)</i>	Co Londonderry	25kW

Source: Garcke's Manual 1930/31.

II State Intervention

Noting the difficulties faced by the Antrim company in raising capital and informed by the Kennedy Reports, the government took action. The Electricity (Supply) Act (Northern Ireland) 1931 established the Electricity Board for Northern Ireland, a non-profit public corporation.¹⁵ As with the 1927 legislation in the Irish Free State, the Board was allowed to acquire undertakings and provide a supply to any

¹³ John Macfarlane Kennedy (1879-1954) had been active in various electric traction schemes in London before World War I. The firm was also a major consultant for several British grid schemes between 1926 and 1933. From 1934 he served as a member of the Electricity Commissioners becoming chairman in 1947. See obituary in *The Engineer*, Vol.198, 1954, pp.361-362. Kennedy's father had designed the original DC system for Belfast in the early 1890s.

¹⁴ The Reports were published as Command Papers. J.M. Kennedy, *Electricity Development: Scheme for the South-Eastern Area*, 1930. Cmd 122; J.M. Kennedy, *Electricity Development: Scheme for the Western Area*, 1930. Cmd 123. The reports are noted in Arthur Maltby, *The Government of Northern Ireland 1922-1972: A Catalogue and Breviate of Parliamentary Papers* (Dublin: Irish University Press, 1974), pp.74-76.

¹⁵ Outside observers were very positive about the Board. See Graeme Haldane, "The Central Electricity Board and other Electricity Authorities", Chapter 5 in W.A. Robson ed., *Public Enterprise: Developments in social ownership and control in Great Britain* (London: Allen & Unwin, 1937), pp.148-149.

consumer. C.R. Westlake¹⁶ was appointed chief engineer in 1932 and set to work on electrification. His previous experience with the innovative Dumfriesshire County Council rural electricity scheme proved invaluable in expediting work in Northern Ireland.

