UNITED KINGDOM

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1. GENERAL INFORMATION

1.1. General Overview

United Kingdom (UK) is an abbreviated form of United Kingdom of Great Britain and Northern Ireland. The UK consists of England, Northern Ireland, Scotland and Wales and lies in north-western Europe, occupying the major portion of the British Isles. The country's only land boundary is with the Republic of Ireland. The UK is separated from the coast of western Europe by the English Channel to the south and by the North Sea to the east. The northern and western shores are washed by the Atlantic Ocean.

As a result of the relative warmth of the nearby seas, UK has a moderate climate, rarely marked by extremes of heat or cold. The mean annual temperature ranges between 11.1°C in the south and 8.9°C in the north-east. Seasonal temperatures vary between a mean of about 16.1°C during July, the hottest month of the year, and 4.4°C during January, the coldest month. Fogs, mists, and overcast skies are frequent, particularly in the Pennine and inland regions. Precipitation, heaviest during October, averages about 760 mm annually in most of the UK.

During the Industrial Revolution the country became rapidly urbanized, and today more than 70% of the total population of 58.8 millions (1996) is concentrated in cities occupying 10% of the total land area. It has a mean population density of 243.2 persons per square km with an annual growth of 0.3% (1997). The population is highly urbanized, and the United Kingdom is the third most densely populated nation in Europe (after Netherlands and Belgium). The most densely populated part of the United Kingdom is England, with 376 persons per square km; Scotland has a density of 66 per square km; Wales, 141 per square km; and Northern Ireland, 123 per square km. Population in 1998 was 59.1 millions (Table 1) and is expected to grow to 60.3 millions in 2006.

TABLE 1. POPULATION INFORMATION

								Growth rate (%)
	1960	1970	1980	1990	1998	1999	2000	1980 to 1999
Population (millions)	52.5	55.6	56.3	57.6	58.6	59.3	59.4	0.2
Population density (inhabitants/km²)	214	227	230	235	240	242	243	0.2
Urban population as percent of total	86	88	89	89	89	89	N/A	-
Area (1000 km²) 244.9								

Source: IAEA Energy and Economic Database; Data & Statistics/The World Bank.

1.2. Economic Indicators

Gross Domestic Product (GDP) increased from US$ 1,240,569 million in 1997 to US$ 1,286,166 million in 1998 (Table 2).

1.3. Energy Situation

Extensive coal deposits occur around the eastern and western edges of the Pennines, in South Wales, in the Midlands (Birmingham area), and in the Scottish Central Lowland. Easily accessible coal seams are, however, largely exhausted. Fortunately for the energy-hungry British economy, large deposits of petroleum and natural gas under the North Sea came into commercial production in 1975 and at present the United Kingdom is self-sufficient in petroleum (Table 3).

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1995	1996	1997	1998	1999
GDP at market prices (current US$)	1.13E+12	1.18E+12	1.32E+12	1.41E+12	1.44E+12
GDP growth (annual %)	2.79	2.55	3.51	2.64	2.11
GDP by Sector, value added (% of GDP):					
Agriculture	1.64	1.58	1.32	1.14	1.05
Industry	28.2	28.25	27.24	25.95	25.24
Services, etc.	70.16	70.16	71.44	72.9	73.72

Source: Data & Statistics/The World Bank.

TABLE 3. ESTIMATED ENERGY RESERVES

Exajoule

	Solid	Liquid	Gas	Uranium (1)	Hydro (2)	Total
Total amount in place	36.65	27.93	29.82	N/A	0.77	95.17

(1) This total represents essentially recoverable reserves.

(2) For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 1998) by a factor of 10.

Source: IAEA Energy and Economic Data Base; Country Information.

TABLE 4. ENERGY STATISTICS

Exajoule

							Average annual growth rate (%)	
	1960	1970	1980	1990	1999	2000	1960 to 1980	1980 to 2000
Energy consumption								
- Total (1)	6.86	8.70	8.43	8.97	9.84	9.91	1.03	0.81
- Solids (2)	4.96	3.90	2.98	2.66	1.51	1.40	-2.51	-3.69
- Liquids	1.85	4.03	3.26	3.25	3.17	3.16	2.86	-0.15
- Gases	N/A	0.47	1.80	2.31	4.11	4.42	37.56	4.60
- Primary electricity (3)	0.05	0.30	0.39	0.75	1.05	0.92	10.86	4.31
Energy production								
- Total	5.01	4.42	8.33	8.83	11.96	12.19	2.58	1.92
- Solids	4.95	3.68	3.18	2.33	1.02	0.95	-2.18	-5.88
- Liquids	N/A	0.01	3.37	3.85	5.73	5.78	40.71	2.72
- Gases	N/A	0.43	1.38	2.03	4.25	4.63	36.23	6.25
- Primary electricity (3)	0.05	0.30	0.39	0.63	0.96	0.84	10.86	3.83
Net import (import - export)								
- Total	1.91	4.28	0.60	0.32	-1.63	-1.65	-5.66	-5.23
- Solids	-0.18	-0.10	0.08	0.37	0.65	0.72	4.09	11.78
- Liquids	2.09	4.35	0.10	-0.34	-2.16	-2.18	-14.07	-16.62
- Gases	N/A	0.04	0.42	0.29	-0.12	-0.19	46.24	3.83

(1) Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.

(2) Solid fuels include coal, lignite and commercial wood.

(3) Primary electricity = Hydro + Geothermal + Nuclear + Wind.

Source: IAEA Energy and Economic Database.

