

Introduction to the UK Electricity Industry

The structure of the electricity industry

The UK electricity industry is at the forefront of energy liberalisation in Europe. The liberalisation process, which began in 1990, has created a highly competitive market in the UK in which suppliers can sell energy nationwide and all customers can choose the supplier which best meets their needs. Competition is underpinned by open access to the grid and distribution networks on non-discriminatory terms both in relation to granting the use of the system and the charges.

Privatisation, which was carried out in stages, beginning in England and Wales, then in Scotland and lastly in Northern Ireland, has resulted in different structural, commercial and legislative arrangements for the three regions, although the same principles have been applied.

England and Wales

In England and Wales the monopoly elements of the business, transmission and distribution, have been separated from those which are subject to competition, supply and generation.

The generation market in England and Wales has changed from a highly concentrated market with a few portfolio players to a market with many diverse generating companies including merchant generators often owning only one plant. There are now 38 companies regarded as major power producers. The reduction in horizontal market concentration has resulted in greater competition in the market and has led to a significant reduction in the market shares held by the largest generators. The expansion of gas-fired capacity since privatisation has brought about a more balanced generating capacity mix with coal stations accounting for 34 % of the total, gas for 35%, nuclear for 15%, interconnectors for 5%, oil for 4% and other including pumped storage and renewables for the remaining 7%.

Under the New Electricity Trading Arrangements (NETA), bulk electricity is traded between generators and suppliers through bilateral contracts and on power exchanges. Only a small volume of electricity is subject to arrangements in the central Balancing Mechanism, through which National Grid balances output with demand. Generators and suppliers notify National Grid one day ahead about the level at which they wish to operate for each half-hour and may also make bids and offers into the Balancing Mechanism. They are in effect self-despatching. National Grid, the transmission network operator in England and Wales, has a central role in the industry. It has a statutory duty to develop and to maintain an efficient, co-ordinated and economic transmission system and to facilitate competition in supply and generation. National Grid must ensure that the system in England and Wales is balanced nationally and locally at all times, taking into account and resolving any constraints on the transmission network. It also owns and operates jointly with Electricité de France the interconnector between the systems of England and France and owns jointly with ScottishPower and Scottish and Southern Energy the interconnector with Scotland. A number of other interconnectors, with the Republic of Ireland, Norway and the Netherlands are under consideration.

Distribution remains a monopoly business and under the Utilities Act 2000 it has become a separately licensable activity. There are nine distribution companies operating 12 authorised distribution areas. Distribution companies hold separate licences in respect of each area and are governed by the terms of their distribution licences. They are under a statutory duty to connect any customer requiring electricity within a defined area and to maintain that connection. The Utilities Act places statutory duties on Distribution Network Operators (DNOs) requiring them to facilitate competition in generation and supply, to develop and maintain an efficient, coordinated and economical system of distribution and to be non-discriminatory in all practices.

Any company holding an electricity supply licence can sell electricity. There is no duty to supply, but supply licensees have a duty to offer terms on request. Suppliers may supply customers nationwide using other company's distribution networks and paying DNOs for the use of the system. Suppliers who are authorised to supply domestic customers must meet all reasonable demands made by domestic customers. They have always been required to ensure that they have sufficient electricity at their disposal to meet their customer requirements - they have been able to meet this obligation through contracts with generators or by establishing their own generation. A number of the major generators are active in the supply market, some through acquiring the former Public Electricity Suppliers (PESs).

The Office of Gas and Electricity Markets (Ofgem) regulates the industry by granting licences. The monopoly businesses of transmission and distribution are regulated additionally through price controls, which are usually reset every four or five years.

Scotland

The Scottish electricity industry had an integrated structure prior to privatisation, which continued after Vesting. Two companies, ScottishPower and Scottish and Southern Energy, the latter formed as a result of merger between Scottish Hydro Electric and Southern Electric, cover the full range of electricity provision from generation, transmission and distribution through to supply. The two companies also have access to each other's generating capacity under the long term contracts put in place at privatisation to provide the companies with a more balanced portfolio. The third main company operating in Scotland, British Energy, is a nuclear generator contracted for the full output of its Scottish nuclear plant to the other two companies until 2005.

ScottishPower and Scottish and Southern Energy schedule generation in their own areas from plant available to them, either owned or under contract. British Energy's two Scottish nuclear power stations provide the bulk of baseload in Scotland accounting for about 50% of output. ScottishPower's own generation capacity comprises two large coal-fired plants, hydro plant and wind turbines totalling 4,050 MW. The generation portfolio owned by Scottish and Southern Energy comprises the gas-fired Peterhead plant, a large number of hydro plants and wind turbines, amounting to 2,888 MW. Both companies have also invested in generation capacity in England and Wales.