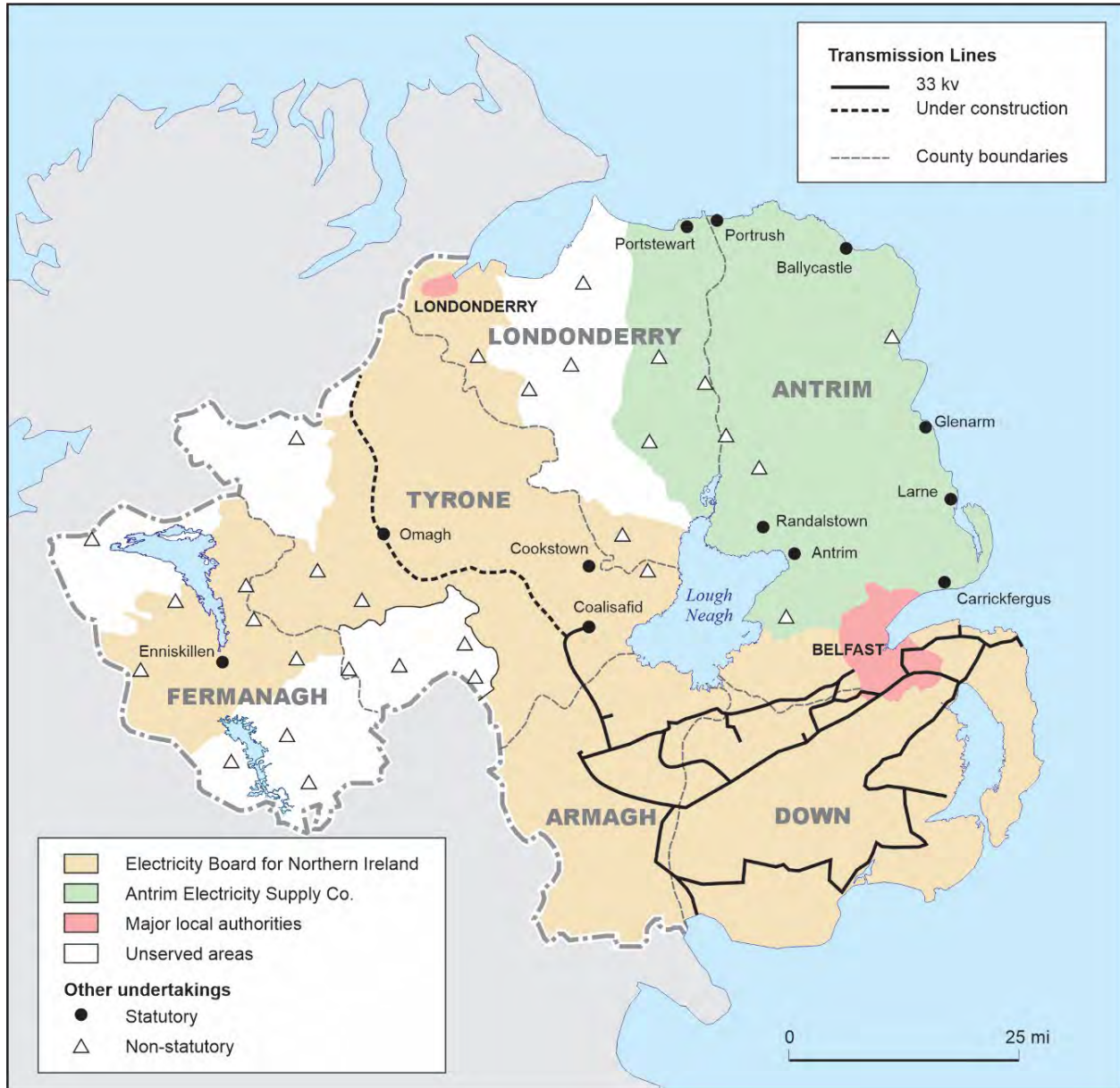


Figure 2 NORTHERN IRELAND: ELECTRICITY UNDERTAKINGS 1934/35.

¹⁶ Charles Redvers Westlake (1900-1972) moved from Northern Ireland in 1936 to become the chief engineer of the Finchley UDC electricity department. After 1945 he was appointed chairman of the Uganda Electricity Board and was responsible for the Owen Falls hydro-electric scheme opened by the Queen in 1954. See obituary, *The Times*, 18 February 1972, p.14.

The Board bought the Belfast Corporation's lines to Lisburn and Bangor and extended these to cover most of the towns in County Down and County Armagh. **Figure 2.** By mid-1934 the EBNI had built an extensive 33kv network across the southeast.¹⁷ Over the next year the area was extended to cover the more densely settled parts of the western counties of Fermanagh, Londonderry and Tyrone. A mains connection was made with Londonderry Corporation's power station and a branch to serve Enniskillen was under construction.

Electricity sales increased from 3million kWh in 1932 to 23.3m kWh in 1935 and 39.7 m kWh in 1937, New consumers added in 1936 included the BBC radio transmitting station at Lisnagarvey¹⁸ and the Governor's official residence at Hillsborough Castle.¹⁹ Substantial areas with low population densities in Counties Fermanagh, Tyrone and Londonderry still remained unserved. **Table 2.**

Table 2 NORTHERN IRELAND: MAJOR POWER STATIONS 1939.

		CAPACITY (kW)
<i>Belfast Corporation</i>	East Bridge Street	13,300
<i>Belfast Corporation</i>	Harbour	120,750
<i>Londonderry Corporation</i>	Strand	10,000
<i>Larne EL&P Co.</i>	Curran Point	7,250
Total		151,300

Major changes to the system were made during World War II to reduce the dominance and vulnerability of the Belfast Harbour station to air raids. Early in 1941 the Ministry of Commerce acted on the advice of the consulting engineers Kennedy & Donkin to improve the Larne power station and build a new power station at Ballylumford on the eastern side of Larne Harbour. Curran Point station improvement entered service in December 1941 with a 7,200kW turbine (bought from the London Power Company) and two new boilers.²⁰ Ballylumford station began service in 1943 with a 30,000kW turbine originally ordered by the Belfast Corporation. Construction of this station was difficult not only from wartime shortages of materials but also the isolated site at the tip of the Islandmagee peninsula which was accessible only by a narrow road.

The war period also fostered a spirit of co-operation across the border, particularly in County Donegal where an isolated system depended on a diesel power station at Letterkenny. When the engine began to fail in 1943-43 the EBNI was able to provide an emergency supply via a cable link between Strabane and Lifford.²¹ The EBNI continued to supply the Donegal system for another decade until a permanent 38kv line to Letterkenny was built to connect with the main Electricity Supply Board system. Cross-border co-operation was also important for the later development of the Lough Erne scheme where the power station was in the Republic but the watershed was in Northern Ireland.

¹⁷ C.R. Westlake, "Electrical development of Northern Ireland", *Journal of the Institution of Electrical Engineers*, Vol.77, 1935, pp.245-265.

¹⁸ This station replaced the earlier broadcasting system installed in October 1924 which used the two chimneys at the East Bridge Street power station for stringing the aerials. See Edward Pawley, *BBC Engineering 1922-1972* (London: BBC Publications, 1972), p.39.

¹⁹ Historic Royal Palaces, Hillsborough Castle, Blog: "Renewal energy meets conservation: the hydro house at Hillsborough", August 9, 2019.