Energy consumption by the industrial sector has fallen dramatically since 1970, with a sharp reduction in the use of coal outweighing the increased consumption of gas and electricity. The greatest growth in energy consumption has been in the transport sector mainly due to the high level of transport activity, but electricity accounts for just under 1% of total energy consumption by this sector and is used only for rail transportation. Table 4 shows the basic energy statistics.

1.4. Energy Policy

The formal aim of the UK Government's energy policy is to ensure secure, diverse, and sustainable supplies of energy in the forms that people and businesses want, and at competitive prices**.** The Government believes that this aim will best be achieved by means of competitive energy markets working within a stable framework of law and regulation to protect health, safety, and the environment. Government policies also aim to encourage consumers to meet their needs with less energy input, through improved energy efficiency. The key elements of the policy are:

- to encourage competition among producers and choice for consumers, and to establish a legal and regulatory framework to enable markets to work well;
- to ensure that service is provided to customers in a commercial environment in which customers pay the full cost of the energy resources they consume;
- to ensure that the discipline of the capital markets is applied to state owned industries by privatizing them where possible;
- to monitor and improve the performance of the remaining state-owned industries, while minimizing distortion;
- to have regard to the impact of the energy sector on the environment, including adopting policies and taking measures to meet international commitments;
- to promote energy efficiency and renewable sources of energy;
- to safeguard health and safety.

In pursuit of these policies, the UK Government has privatized almost all the former state-owned energy sector (coal, electricity, gas). The only part of the generating sector remaining in public ownership is the newly formed company, Magnox Electric plc, which operates the UK's older Magnox nuclear power stations.

The Government has no direct operational control over any part of the energy sector, which comprises private companies operating on the basis of their own commercial criteria and judgement. This includes such things as what fuels to use for power generation, their source, and the location of facilities (although this remains subject to local planning permissions).

The gas and electricity industries are overseen by independent regulators, appointed by Government, whose role is to promote competition where possible and to protect consumers by providing a proxy for competition in areas of continuing monopoly. The requirement for regulatory intervention will diminish over time, as more sectors of the energy market become open to competition; but there will always be a need for regulation of monopoly infrastructure (the pipes and wires).

The final stage in the liberalization of the electricity supply market was concluded in May 1999 when all remaining public electricity supply monopolies were abolished. All customers may now choose their supplier. By September 1999, some 3.3 million had registered to change supplier and some 2.7 million had actually done so. To make supply competition work, a major programme of work was needed to build systems, commercial arrangements, trading arrangements, and licences which administer the change of supplier process. Following final agreement on the overall design of the arrangements, end to end testing of the systems commenced at the beginning of 1998 and was completed in all areas by the end of the year. Competition was then rolled out between September 1998 and May 1999, area by area according to the postcodes of the customers involved.

A new agreement, the Master Registration Agreement, has been established to oversee developments in the change of supplier process and a new company MRASCo has been established to manage such changes.

In the gas sector, competition first started in the industrial and commercial (non-tariff) market and there are currently 71 shippers competing in it. Domestic competition took longer to develop and was started by the Gas Act 1995. This Act opened up the market by creating three separate licences for Public Gas Transporters who operate the pipelines, shippers who buy gas wholesale from producers and sell it to suppliers who in turn sell it to consumers. The roll-out of domestic competition began in 1996 and was completed in May 1998. So far almost five million domestic customers (roughly a fifth of total domestic gas consumers) have changed supplier.

In January 1999 the Director General of Gas Supply, Callum McCarthy, also assumed the office of the Director General of Electricity Supply. This reflects "convergence" between gas and electricity markets - gas is now used for electricity generation, many companies are now operating in both gas and electricity markets so that consistency of regulation is therefore very important.

The Government remains responsible for establishing the framework of environmental regulation within which the energy sector operates, including permissible levels of emissions and disposal of wastes. But within these broad parameters, it is for companies to decide how best to meet the particular environmental requirements relevant to them.

2. ELECTRICITY SECTOR

2.1. Structure of the Electricity Sector

Until 1990, when the institutional reform enacted for England and Wales by the Electricity Act 1989 was put into practice, the United Kingdom's power system had been organised as follows:

England and Wales: power generation and transmission was in the hands of the Central Electricity Generating Board (CEGB) - a power company exerting monopoly rights over these activities, who was responsible for supplying the twelve Regional Electricity Companies (RECs) in charge of distribution. The Electricity Council, an intercompany co-ordination agency, was in charge of assessing demand forecasts, investment and financing needs, and representing the industry.

Scotland: the system was supplied by two vertically integrated companies, the South of Scotland Electricity Board (SSEB) and the North of Scotland Hydro-Electric Board (NSHEB).

Northern Ireland: supplied by a vertically integrated monopolistic company, the Northern Ireland Electricity (NIE).

In 1990, all of the electricity supply industry, except for the nuclear generators, was privatised. The more modern nuclear power stations, the AGRs and the PWR, were subsequently privatised in 1996 under the holding company British Energy plc, formed with two subsidiaries, Nuclear Electric Ltd and Scottish Nuclear Ltd. Restructuring in 1998 led to Scottish Nuclear being renamed as British Energy Generation (UK) Ltd and Nuclear Electric as British Energy Generation Ltd. The older Magnox stations remain in the public sector and are operated as BNFL Magnox Generation.

In England and Wales around 21% of generation is carried out by Independent CCGTs; In respect of individual generators British Energy Powergen, Innogy, TXU, BNFL, EDF, Edison and AES are all active in the market. There are twelve distribution companies and one transmission company, the National Grid Company (NGC). NGC also manages the despatch and administers the market in wholesale power.