ScottishPower serves an area of 22,950 km² in the south of Scotland with 2.1 million customers and an annual maximum demand of 4,382 MW in 2000/01. Scottish and Southern Energy serves a large, predominantly rural area of 54,390 km² in the north of Scotland with 670,000 customers and an annual maximum demand of 1,671 MW in 2000/01.

The Scottish network is connected to National Grid's transmission system in England and Wales via a 1,600 MW interconnector. The interconnector's capacity is shared by ScottishPower, Scottish and Southern Energy and British Nuclear Fuels (BNFL) under a formal agreement which allows the companies to sell or purchase electricity in England and Wales. The generation capacity in Scotland currently exceeds demand and companies export surplus output to England and Wales through the interconnector. Exports to England and Wales provide a substantial additional market for Scottish generators.

The integrated structure in Scotland has required different arrangements for the wholesale market than in England and Wales. The Scottish wholesale price is indexed to that in England and Wales on the basis of a price administered by Ofgem. Following lengthy consultation on future trading arrangements in Scotland, Ofgem and the industry agreed that NETA should be extended to Scotland to allow Scottish companies to participate in a larger British market. Scotland will become a part of the British Electricity Trading and Transmission Arrangements, BETTA, expected to be introduced in 2005, with a common set of rules for trading and transmission access.

Competition in supply in Scotland is made possible as a result of third party access to the transmission and distribution systems on a non-discriminatory basis. There are presently 10 suppliers licensed to supply electricity in Scotland. The Scottish companies also supply customers and construct and operate generating stations in Scotland and throughout the UK.

Northern Ireland

The industry in Northern Ireland differs from that in the rest of the UK in a number of important ways. The electricity system serves a comparatively small area (14,000 km², 1.6 million people) with 690,000 customers and a peak demand, including autoproducers, of 1,665 MW in 2000/01. Until March 1995, it had been isolated from other networks. There are only four major power stations: Ballylumford, Kilroot, Belfast West and Coolkeeragh with a total generating capacity of 2,082 MW. Premier Power, a subsidiary of British Gas, owns the largest power station, Ballylumford, which has been converted to gas. The US company, AES owns the coal-fired Belfast West and dual-fuel (coal and oil) Kilroot power stations. The smallest plant is Coolkeeragh, which entered the private sector as a result of a successful management buy-out. Two power stations, Ballylumford and Kilroot, account for almost 90% of Northern Ireland's output.

Following a capital reorganisation in 1998, the regulated businesses of Northern Ireland Electricity were separated from the unregulated businesses and a new holding company, Viridian Group PLC, was established, leaving NIE to concentrate on regulated businesses. Northern Ireland Electricity acts as the Independent System Operator with responsibility for transmission, through a subsidiary company SONI, and for distribution. NIE is also responsible for the power procurement function - the purchase of electricity from the generating companies. NIE's Power Procurement Business acts as a wholesaler of electricity within Northern Ireland. A separate supply business has been established within the company. As in the rest of the UK, strict provisions are in operation to ensure the unbundling of NIE's core businesses.

At privatisation a series of power purchase agreements, and related generating unit agreements (GUAs), were struck between NIE's Power Procurement Business and the generating companies. Generating companies were required to sell their entire output to the power procurement business of NIE, which then sold electricity on to licensed suppliers, including NIE's own supply business. This secured the position of the generating companies but also deterred new entry into the generating market.

A framework for competition in supply has been established through the introduction of second tier licences to enable other licensed suppliers to sell electricity to final customers in Northern Ireland. However, until July 1999 all suppliers had to buy their power from NIE's Power Procurement Business.

In line with the EU Directive for the Internal Market for Electricity, the Government has introduced new terms for competition. In July 1999 about 26% of the generation and supply market was opened to competition, which allowed customers with an annual consumption greater than 2.5 GWh to purchase electricity from generators either directly or via second-tier suppliers. The eligible market has been extended gradually and from April 2001 all customers with a maximum demand over 1 MW or consuming at least 0.79 GWh a year are eligible to purchase electricity from generators either directly or through second-tier suppliers. These eligible customers, about 720 in total, make up about 35% (by volume) of the N.I. electricity market. NIE Supply is the main supplier of the remaining 65% of the market, but a small number of ineligible customers are also supplied by second-tier suppliers. Both NIE Supply and second-tier suppliers must purchase all their requirements from NIE Power Procurement for supplies to non-eligible customers, excluding purchases from renewable generators, as the renewables market in Northern Ireland is fully open to competition.