²⁰ "Ballylumford Power Station", *The Engineer*, Vol.17, 1945, p.295.

²¹ The purchase of power from EBNI is noted in the Annual Reports of the Electricity Supply Board from 1942-43. In 1950-51 the purchases amounted to 2.1million kWh.

III Postwar Development: State Coordination

One of the striking features of the early postwar map of electricity supply in Northern Ireland (**Figure 3**) is the dominant position of the EBNI. The service area had been expanded to cover the Limavady area in 1946²² and the territory of the Antrim Electric Supply Co. in 1947. Sales grew from 42million kWh in 1939 to 291m kWh in 1951. The sales as a proportion of total sales in Northern Ireland correspondingly increased from 21 percent to 46 percent. Only the two local authorities, Belfast (82.7 square miles) and Londonderry (3.5 square miles) remained as full-service electricity providers.

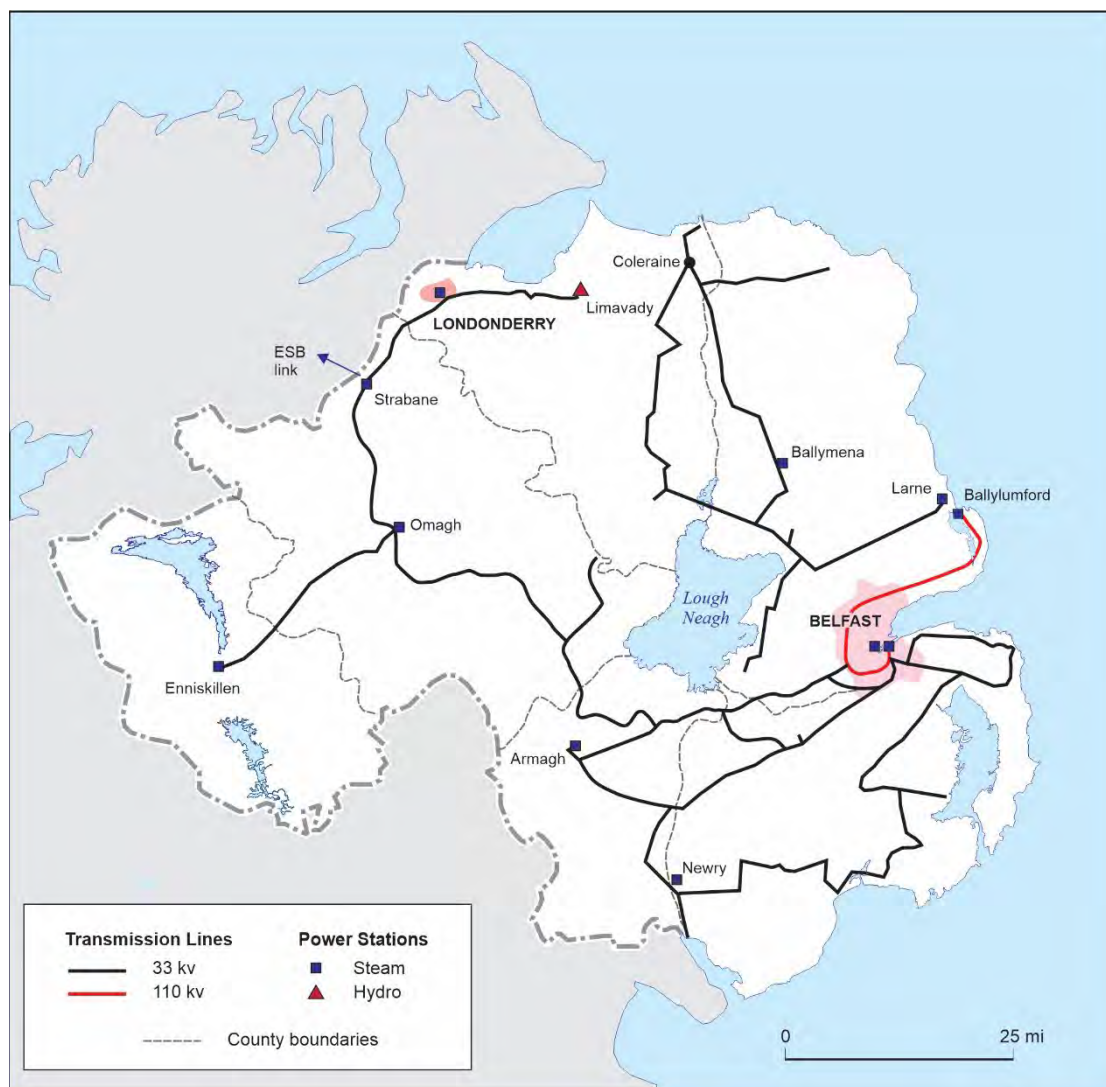


Figure 3 ELECTRICITY BOARD FOR NORTHERN IRELAND 1948/49.