The retailing or supply of electricity, formerly a monopoly of the local distribution company for all but the largest consumers, is now completely open to competition. In the case of Scotland two companies, Scottish Power and Scottish and Southern (formerly Scottish Hydro-Electric, but renamed after its merger with the English distribution company Southern Electric in 1998), each generate,

transmit, distribute and supply electricity in their own areas. There are also other generators and suppliers.

Regulation of the electricity industry in England, Wales and Scotland is the responsibility of the Chief Executive of the Office of Gas and Electricity Markets (OFGEM). The Chief Executive is appointed by the Government to be an Independent regulator of the industry with statutorily defined duties to protect consumers and promote competition.

In Northern Ireland, generation and distribution were privatised independently. However, unlike England and Welsh case, no new generating companies were established, and the power plants were sold to already existing companies (Tractebel from Belgium and British Gas).

The wholesale electricity market in England and Wales has recently been reformed. On 27 March 2001, the Electricity Pool was replaced by New Electricity Trading Arrangements (NETA). The Electricity Pool was the trading arrangement in England and Wales by which electricity suppliers and large industrial users purchased electricity from the electricity generators. It was established in 1990 when the electricity industry was privatised, and operated under the Pooling and Settlement Agreement, a commercial arrangement between the generators and public suppliers of electricity. The Pool was used to determine which generating sets were called on to satisfy demand, and the price for wholesale electricity (the Pool price) was set for each half hour by the most expensive generator used during that period. All generators called to run received this price.

Among the long-standing criticisms of the Pool were that it was not open to electricity consumers, its operation was not transparent, it was a price setting mechanism rather than a true market, it facilitated the exercise of market power by generators owning large amounts of capacity, and it distorted the market to the disadvantage of flexible plant, including coal. These concerns led to a programme to replace the Pool with more competitive trading arrangements and this came to fruition in March 2001. The new trading arrangements are much more like those in other commodity markets. They comprise a series of bilateral markets (i.e. genuine two-side markets unlike the Pool) designed to encourage competition and liquidity and to remove distortions in the market.

The key features of NETA are:

- a forwards market where generators are be able to contract with suppliers and large customers for the physical delivery of electricity. Such contracts can be struck close to the time of delivery or a year or more ahead;
- screen-based short-term power exchanges to enable participants to refine their contract positions close to real time in the light of current information (e.g. on the weather). Five power exchanges have either set up or are in the process of being set up;
- a balancing mechanism operating from 3½ hours ahead of real time up to real time, managed by the National Grid Company (NGC). As electricity cannot be stored, NGC needs to manage the grid system on a second-by-second basis and the balancing mechanism is the facility under the new arrangements, which allows it to do this. However, the vast majority of trading takes place in the forward markets rather than in the Balancing Mechanism;
- associated derivatives markets to enable market participants to manage commercial risks; and
- a settlement process to deal with the financial settlement of balancing mechanism trades and to deal with those whose generation or consumption of electricity is out of balance with their contracted position.

At the time of writing, NETA is only three months old, and it is therefore too early to draw conclusions about the new market. However, the transition from the Pool to NETA was generally considered to have been smooth, liquidity is increasing, participants are getting to grips with the new NETA world, and forward prices are 30% lower than when the reform programme began in 1998. In fact, forward prices had been low for some time in anticipation of NETA.

However, there remains some concern amongst unlicensed generators (particularly CHP and renewable plants) about the impact of NETA on their businesses. This stems from the fact that a number of unlicensed generators have unpredictable or inflexible output and might therefore be significantly (indirectly) exposed to imbalance prices. Although special arrangements have been developed to enable to such generators to reduce their potential exposure to imbalance, they remain concerned, particularly with current volatility in the Balancing Mechanism.

In the light of these concerns, prior to implementing NETA, the then Energy Minister (Peter Hain) asked the Regulator to undertake a review of the impact of NETA on smaller generators based on its first two months of operation. OFGEM commenced the Review at the end of May and are due to report their findings by August 2001.

2.2. Decision Making Process

Responsibility for formulating energy policy and for most of the measures to implement it rest with the central government. Within government, lead responsibility on energy matters outside Northern Ireland rested until 12th April 1992, with the Secretary of State for Energy. On 13th April 1992, the Secretary of State's responsibilities were transferred to the Secretary of State for Trade and Industry, except for energy efficiency, which was transferred to the Secretary of State for the Environment. Northern Ireland energy matters are the responsibility of the Secretary of State for Northern Ireland. The Secretary of State for Scotland is responsible for the electricity industry in Scotland. Because of the cross cutting nature of the issues many Ministers are involved particularly on policy for the efficient use of energy and for safety and the environment. Co-ordination between Ministers and Departments is achieved through the Cabinet, Ministerial and official committees and interdepartmental consultation.

The Secretary of State for Trade and Industry appoints the Director General of Electricity Supply who heads the Office of Electricity Regulation which now has over 200 staff including regional offices. The relevant Secretary of State and the Director General are the principal regulators of the industry and have been given specific powers in the new regime. Those of the Secretary of State include licensing and the regulation of certain matters related to the development of the physical electricity supply system, fuel stocking and the quality of the electricity supply. Those of the Director General include economic regulation and general supervision and enforcement of the licence regime (including the issue of new licences).

The building of a new power station with a capacity of over 50 MW requires the consent of the relevant Secretary of State. Environmental assessment is mandatory in most cases and is normally required in all other cases.