The Northern Ireland system has been re-connected with the Electricity Supply Board system in the Republic of Ireland. A new HV DC submarine link with Scotland is being commissioned, which is expected to meet about 20% of future demand.

Responsibility for the regulation of the industry is in the hands of OFREG - the Office for the Regulation of Electricity and Gas - which oversees the development of competition and protects the interests of customers in Northern Ireland.

Offshore companies

Jersey Electricity and Guernsey Electricity

The two largest Channel Islands, Jersey and Guernsey, are served by two separate companies Jersey Electricity and Guernsey Electricity, which are responsible for generation, distribution and supply of electricity to the islands' customers.

Jersey Electricity is 50/50 owned by the States of Jersey and private investors. It has an obligation to preserve Jersey's strategic independence in electricity supply. The company supplies electricity to 42,400 customers on the Island of Jersey. Its generating capacity of 205 MW consists mainly of gas steam turbines and diesel engines. Jersey is connected by two 27 km submarine cables to the EDF system, which allows the company to import electricity from France. In 2000 about 60% of total electricity consumption was met through imports. The generation output of 244,746 MWh was supplemented by 349,256 MWh of imports from France. The

company intends to increase imports to 80%-85% of the island's electricity needs in the future.

Guernsey Electricity is wholly owned by the States of Guernsey. The company supplies 27,479 customers on the island of Guernsey. Its generating capacity comprises mainly diesel engines and open cycle gas turbines, totalling 125.4 MW, is run on heavy fuel oil. The generating capacity is insufficient to meet demand for electricity and Guernsey imports electricity from its neighbouring island Jersey. In 2000/01 the generating output of 255,381 MWh was supplemented by 56,447 MWh of electricity imports.

The two electricity systems are now integrated through the Channel Island Electricity Grid. The Cable Link Project, a joint 50:50 venture between these two companies involved linking the two systems and strengthening Jersey's existing link with France. It was a major investment project, which took 4.5 years to complete and cost £50 million.

The integration of the two electricity networks has brought a major change in the operation of the two systems. The Channel Island Electricity Grid has allowed the two companies to share generation assets and has provided access to lower cost European electricity. It has reduced the islands' dependence on fossil fuels and lowered emissions, which will bring considerable cost savings. The two undertakings are now cooperating in a number of other areas which will benefit both islands.

The Manx Electricity Authority

The Manx Electricity Authority has responsibility for the generation, transmission and supply of electricity on the Isle of Man. The Authority supplied 41,000 customers in 2000/01. Its generating capacity of 82 MW is mainly provided by diesel power stations. The Authority has decided that the island's future electricity needs should be met by a local 75 MW CCGT plant and an undersea link to the system in England and Wales. The 100 km link, capable of carrying 40 MW of power, was completed in 2000. It is providing much needed power to the island where demand has increased by 40% in the last 10 years.

Consolidation in the industry

(For details of current ownership see *Who Owns Whom in the UK Electricity Industry*)

At the time of privatisation there were 14 Public Electricity Suppliers (PESs) in Great Britain, which replaced the old Area and Scottish Boards. The structure of the PESs remained largely unchanged from that of Area Boards and they continued to have responsibility for supply and distribution of electricity in their authorised areas. Under their PES licence they had a statutory duty to supply customers.

Eleven years later all this has changed. Now only a handful of companies run both electricity supply and distribution businesses. Increasing competition in the market, tight regulation and the obligation to separate supply from distribution businesses were the catalysts for restructuring. The concept of the PES as an exclusive authorised area came to an end with the Utilities Act 2000. All suppliers now are on the same legal footing and the distribution activities of the former PESs have become separate businesses.

Consolidation has been seen by many companies as an opportunity to become more competitive, amidst falling prices and relentless competition for customers. There are now only seven major supply groups formed from the previous PES supply businesses through takeovers or mergers. British Gas Trading, the trading arm of Centrica, has also become an important electricity supplier. The ex-PESs supply businesses on the other hand have become major players in the gas market as they have developed their dual fuel sales.

The first company to expand its business by taking over another PES was ScottishPower, which acquired Manweb in October 1995. Southern Electric and Scottish Hydro Electric subsequently merged in December 1998 and formed a new holding company, Scottish and Southern Energy. In July 1999 London Electricity took over SWEB's supply business.