The shift from Belfast dominance in 1939 to near parity in 1951 was also reflected in the Electricity (Supply) Act (Northern Ireland) 1948. The Act established the Northern Ireland Joint Electricity Committee to co-ordinate the generation of electricity and recommend development schemes to the

²² The Limavady system is well documented in H.G. Gribbon, *The history of water power in Ulster* (Newton Abbot: David & Charles, 1969) pp.141-143 and R.J. Elder, ed., *Electricity from the Red River: the story of electricity generation on the River Roe and of electricity supply in the town of Limavady and district by the Ritter family 1896-1946* (Belfast: Northern Ireland Electricity, c1970).

Ministry of Commerce. The Ministry was also empowered to transfer the ownership of the Larne and Ballylumford power stations to the EBNI.

In the new arrangements generating costs were pooled. The Joint Electricity Committee purchased at cost all output from the power stations and sold the current to the EBNI and two local authorities at a common tariff. These arrangements were similar to the pattern introduced by the Central Electricity Board in Britain from the early 1930s.

An effective transmission grid was a necessary part of the system. By 1948/49 a 33kv network covered most of the province (**Figure 3**). Lower-voltage distribution lines linked the grid with the consumers. The map also shows the 28-mile 110kv line from Ballylumford to Belfast designed by Kennedy & Donkin and built in 1943. The voltage was chosen to match the extensive network of the Electricity Supply Board in the south.

Table 3 NORTHERN IRELAND: MAJOR POWER STATIONS 1948/9.

		<i>CAPACITY (kW)</i>
<i>Belfast Corporation</i>	East Bridge Street	12,000
<i>Belfast Corporation</i>	Harbour	150,000
<i>Londonderry Corporation</i>	Strand	17,000
<i>EBNI</i>	Larne	10,000
<i>EBNI</i>	Ballylumford	90,000
		Total 279,000

(**Table 3**) Generation was concentrated in Ballylumford and the Belfast Harbour stations with the smaller power stations in Belfast, Larne and Londonderry retained for peak demand or kept on standby.

Table 4 NORTHERN IRELAND: MAJOR POWER STATIONS 1958/59.

		<i>CAPACITY (kW)</i>
<i>Belfast Corporation</i>	East Bridge Street	12,000
<i>Belfast Corporation</i>	East Harbour	174,800
<i>Belfast Corporation</i>	West Harbour	240,000
<i>Londonderry Corporation</i>	Strand	18,000
<i>EBNI</i>	Larne	10,000
<i>EBNI</i>	Ballylumford	124,500
		Total
		579,300

The 1950s was a period of substantial growth including an emphasis on rural electrification. Total sales rose from 623.2million kWh in 1950/51 to 1,082.4m kWh in 1958/59 while the number of consumers increased from 233,405 to 331,729 over the same period. **Figure 4** shows the distribution of 32 service centres where customers could pay their bills and purchase appliances. These service centres were an important and profitable part of the Board's business. The growth of the EBNI was also reflected in the

building of a new headquarters at 120 Malone Road in south Belfast. A 20-acre site, Danesfort, had been purchased in 1945 and the offices were completed in 1958/59.²³

More generating capacity was added at the Belfast Harbour station, Ballylumford and a 6,000kW turbine at Londonderry replaced some older equipment. Belfast Corporation also built a new station in the harbour area which opened in stages between 1952 and 1959. The 60,000kW turbines of the later stage of development were double the size of previous units installed in Northern Ireland.



Figure 4 ELECTRICITY BOARD FOR NORTHERN IRELAND SERVICE CENTRES 1957.

All generation depended on imported coal which was rising in cost, and supply could be variable in quantity and quality. Nuclear power as an alternative energy source was given some consideration in

²³ Harold Briggs, *100 Years of Electricity in Belfast 1895-1995* (Belfast: Northern Ireland Electricity, 1995), p.29.

the mid-1950s.²⁴ Lord Glentoran (Minister of Commerce 1952-1964) was a particular enthusiast and actively lobbied British officials in 1955/56. A nuclear installation would, it was hoped, help with plans to diversify the economy. The decision by the UK Atomic Energy Authority to build a nuclear research plant at Dounreay in the far north of Scotland gave some hope for Glentoran's ambitions. A White Paper²⁵ published in 1956 outlined the plans and a site at Maydown in the Foyle estuary near Londonderry (a World War II airfield) was offered. The government in London was reluctant to develop any nuclear facilities in Northern Ireland and no action was taken. Many experts at the time felt that the minimum scale of a Magnox reactor of the type then being planned for Berkeley and Bradwell²⁶ in England was too large for the Northern Ireland baseload at the time. Attention turned instead towards oil firing and plans were made for a new station at Coolkeeragh, adjacent to the Maydown site. The first unit entered service in 1960.