2.3. Main Indicators

Contrasting with the 60s, since the mid 70s, power consumption growth rate has been moderate (under 1.3% accrued rate). The system was affected by market stagnation during the first five years of the 80s, primarily due to the behaviour of industrial demand which decreased 17% between 1979 and 1983. During the last years demand growth seems to have increased, with rates slightly above 2% per year. In this context, the expansion of public service's installed capacity has been very limited since 1985, and a gradual obsolescence of generating facilities must also be considered. In spite of fluctuations affecting electricity demand, its share in the country's energy requirements has been steadily increasing. In fact, in 1970 electricity accounted for 12% of final energy consumption, though its penetration steadily increased and reached 16% in 1991. The share of electricity was even more important in the industrial sector during the same period, and rose from 11% in 1970 to almost 21% in 1991.

Electricity has increased its share of final energy consumption, which has been steadily rising from 7% in 1960 to 11% in 1970 and 16% in 1991, mainly at the expense of coal and oil, and has been

particularly successful in gaining an increased share of the industrial and commercial sectors. Electricity's share of industrial energy consumption has more than doubled since 1970, rising from 10% to 22% in 1991, due to structural changes and technological innovations. Electricity's share over energy consumption in the commercial sector increased significantly over the period from 18% in 1970 to 32% in 1991. The growth in electricity consumption was associated with increased use of air conditioning, growth in Information Technology applications and improvement in the standard of lighting in the commercial sector. Electricity, maintained its share of about 19% of energy consumption in the domestic sector due to the availability of lower priced off-peak electricity, growth in ownership of electrical appliances and more diverse applications.

The total electricity production in 1995 was 332.9 TW·h and the total installed electrical capacity was 69 GW(e). Fossil fuels contributed 74% to the electricity generated and hydro and nuclear 2% and 24%, respectively. Table 5 shows the historical electricity production and installed capacities and Table 6 the energy related ratios.

TABLE 5. ELECTRICITY PRODUCTION AND INSTALLED CAPACITY

							Average ann. growth rate (%)	
	1960	1970	1980	1990	1999	2000	1960 to 1980	1980 to 2000
Electricity production (TW·h)								
- Total [1]	136.97	247.98	283.75	318.97	367.78	376.28	3.71	1.42
- Thermal	131.76	217.34	242.79	253.31	268.57	289.38	3.10	0.88
- Hydro	3.13	4.63	3.94	7.06	6.89	7.12	1.15	3.01
- Nuclear	2.08	26.01	37.02	58.60	91.19	78.30	15.49	3.82
Capacity of electrical plants GW(e))								
- Total	36.70	62.06	73.64	73.01	74.28	75.38	3.54	0.12
- Thermal	35.17	56.48	64.73	56.43	56.87	57.92	3.10	-0.55
- Hydro	1.17	2.15	2.45	4.17	4.26	4.27	3.76	2.82
- Nuclear	0.36	3.43	6.46	12.40	12.97	12.97	15.53	3.55
- Wind	N/A	N/A	N/A	0.01	0.19	0.22		

[1] Electricity losses are not deducted.
Source: IAEA Energy and Economic Database.

TABLE 6. ENERGY RELATED RATIOS

	1960	1970	1980	1990	1998	1999	2000
Energy consumption per capita (GJ/capita)	131	156	150	156	161	166	167
Electricity per capita (kW·h/capita)	2,615	4,155	4,707	5,409	6,035	6,094	6.199
Electricity production/Energy production (%)	26	50	31	33	28	27	28
Nuclear/Total electricity (%)	2	11	14	20	27	27	22
Ratio of external dependency (%)[1]	28	49	7	4	-19	-20	-17
Load factor of electricity plants							
- Total (%)	43	46	44	50	55	55	57
- Thermal	43	44	43	51	52	52	57
- Hydro	31	25	18	19	15	15	19
- Nuclear	66	87	65	54	80	80	69

[1] Net import / Total energy consumption
Source: IAEA Energy and Economic Database.

Traditionally, the United Kingdom's power system generation structure has relied on domestic coal. It should be pointed out that since the 60s, there has been a mutual dependence between the power and the coal industries. Coal fired plants contributed 60 and 70% to power generation thus becoming the major consumer and supporter of the country's coal industry.

While the power sector was in the hands of the State, its relationship with the coal industry was strongly supported, in spite of the discovery of important gas fields in the Northern Sea at the end of the 60s and of the early development of nuclear power generation, which also started during the 60s.

2.4. Impact of Open Electricity Market in the Nuclear Sector

The electricity sector has seen a large amount of merger and acquisition activity over the last year, with vertical integration on the increase. Responding to this, British Energy (BE) is seeking to grow its supply business and broaden its customer base and has proposed to acquire the retail electricity and gas supply business of SWALEC plc, a subsidiary of Hyder. The Secretary of State for Trade and Industry announced on 23 September 1999 that, having received satisfactory assurances, he had decided not to refer the proposed acquisition to the competition Commission.

3. NUCLEAR POWER SITUATION

3.1.Historical Development

In 1954 the Atomic Energy Authority Act established the United Kingdom Atomic Energy Authority (UKAEA) with responsibility for the UK nuclear power programme. The programme was to concentrate on the development of gas cooled reactors. The world's first industrial scale nuclear power station to demonstrate the commercial potential of generating electricity through nuclear fission, at Calder Hall in Cumbria, was commissioned by the UKAEA in 1956. Calder Hall was soon followed by a station of similar design, Chapelcross in Scotland; now operated by British Nuclear Fuels plc (BNFL), both these stations continue to generate electricity today after 40 years service.

Calder Hall and Chapelcross were Magnox prototypes, and nine full scale Magnox power stations were subsequently commissioned in the UK between 1962 and 1971. The Magnox stations were so-called from the magnesium alloy used to make the fuel can which contains the natural uranium fuel elements. The reactors use CO_2 as coolant. These stations are now owned by BNFL Magnox Generation and six are still in operation, while three are in the process of being decommissioned.