Recent years have also seen a trend to integration of generation and supply. Generators losing their market shares, as a result of growing competition in the generation market and divestment of capacity required by the regulator, have been prompted to diversify into the supply business. In July 1998 Powergen bought East Midlands Electricity, while National Power bought Midlands Electricity's supply business. This latter acquisition involved the first ownership separation of supply and distribution businesses. British Energy has also decided to purchase a PES supply business and in June 1999 bought SWALEC's supply business. A year later it sold the business to Scottish and Southern Energy. After National Power decided to demerge into Innogy and International Power, Innogy began expanding its supply business and acquired Yorkshire's supply business in February 2001 and in November 2001 Northern Electric's supply business.

TXU Europe has also expanded its supply business by buying Norweb Energi in August 2000. Only one former PES, SEEBOARD, owned by American Electric Power, has remained. This too may well become a part of larger energy group, when its owner receives a suitable offer.

Consolidation is also taking place in the distribution business, with potential benefits of economies of scale, reduction of costs and increased operational efficiency. Some PESs which have sold their supply businesses have evolved into distribution service and support companies. SWEB, after the sale of its supply business, formed a new distribution company, Western Power Distribution. In September 2000 the company expanded through the purchase of Infracore, SWALEC's distribution business. Midlands Electricity became GPU Power UK following the sale of its supply business to National Power. London Electricity and TXU Europe joined forces in a distribution venture, 24seven, to manage and operate their combined distribution assets, while the ownership of these assets and the licenses were retained by the parent organisations. In November 2001, however, TXU Europe announced the sale of its electricity distribution network and its 50% share of the network management company 24seven to London Electricity, which is subject to regulatory approval. At present there are nine independent groups of distribution companies in Great Britain and further corporate transactions including mergers are likely in the future.

Horizontal integration has arrived in earnest with an assets swap between Northern Electric and Yorkshire Electricity. Innogy has bought Northern Electric's supply business in exchange for selling to Northern Electric its 94.5% interest in Yorkshire's distribution business. Northern Electric thus now owns two distribution networks. The swap of businesses between different parts of Northern Electric,

Yorkshire and Innogy is another step towards only a handful of companies owning and running the electricity industry. Both distribution and supply could consolidate down to 5-6 players in the next few years.

Ownership of generation plant

Plant ownership has seen numerous changes since privatisation, as a result of forced and voluntary divestment of plant, significant entry of new generators and changes in business strategies. Generation has changed from a highly concentrated market with a few portfolio players to a market with many diverse generating companies. Today there are 42 companies regarded as major power producers compared to seven in 1990.

At the time of privatisation in 1990, coal and oil-fired generation plants in England and Wales were divided between two generators National Power and Powergen. National Grid retained the two pumped storage plants, Dinorwig and Ffestiniog. The fossil fuel and hydro capacity in Scotland was also divided between two companies, ScottishPower and Scottish Hydro Electric. Nuclear power stations were retained in public ownership. Nuclear Electric was responsible for operating nuclear plant in England and Wales, and Scottish Nuclear Electric for nuclear plant in Scotland. Northern Ireland Electricity ran the power stations in Northern Ireland.

In Northern Ireland the NIE's generation business was divided into four companies based on its two coal-fired stations, Kilroot (dual-fuel capacity with oil) and Belfast West, and two oil-fired power stations, Ballylumford and Coolkeeragh. The two coal-fired stations were bought by Nigen, which was a 50:50 venture between US's AES and Belgium's Tractebel, but which are now wholly owned by AES. The large oil-fired station, Ballylumford, was sold to a British Gas subsidiary with permission for conversion to gas firing and since 1997 has been running on gas. Coolkeeragh was bought by the station's management team.

The British nuclear industry was restructured in 1996 and nuclear plant divided between the newly created BNFL Magnox Generation and British Energy, which also took over the Scottish nuclear plant.

The first independent power projects, all based on Combined Cycle Gas Turbine (CCGT) technology, were backed by the regional electricity companies (RECs), which participated in these projects on a joint venture basis and entered into long term agreements to purchase the output from these plants. Their participation in generation was, however, limited by a regulatory rule, which allowed them to meet only 15% of their demand from own generation. Eastern Group (now TXU Europe) was the only REC which obtained consent to relax this limit and invested in new CCGTs at Peterborough and King's Lynn. In 1996 the company acquired five coal-fired plants from National Power and Powergen, with a total capacity of 6 GW. Both companies were required by the regulator to divest some of their capacity to create more competition in the generation market. Eastern Group with almost 7 GW of capacity became the fourth largest generator in the UK. Most of the other regional electricity companies have since withdrawn from generation.