Figure 5 NORTHERN IRELAND TRANSMISSION SYSTEM 1958.

²⁴ Veronica McDermott, *Going Nuclear: Ireland, Britain and the campaign to close Sellafield* (Dublin: Irish Academic Press, 2008), pp.118-122.

²⁵ *Electricity Supply*, Ministry of Commerce, 1956. Cmd 355.

²⁶ Berkeley station had two reactors of 138 megawatt capacity. Those at Bradwell were slightly larger at 150MW. Later Magnox stations had larger reactors—Trawsfynydd 235MW and Wylfa 495MW.

The growing demand for power beyond Belfast required a stronger infrastructure for transmission. This was achieved by 1958 (**Figure 5**) by the extension of the 110kv network to serve the whole state. Three spur lines to Enniskillen, Newry and Bangor were added by 1966.

Summary

Although parts of the north had a long tradition of differences from the rest of Ireland and had begun active resistance to Home Rule before World War I, there were few real plans for the formation of a state. When this took shape quickly in 1921, electricity was a minor issue in the building of a new government structure.

A small unit called the Electricity Commissioners in the Ministry of Commerce at first followed the same practices of supervision previously exercised from London. Any new policies had to recognize the dominance of Belfast, not only in population (415,151 in 1926, one third of the state) but also in electricity supply. The city remained a powerful force in Northern Ireland for another 40 years and was one of the last local authorities in the British Isles to retain ownership of an electricity system.

Local authority development outside Belfast and Londonderry was very limited. The few new creations in the 1920s had only a short life. Non-statutory companies were much more important in the early period in spreading electrification beyond the main urban centres.

State intervention in electricity began in 1931 with the formation of the Electricity Board for Northern Ireland. Unlike its British counterparts such as the Ayrshire Electricity Board, this regional body was backed by the state in raising capital for development. By taking a bulk supply from Belfast Corporation, the Board was able to avoid high capital investment in a generating station and devote its efforts to building a supply network.

Table 5 SUMMARY OF DEVELOPMENT IN NORTHERN IRELAND.

YEAR	NUMBER OF UNDERTAKINGS ¹	LOCAL AUTHORITY UNDERTAKINGS	NUMBER OF POWER STATIONS	GENERATING CAPACITY (kW)	PER CAPITA CONSUMPTION (kWh)
1900	2	2	2	..	.. (4) ²
1912	2	2	2	..	..(36)
1930	8 ³	6 ⁴	4	82,000	62 (203)
1939	5	2	4	151,300	196 (486)
1948/49	3	2	5	279,000	401 ⁵ (821)
1958/59	3	2	6	579,300	824 (1,765) ⁶

Notes:

¹ Excluding 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.427-428.

³ Includes Antrim Electric Supply Co. and Larne EL&P Co.

⁴ Includes Belfast, Belleck RDC, Londonderry, Lurgan UDC, Portrush UDC, Portstewart UDC.

⁵ Data for 1947.

⁶ Calculated from data in Electricity Council, *Handbook of Electrical Supply Statistics 1977*, p.63 and census returns.

With very limited waterpower resources Northern Ireland always remained wholly dependent on imports of coal from Scotland and England. Unlike the Irish Free State which developed independent technical relationships with Europe, Northern Ireland remained loyal to British consulting engineers and equipment manufacturers.²⁷

Table 5 shows the general development from 1900. From the late 1920s there were many benefits from economies of scale in the Belfast power station and later from Ballylumford, both using 30,000kW turbines by 1950/51.²⁸ Industrial demand in Northern Ireland was an important contributor to per capita consumption levels, always higher than in its southern neighbour. Electrification was a gradual process, supported by the state from the 1930s, and was seen as an essential utility in the modernisation and diversification of the economy, not only in the urban areas but also across the extensive rural zone.

Electricity in Northern Ireland from 1959

Over the period from 1961 to 2011 the population of Northern Ireland grew from 1.42million to 1.81million. The urban proportion increased from 54 percent to 65 percent, with much of the expansion taking place in the greater Belfast area.