In 1964, it was decided that the UK-developed advanced gas cooled reactor, the AGR, should succeed the Magnox as the principal source of nuclear power in the UK. Seven AGR stations, making use of enriched uranium fuel, were commissioned between 1976 and 1988 and these are now operated by British Energy's subsidiaries, Nuclear Electric and Scottish Nuclear.

As part of the reorganization of the UKAEA under the Atomic Energy Authority Act in 1971, BNFL was set up as a private limited company and subsequently transformed into a public limited company. The fuel cycle operations previously undertaken by the UKAEA were transferred to BNFL. BNFL now provides the full range of nuclear fuel cycle services to the UK and international markets and in 1994 it sheared its first irradiated fuel in the Thermal Oxide Reprocessing Plant (THORP), constructed to reprocess domestic and overseas spent fuel from AGR and PWR reactors.

In 1978 the Government had decided that for future nuclear power station design it would be appropriate to pursue the Pressurized Water Reactor (PWR) option, the most widely used design outside the UK. Subsequently the site at Sizewell in Suffolk was chosen and construction began in 1988 after a lengthy public inquiry. This station, Sizewell B, first supplied electricity to the national grid in February 1995.

The United Kingdom Nuclear Industry Radioactive Waste Executive was set up in 1982. It was incorporated in 1985 as United Kingdom Nirex Ltd. The company's principal activity is to carry out research, development and design with a view to developing and managing commercial facilities for disposal of solid intermediate and low level radioactive waste. High level waste is managed by its producers, BNFL and the UKAEA.

In its 1988 White Paper "Privatising Electricity", the Government announced its intention to privatize the UK electricity supply industry. However, it later removed the nuclear stations from its privatization plans for economic reasons and also because of concerns about the operational

performance of AGRs at that time and uncertainties over the financing of any new PWRs. The Government did however recognize that there were advantages to be gained from the continued operation of existing nuclear power stations, in their contribution to security of supply and protection of the environment.

When announcing the Government decision not to privatize nuclear power, the Secretary of State for Energy also announced that there was to be a moratorium on public sector construction of new nuclear stations (the Sizewell B PWR was already being built) until the Government conducted a review of the prospects for nuclear power.

3.2. Status and Trends of Nuclear Power

Thirty-five nuclear units are in operation in the United Kingdom, representing a total capacity of 11.7 GW(e) and supplying almost 25% of the electricity generated in the country. Table 7 shows the status of the nuclear power plants in the UK, Sizewell B, was connected to the grid in February 1995 and achieved full load in September 1995.

Sizewell B is an advanced PWR, built by the UK industry under a licence from the American manufacturer Westinghouse, which incorporates a number of enhanced safety features to meet more stringent safety standards. The unit was completed on schedule and within the provisional budget. All the other nuclear units in operation in the UK are gas-cooled reactors of Magnox and advanced gas cooled (AGR) types. Substantial improvements in the performance of the AGRs have been attained during recent years. The Prototype Fast Breeder at Dounreay, which was commissioned in 1976, is currently under-going decommissioning.

As of April 1998, the national safety authority, Nuclear Installations Inspectorate (NII), has authorized lifetime extension for all the Magnox units, which had reached thirty years of operation. Although the authorizations from NII do not specify the duration of the lifetime extension, the British regulators have indicated that no safety factors have been identified which would limit the operation of the Magnox reactors to less than 40 years and 50 years for Calder Hall and Chapelcross. The Wylfa reactors in Wales received permission to continue operation until at least 2004 following completion of the last of the long-term safety reviews of Magnox reactors.

NII has accepted that the Periodic Safety Reviews of the AGR stations at Hinkley Point B, Hunterston B, Dungeness B, Hartlepool and Heysham 1 have shown that the stations can be expected to operate safely for at least a further 10 years, subject to satisfactory outcomes from routine inspection activities. The Periodic Safety Review of Heysham 2 and Torness is scheduled for completion in 2000.

British Energy has said it does not plan to invest in any form of new generation in the short term because the future of UK energy prices is insufficiently certain. While the company announced in December 1995 that it had abandoned plans to proceed with the early construction of two new nuclear power stations in the UK (i.e. Sizewell C and Hinkley Point C), British Energy has made clear that new nuclear build remains a part of its business strategy provided it offers an appropriate return to its shareholders.

Notwithstanding British Energy’s decision, the Government has concluded that it is reasonable to assume that the existing technology will not be lost and that the option to build new nuclear power stations will be available for some time to come, albeit with first-of-a-kind costs attached. Through Sizewell B, which is a modern PWR reactor built only recently in line with international standards, British Energy has access to the latest technology in this area. The company has made it clear that it will be able to keep up with the latest developments, both through operating its new station and by taking on overseas consultancy projects.