The demerger of pumped storage capacity from National Grid, and its subsequent sale in 1995 brought in the US company, Edison Mission Energy. Other US companies also entered the generation market, notably AES, Enron, Entergy and NRG. In addition to buying the pumped storage plants, Edison Mission Energy

acquired stakes in the Roosecote and Derwent Co-generation CCGTs. It subsequently became sole owner of Roosecote and added to its portfolio two coal-fired plants, Ferrybridge and Fiddler's Ferry, acquired under a long term lease from Powergen.

AES built the Barry CCGT and acquired a stake in another CCGT, Medway. Following National Power's divestment of plant AES then bought the UK's largest coal-fired plant, Drax. These acquisitions have turned both Edison and AES into major players in the UK generation market.

Enron was a major stakeholder in one of the first large IPP projects, Teesside Power, and also developed a CCGT at Sutton Bridge. Ennergy invested in two CCGT plants, Saltend and Damhead Creek, which came on stream in 2000. NRG built the Brimsdown CCGT.

The second divestment of plant by National Power and Powergen in 1999 was a regulatory condition for permission they were seeking to acquire REC supply businesses. Both companies wanted to move into retail electricity sales in order to hedge their generating operation in the increasingly competitive market.

British Energy bought National Power's coal-fired plant, Eggborough, to diversify its portfolio while NRG acquired National Power's CCGT plant, Killingholme. National Power had continued to restructure its business and in August 2000 demerged into Innogy and International Power, with Innogy taking all UK generation assets, except for the Deeside CCGT.

Electricité de France (EdF), owner of London Electricity, entered the UK generation market by buying the Sutton Bridge CCGT from Enron and then the coal-fired Cottam power station from Powergen. In 2001 it added to its portfolio the West Burton coal-fired plant, which it bought from TXU Europe. The company has now grown from a position of interconnector supplier to becoming one of the major players in the generation market with access to almost 5 GW of capacity.

The major gas and electricity supplier, Centrica also recently entered the generation market. The company bought a 60% stake in Humber Power in May 2001, with the remaining 40% owned by Total/Fina/Elf. In June 2001 Centrica acquired from TXU its two CCGTs, King's Lynn and Peterborough, on 20 year leases, to secure sufficient capacity for its growing base of electricity customers. TXU sold another of its coal-fired plants, Rugeley, to International Power.

TXU's divestment of plant is part of its business restructuring which aims to create a merchant energy business with high growth potential. In the past, with National Power and Powergen dominating the generation market, the purchase of coal-fired plant was viewed as an effective way to manage wholesale exposure. Today, with the large disposal of generating assets by National Power and Powergen, the generating market has become more liquid. It is easier to obtain capacity through contracts, operate plant and have access to generating capacity without actually owning it. TXU has a tolling deal with Rugeley, and wholesale contracts with AES Drax, which allow the company to act as a virtual generator.

The rapid change in the market conditions - the steep decline of the Pool price and a further fall in wholesale prices after the introduction of NETA, together with a dramatic rise in gas prices - has altered the prospects in the generation market.

This has resulted in yet further sales of generation capacity. Edison Mission Energy recently sold its two coal-fired plants to another US company, AEP, the owner of SEEBOARD, while Entergy sold one of its CCGTs, Saltend, to Calpine.

In contrast, ownership in Scotland has been fairly stable. There has been little opportunity for investment in Scotland, which has more than ample generating capacity. British Energy, ScottishPower and Scottish and Southern Energy remain the major players north of the border. ScottishPower and Scottish and Southern Energy export power to England and Wales via the interconnector and have also invested in generating projects in England. ScottishPower has bought the Rye House CCGT from Powergen, while Scottish and Southern Energy has bought the Keadby CCGT and has built some small OCGT plants.

In Northern Ireland the contractual arrangements between generators and NIE's Power Procurement Business, put in place at privatisation, have limited the scope for new entrants into the generation market. The four power stations were sold with long term off-take contracts with NIE's Power Procurement Business, which required generators to sell their entire output to NIE. The generation market is being opened to competition with the implementation of the EU Directive on the Internal Market in Electricity. As part of this implementation process, some generating units were taken out of contract with Power Procurement and can trade directly with suppliers to eligible customers, which represent 35% of the NIE market. Recent developments cover construction of a 600 MW station at Ballylumford due for commercial operation in 2002. The Moyle 500 MW interconnector with Scotland to be completed at the end of 2001 will also provide additional generating capacity. In addition, there are two development proposals to build new independent CCGT plant.

January 2002