De-industrialisation became a major issue from the 1970s as the traditional industries of shipbuilding and textiles were subject to massive job losses.²⁹ In the transition to a post-industrial economy, employment in manufacturing fell from 29.4 percent of the labour force in 1961 to 9.7 percent in 2011.³⁰ Political instability and the civil unrest of The Troubles also had profound effects on the region.

Electricity consumption grew rapidly from 1,716million kWh in 1961 to 4,678m kWh in 1974. Growth over the next decades was at a much slower rate. From 2004 annual consumption has stabilised at around 8,300million kWh.³¹

Organisation

The limitations of the Joint Electricity Committee established in 1948 were noted by two reports in the 1960s.³² A new Northern Ireland Joint Electricity Authority was formed after the passing of the Electricity (Supply) Act (Northern Ireland) 1967. With more powers than the earlier Committee and a staff of 33, the Authority began work on strategic plans.

One of the early effects of Direct Rule from London, which began in late March 1972, was the replacement of the Joint Electricity Authority by a unified Northern Ireland Electricity Service.³³ The

²⁷ With support from state incentives as part of a policy of industrial diversification, Allied Electrical Industries (British Thomson-Houston division) built a large steam turbine factory at Larne. Opened in 1957, the plant cost £8million. Robert Jones and Oliver Marriott, *Anatomy of a Merger: A history of GEC, AEI and English Electric* (London: Pan Books, 1970), pp.273-276.

²⁸ The new Belfast West power station which opened with two 30,000kW units had three 60,000kW machines by 1960.

²⁹ Christopher Lawson, "Nothing left but smoke and mirrors: Deindustrialization and the remaking of British communities 1957-1994", PhD dissertation, University of California, Berkeley, 2020. Chapter 2 examines Belfast in detail.

³⁰ Calculated from Census Reports, 1961 and 2011.

³¹ Department of Business, Energy and Industrial Strategy, Electricity Statistics, data table, "Generation and supply of electricity in Scotland, Wales, Northern Ireland and England", 2004-2020.

³² Ministry of Commerce, *Administration of the Electricity Supply Service*, Report by Sir Joseph Eccles, 1963. Ministry of Commerce, *A Ten Year Programme for Electricity Supply*, 1965. Cmd 478.

³³ A unified system had been recommended by a Committee of Inquiry carried out by three experts from London—N.F. Marsh and D.V. Ford from the Electricity Council and G.T. Shepherd of the London Electricity Board. See Ministry of Commerce, *Report of an inquiry into the characteristics of the system in Northern Ireland*, March 1971.

amalgamation of the Electricity Board for Northern Ireland and the undertakings of Belfast and Londonderry took place on 1 April 1973.

Privatisation policies, also directed from London, began to take effect from 1 April 1992, when Northern Ireland Electricity was registered as a public company. The previously simple integrated system was gradually divided up into four separate sectors—generation, transmission, distribution, and supply/sales to the consumer. Regulation of the new order was under the Director-General of Electricity Supply, an independent agency.³⁴ Overall supervision of energy remained with the Department of Economic Development.³⁵

One of the primary goals of privatisation and the introduction of competition in electricity supply was to lower the price of power to the final consumer. The establishment of the Single Electricity Market in November 2007 was a further move in this direction. Both parts of Ireland were now integrated for the wholesale distribution of electricity. The SEM Committee is the decision-making authority for the Single Electricity Market on the island of Ireland.

Although government has retreated from direct ownership of the electricity system, concerns about global warming and climate change have increasingly involved new state interest. This interest has brought a range of incentives and policies for renewable energy that are reshaping the nature of electricity supply.³⁶

Transmission and Interconnection

The creation of the Single Electricity Market depended on the earlier development of high-voltage transmission systems that could move power over long distances at low cost. In Northern Ireland the 110kv transmission system built in the 1950s was reinforced by a higher-voltage network working at 275kv. The first line, from Coolkeeragh power station to a substation at Tandragee (**Figure 6**) was completed in 1966. Further extensions to Belfast and Ballylumford were built shortly afterwards.

A cross-border link between the Electricity Board for Northern Ireland and the Electricity Supply Board was recommended by a joint committee in 1966.³⁷ Such a connection would end the isolation of the small northern system and benefit both parties by reducing spare capacity and maximising use of the most efficient generators. A new line was built from Tandragee (County Armagh) to Maynooth (County Kildare) and brought into service on 16 July 1970. Transformers at a substation near Dundalk converted the different voltages of the northern system (275kv) and the southern system (220kv). The interconnector with a capacity of 300MW had only a short life. Terrorist activity soon interrupted service and full power was not restored until March 1995.