TABLE 7. STATUS OF NUCLEAR POWER PLANTS

Station	Type	Capacity	Operator	Status	Reactor Supplier	Construction Date	Criticality Date	Grid Date	Commercial Date	Shutdown Date
BRADWELL	GCR	123	BNFL	Operational	TNPG	01-Jan-57	01-Aug-61	01-Jul-62	01-Jul-62	(2002)
BRADWELL	GCR	123	BNFL	Operational	TNPG	01-Jan-57	01-Apr-62	06-Jul-62	12-Nov-62	(2002)
CALDER HALL	GCR	50	BNFL	Operational	UKAEA	01-Aug-53	01-May-56	27-Aug-56	01-Oct-56	(2006
CALDER HALL	GCR	50	BNFL	Operational	UKAEA	01-Aug-53	01-Dec-56	01-Feb-57	01-Feb-57	to
CALDER HALL	GCR	50	BNFL	Operational	UKAEA	01-Aug-55	01-Mar-58	01-Mar-58	01-May-58	
CALDER HALL	GCR	50	BNFL	Operational	UKAEA	01-Aug-55	01-Dec-58	01-Apr-59	01-Apr-59	2008)
CHAPELCROSS	GCR	50	BNFL	Operational	UKAEA	01-Oct-55	01-Nov-58	01-Feb-59	01-Mar-59	(2008
CHAPELCROSS	GCR	50	BNFL	Operational	UKAEA	01-Oct-55	01-May-59	01-Jul-59	01-Aug-59	to
CHAPELCROSS	GCR	50	BNFL	Operational	UKAEA	01-Oct-55	01-Aug-59	01-Nov-59	01-Dec-59	
CHAPELCROSS	GCR	50	BNFL	Operational	UKAEA	01-Oct-55	01-Dec-59	01-Jan-60	01-Mar-60	2010)
DUNGENESS-A	GCR	225	BNFL	Operational	TNPG	01-Jul-60	01-Jun-65	21-Sep-65	28-Oct-65	(2006)
DUNGENESS-A	GCR	225	BNFL	Operational	TNPG	01-Jul-60	01-Sep-65	01-Nov.-65	30-Dec-65	(2006)
DUNGENESS-B1 UNIT A	AGR	555	BE	Operational	APC	01-Oct-65	04-Dec-85	29-Dec-85	01-Apr-89	
DUNGENESS-B2 UNIT B	AGR	555	BE	Operational	APC	01-Oct-65	23-Dec-82	03-Apr-83	01-Apr-85	
HARTLEPOOL-A1 UNIT A	AGR	605	BE	Operational	NPC	01-Oct-68	24-Jun-83	01-Aug-83	01-Apr-89	
HARTLEPOOL-A2 UNIT B	AGR	605	BE	Operational	NPC	01-Oct-68	09-Sep-84	31-Oct-84	01-Apr-89	
HEYSHAM-1 UNIT A	AGR	575	BE	Operational	NPC	01-Dec-70	06-Apr-83	09-Jul-83	01-Apr-89	
HEYSHAM-1 UNIT B	AGR	575	BE	Operational	NPC	01-Dec-70	03-Jun-84	11-Oct-84	01-Apr-89	
HEYSHAM-2 UNIT A	AGR	625	BE	Operational	NPC	01-Aug-80	23-Jun-88	12-Jul-88	01-Apr-89	
HEYSHAM-2 UNIT B	AGR	625	BE	Operational	NPC	01-Aug-80	01-Nov-88	11-Nov-88	01-Apr-89	
HINKLEY POINT-A	GCR	235	BNFL	Operational	EE/B&W/T	01-Nov-57	01-May-64	16-Feb-65	30-Mar-65	(2000)
HINKLEY POINT-A	GCR	235	BNFL	Operational	EE/B&W/T	01-Nov-57	01-Oct-64	19-Mar-65	05-May-65	(2000)

Source: IAEA Power Reactor Information System as of 31-Dec-2000. Years between brackets are based on authorized lifetime extension by NII.

TABLE 7. CONTINUED, STATUS OF NUCLEAR POWER PLANTS

Station	Type	Capacity	Operator	Status	Reactor Supplier	Construction Date	Criticality Date	Grid Date	Commercial Date	Shutdown Date
HINKLEY POINT-B UNIT A	AGR	610	BE	Operational	TNPG	01-Sep-67	24-Sep-76	30-Oct-76	02-Oct-78	
HINKLEY POINT-B UNIT B	AGR	610	BE	Operational	TNPG	01-Sep-67	01-Feb-76	05-Feb-76	27-Sep-76	
HUNTERSTON-B1 UNIT A	AGR	595	BE	Operational	TNPG	01-Nov-67	31-Jan-76	06-Feb-76	06-Feb-76	
HUNTERSTON-B2 UNIT B	AGR	595	BE	Operational	TNPG	01-Nov-67	27-Mar-77	31-Mar-77	31-Mar-77	
OLDBURY-A	GCR	217	BNFL	Operational	TNPG	01-May-62	01-Aug-67	07-Nov-67	31-Dec-67	(2013)
OLDBURY-A	GCR	217	BNFL	Operational	TNPG	01-May-62	01-Dec-67	06-Apr-68	30-Sep-68	(2013)
SIZEWELL-A	GCR	210	BNFL	Operational	EE/B&W/T	01-Apr-61	01-Jun-65	21-Jan-66	25-Mar-66	(2006)
SIZEWELL-A	GCR	210	BNFL	Operational	EE/B&W/T	01-Apr-61	01-Dec-65	09-Apr-66	15-Sep-66	(2006)
SIZEWELL-B	PWR	1188	BE	Operational	PPC	18-Jul-88	31-Jan-95	14-Feb-95	22-Sep-95	
TORNESS UNIT A	AGR	625	BE	Operational	NNC	01-Aug-80	25-Mar-88	25-May-88	25-May-88	
TORNESS UNIT B	AGR	625	BE	Operational	NNC	01-Aug-80	23-Dec-88	03-Feb-89	03-Feb-89	
WYLFA	GCR	490	BNFL	Operational	EE/B&W/T	01-Sep-63	01-Nov-69	24-Jan-71	01-Nov-71	(2016)
WYLFA	GCR	490	BNFL	Operational	EE/B&W/T	01-Sep-63	01-Sep-70	21-Jul-71	03-Jan-72	(2016)
BERKELEY	GCR	138	BNFL	Shut Down	TNPG	01-Jan-57	01-Aug-61	12-Jun-62	12-Jun-62	31-Mar-89
BERKELEY	GCR	138	BNFL	Shut Down	TNPG	01-Jan-57	01-Mar-62	24-Jun-62	20-Oct-62	26-Oct-88
DOUNREAY FR	FBR	14	UKAEA	Shut Down	UKAEA	01-Mar-55	14-Nov-59	01-Oct-62	01-Oct-62	01-Mar-77
HUNTERSTON-A1	GCR	150	BNFL	Shut Down	GEC	01-Oct-57	01-Aug-63	05-Feb-64	05-Feb-64	30-Mar-90
HUNTERSTON-A2	GCR	150	BNFL	Shut Down	GEC	01-Oct-57	01-Mar-64	01-Jun-64	01-Jul-64	31-Dec-89
PFR DOUNREAY	FBR	234	UKAEA	Shut Down	TNPG	01-Jan-66	01-Mar-74	10-Jan-75	01-Jul-76	31-Mar-94
TRAWSFYNYDD	GCR	195	BNFL	Shut Down	APC	01-Jul-59	01-Sep-64	14-Jan-65	24-Mar-65	06-Feb-91
TRAWSFYNYDD	GCR	195	BNFL	Shut Down	APC	01-Jul-59	01-Dec-64	02-Feb-65	24-Mar-65	04-Feb-91
WINDSCALE AGR	AGR	32	UKAEA	Shut Down	VARIOUS	01-Nov-58	09-Aug-62	01-Feb-63	01-Mar-63	03-Apr-81
WINFRITH SGHWR	SGHWR	92	UKAEA	Shut Down	ICL/FE	01-May-63	01-Sep-67	01-Dec-67	01-Jan-68	11-Sep-90

Source: IAEA Power Reactor Information System as of 31-Dec-2000. Years between brackets are based on authorized lifetime extension by NII.

In November 1995, the Atomic Energy Authority Act 1995 became law, enabling the Authority to privatize its commercial activities, which have been known in recent years as AEA Technology.

3.3. Current policy issues

The conclusions of the Government's nuclear review confirmed the Government's commitment to nuclear power, provided it remained competitive and was able to maintain rigorous standards of safety and environmental protection. However, the Government recognized, against the background of the current electricity market, that providing public sector support for a new nuclear power station would constitute a significant intervention in the electricity market and that current and foreseeable circumstances did not warrant such an intervention.

The review also concluded that moving as much of the nuclear generating industry as was practicable into the private sector, with its associated liabilities, would bring benefits for the industry, electricity consumers and the taxpayer. Back in 1989, the nuclear stations had had to be excluded from the privatization of the other parts of the electricity supply industry. However, the review recognized that the overall performance of the nuclear generators had been transformed in the period since. They had removed many of the uncertainties about the costs of managing spent fuel and waste and decommissioning plant. The performance of the Advanced Gas-cooled Reactors (AGRs) had vastly improved and a Pressurized Water Reactor (PWR), Sizewell B, was now in operation and performing excellently.

Accordingly the nuclear generating industry was reorganized to enable its more modern part, with its associated liabilities, to be transferred to the private sector Two subsidiaries, Nuclear Electric Ltd (NEL) (now British Energy Generation Ltd) and Scottish Nuclear (SN) (now British Energy Generation (UK) Ltd) are now owned by a Great Britain-wide holding company, British Energy Generation plc which is responsible for seven AGRs and Sizewell B. British Energy was privatised in July 1996.

The older plant, eight operating Magnox stations, three closed Magnox stations and the associated liabilities, remain in the public sector and are the responsibility of British Nuclear Fuels plc, the UK's government owned supplier of reprocessing and other nuclear fuel cycle services. BNFL operate two Magnox stations of their own, as BNFL Magnox Generation.

3.4. Organizational Chart

A simplified chart of main operations of the United Kingdom nuclear power programme is shown in Figure 1.

4. NUCLEAR POWER INDUSTRY

The UK nuclear industry has been highly successful in pioneering and developing commercial nuclear power. The UK has about 14,000 MW of installed nuclear capacity and generates over a quarter of all electricity in the UK. After early teething problems the UK nuclear power plants have been performing extremely well with high load factors comparable to the best achieved world-wide. The UK has a comprehensive nuclear industry capacity which embraces research and development; design, construction and supply of nuclear plant and their operation; full fuel cycle capability including manufacture, enrichment and reprocessing; and a very high quality safety culture underpinned by an independent nuclear regulator. This has resulted in an outstanding safety record for the commercial stations operating in the UK over a period of 40 years.