The north-south interconnector was an essential part in facilitating the development of the Single Electricity Market, south. Planning for a higher-voltage line at 400kv that would have greater capacity

³⁴ The agency was later reorganised as the Northern Ireland Authority for Utility Regulation covering electricity, gas, water and sewerage. The website www.oregni.gov.uk explains the current roles of the organisation including the various kinds of licences for generation and supply.

³⁵ The Department formed in 1972 was the successor to the Ministry of Commerce established in 1921. It was renamed Department for the Economy in 2016. The publication *Energy in Northern Ireland* (2020), available online, includes a comprehensive chapter on electricity supply.

³⁶ The Department for the Economy, for example has published monthly statistics on electricity consumption and renewable energy from April 2008.

³⁷ Ministry of Commerce, *Report of a Joint Committee on Co-operation in Electricity Supply*, March 1966. Chairman Sir Josiah Eccles (1897-1947); born and educated in Northern Ireland; spent his career in electrical engineering in Britain. See Arthur Maltby, *The Government of Northern Ireland 1922-1972: A Catalogue and Breviate of Parliamentary Papers* (Dublin: Irish University Press, 1974), pp.77-78.

(500MW) began in 2007. The proposed line would link with the 275kv system at Turleenam near Dungannon, County Tyrone and run south to the station at Woodland, County Meath. Strong opposition has delayed any construction but there are signs that work will begin in 2022.

In the search for more secure interconnections, planning for a link with the British grid began in 1990. The Moyle interconnector required High-Voltage DC (HVDC) submarine cables from a converter station near the Ballylumford power station to a similar converter at Auchenarosh, South Ayrshire. With a capacity of 500MW, the 63.5km cable connection entered service in 2001.



Figure 6 NORTHERN IRELAND MAIN TRANSMISSION LINES 2020.

Operation of the grid was transferred to a new organisation, SONI Ltd, in 2014. This company is also a subsidiary of Eirgrid and is part of the integrated Single Electricity Market.³⁸ Responsibility for the ownership and maintenance of the grid remains with the NIE Networks which also owns and controls all the distribution lines in the province.

Generation

Since 1959 electricity generation has made several transitions in the source of primary energy: first from coal to oil, then from oil to natural gas, and more recently adding renewable sources.

a) Development before Privatisation

Three oil-fired power stations were built:

Coolkeeragh, County Londonderry	420MW	1960-
Ballylumford B, County Antrim	1,080MW	1974-
Kilroot, County Antrim	600MW	1982-

The Kilroot station was rebuilt for dual oil/coal firing in the late 1980s when steady costs of coal avoided the fluctuations in the price and supply of fuel oil.

As part of its strategic plans for a more integrated and efficient system, the Northern Ireland Joint Electricity Authority received approval for a pumped storage scheme from the Ministry of Commerce in September 1970.³⁹ Pumped storage was an effective way of matching peak demand. Power could be switched on very quickly and the reservoir could be refilled overnight when demand was low. Construction began on the scheme (capacity 230MW) at Camlough, County Armagh and equipment was ordered. Terrorist activity in the area stopped work when a 1-kilometre tunnel had been built and the scheme was abandoned.

In the search for low-cost fuels, the lignite resources of the region were considered in the early 1980s. At the time the major deposits at Crumlin, east of Lough Neagh and Ballymoney, were being explored in detail.⁴⁰ The Crumlin field offered the potential for a 450MW power station with a life of 30-40 years.⁴¹ Limited water supplies would have required the construction of cooling towers. Opposition to the mining project and the high cost of meeting the emission standards set by the European Commission Directive on Large Combustion Plants 1988 ended any further planning.

b) Generation after Privatisation

Premier Power, subsidiary of British Gas, bought Ballylumford B in 1992 with plans to convert the station to natural gas firing. This was achieved in 1996 when the 135km Scotland-Northern Ireland Pipeline entered service.

Two Closed Circuit Gas Turbine (CCGT) power stations were opened later:

Ballylumford C	626MW	2003-
Coolkeeragh	400MW	2005-

³⁸ SONI Ltd/Eirgrid, *Planning our Electricity Future: Technical Report* (Belfast/Dublin, 2021), 190pp. Available online.

³⁹ Northern Ireland Joint Electricity Authority, *Annual Report 1971*, p.22.

⁴⁰ C.W. Jefferson and N.C. Mitchel, "Northern Ireland Lignite", *Geojournal*, Vol.24(4), 1991, pp.405-412.

⁴¹ *100 Years of Electricity in Northern Ireland: A short history from 1883* (Belfast: Northern Ireland Electricity Service, 1986), p.32.

The latter station, built on the site of the earlier oil-fired plant, was developed by ESB in its first venture across the border.

Thermal electricity generation in 2006 was concentrated in four power stations: Ballylumford B (380MW), Kilroot (663MW) and the two newly opened CCGT stations. The total capacity amounted to 2,132MW. Few changes were made after this time; total capacity in 2021 was 1,900MW.⁴²

Most of the effort devoted to generation since 2006 has emphasised renewables, particularly wind power. The first wind turbine, connected to the grid in February 1996, was erected at Slievenahanaghan, County Antrim. A second scheme in October 1992 added three turbines on Rathlin Island which took over most of the generation previously supplied by diesel engines.⁴³ Wind generating capacity increased from 214MW in 2008 to 581MW in 2013 and 1,353MW in 2018.⁴⁴ By 2020 there were about 132 wind farms in Northern Ireland. Most of the capacity (72 percent) was located in Counties Londonderry and Tyrone with the remainder in Antrim and Fermanagh.⁴⁵

Other sources of renewable energy used for generating electricity in 2018 were: solar 329MW, bioenergy 98.9MW, landfill gas 20.1MW and hydro 11MW. The effect of renewable energy on electricity generation has been substantial. In 2008 renewables accounted for only 6.3 percent of electricity generation; by 2018 the proportion had risen to 42.3 percent.

NORTHERN IRELAND ENERGY SOURCES USED IN ELECTRICITY GENERATION⁴⁶
Percent

	<i>Coal</i>	<i>Gas</i>	<i>Renewables</i>	<i>Oil/Other</i>	<i>Total</i>
2013	33.9	45.7	19.5	0.9	100.0
2018	14.3	42.5	42.3	0.9	100.0

Coal usage is likely to disappear in 2023 when the Kilroot power station is due for closure.

The geography of electricity generation has changed dramatically in Northern Ireland from a very concentrated pattern in only three locations to a very dispersed pattern with over 150 sites. Since the introduction of the Single Electricity Market in 2007 there have been significant moves toward further integration of the earlier, totally separate systems.⁴⁷

⁴² *Digest of UK Energy Statistics*, 2006 and 2021.

⁴³ S. Royle, J. Robertson and A. McCrea, "Renewable Energy in Northern Ireland", *Geography*, Vol.79(3), 1994, pp.237-245.

⁴⁴ Department for the Economy, *Energy in Northern Ireland 2020*, p.64.

⁴⁵ Details from www.TheWindPower.net, an online compendium of wind energy market intelligence based in France. The listings and maps are comprehensive.

⁴⁶ *Energy in Northern Ireland 2020*, p.68.

⁴⁷ The SEM Committee has three representatives from the Commission for the Regulation of Utilities (Dublin) and the Utility Regulator (Belfast) as well as two independent members. See website: www.semcommittee.com

Note on Sources

With libraries closed during the pandemic 2020-2022 and few online resources available, this study more than any other region had to be developed from my own limited materials on Northern Ireland.

Two publications by the Northern Ireland Electricity Service⁴⁸ were helpful for the general overview and some detailed points.

The ***Ulster Yearbook: The Official Handbook of Northern Ireland*** (published by HMSO at regular intervals since 1926) offers general context on the evolution of the province.

More comprehensive work will need to explore the resources of the Public Record Office of Northern Ireland (PRONI). Among its significant records are the annual reports of the Electricity Board for Northern Ireland. PRONI was unable to offer any assistance despite several enquiries.

Garcke's Manual has much material on Northern Ireland that is waiting to be examined. The Museum of Science and Industry in Manchester offers the most comprehensive collection.

Since privatisation in 1992 the administrative structure has grown more complex. The Department for the Economy (www.economy-ni.gov.uk) published ***Energy in Northern Ireland 2020*** which includes a major chapter on electricity. Earlier editions were published in 2016 and 2018. The Utility Regulator (www.uregni.gov.uk) has an extensive online library. SONI (the transmission system operator) prepared a technical document: "Transmission Development Plan Northern Ireland 2019-2028".

As part of the United Kingdom, some Northern Ireland material appears in the ***Annual Digest of UK Energy Statistics***. The listing of power stations since 2006 is a useful part of this digest. ***Energy Trends*** published by the Department of Business, Energy and Industrial Strategy (www.bus.gov.uk) often includes statistics for Northern Ireland.



NORTHERN IRELAND

The 11kv transmission network of the Electricity Board for Northern Ireland.

Annual Report 1966.

⁴⁸ ***100 Years of Electricity in Northern Ireland: A short history from 1883*** (Belfast: Northern Ireland Electricity Service, 1986), 37pp.; Harold Briggs, ***100 Years of Electricity in Belfast 1895-1995*** (Belfast: Northern Ireland Electricity, 1995), 53pp.