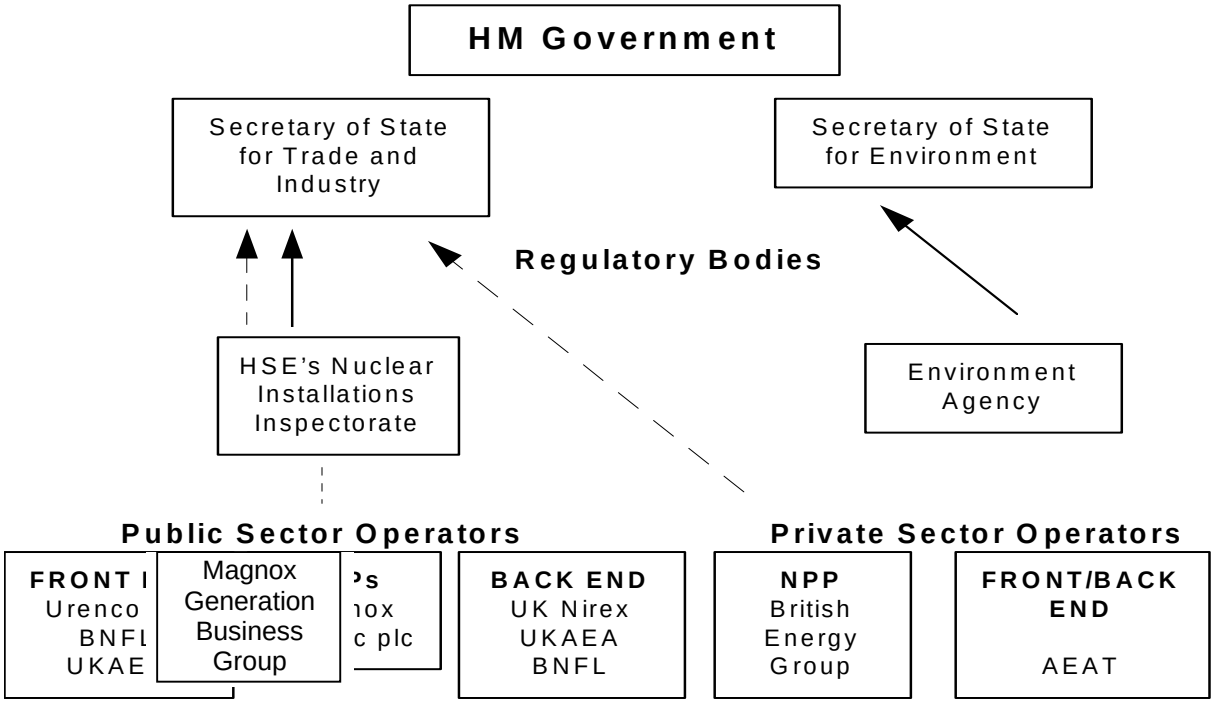

FIG. 1. Structure of the main Operations of UK's Nuclear Power Programme

4.1. Supply of Nuclear Power Plants

The Services provided by AEA Technology, British Energy, British Nuclear Fuels, and many more industrial companies cover a very wide range of activities. These include component supply, fuel supply, fuel reprocessing, services in the area of radwaste management and aspects of advanced reactor engineering.

4.2. Operation of Nuclear Power Plants

The UK's AGRs and single PWR are now owned and operated by the holding company British Energy through its subsidiaries Nuclear Electric Ltd in England and Wales, and Scottish Nuclear Ltd. in Scotland. The Magnox stations have been transferred to British Nuclear Fuels plc (BNFL). BNFL now owns and operates eight Magnox stations in both England and Scotland and is in the process of decommissioning a further three.

4.3. Fuel Cycle, Spent Fuel and Waste Management Service Supply

Apart from raw uranium mining, the UK has an independent nuclear fuel cycle capability. The full range of the nuclear fuel cycle services - from fuel enrichment and manufacture through to spent fuel reprocessing, transport, waste management and decommissioning - are provided to the UK and international markets by British Nuclear Fuels plc (BNFL), which is wholly owned by the Government.

The Government announced in July 1999 that they are looking to introduce a Private Public Partnership into BNFL, subject to progress towards achieving a range of safety, health, environmental and business performance targets, and further work by DTI and its advisers.

Part of the Government's 1995 review into the future prospects of nuclear power in the United Kingdom confirmed that BNFL would continue to offer customers the full range of nuclear fuel cycle services and restated the Government's continuing support for the company in developing its overseas markets.

Fuel enrichment in the UK is carried out at Capenhurst near Chester by Urenco Capenhurst Limited, a wholly owned subsidiary of Urenco Ltd., the holding company for the Urenco Group. The Urenco Group is the joint Anglo-Dutch-German organization which operates uranium enrichment plants in all three countries using centrifuge technology.

Uranium refining and conversion are carried out at BNFL's Springfields site which processes several tonnes of uranium each year for UK and overseas customers. Springfields has the expertise to manufacture fuel for all major reactor designs world-wide and a new, integrated fuels complex was officially opened in July 1996.

Spent fuel from the UK's Magnox and AGRs reactors, overseas LWR and in the future PWR reactors, are reprocessed at BNFL's Sellafield site. The company's Thermal Oxide Reprocessing Plant (THORP) began operations in March 1994 and has so far sheared and dissolved more than 2000 tonnes of spent fuel. It is expected that some 7,000 tonnes of spent nuclear fuel will be reprocessed in its first ten years of operation.

BNFL have constructed and are awaiting final commissioning of the Sellafield Mixed Oxide (MOX) fuel plant which will manufacture MOX fuel for overseas customers using a blend of plutonium (recovered from the reprocessing of spent fuel) and uranium.

In 1985 the Nuclear Industry Radioactive Waste Executive was established as UK Nirex Ltd. It is owned by BNFL, British Energy and the United Kingdom Atomic Energy Authority (UKAEA). It is charged with developing a deep disposal facility for intermediate and long-lived low level wastes. It is currently awaiting a review of Government policy on radioactive waste management following from the refusal of planning permission for Nirex to develop a rock characterization facility at a site adjacent to BNFL's Sellafield works.

Most low level waste (LLW) is disposed of at either BNFL's Drigg surface disposal facility or at the disposal facilities at UKAEA's Dounreay site. Long-lived LLW is stored and will be disposed of in Nirex' proposed facility. Intermediate level waste (ILW) is currently stored, mainly at the centres of production, and will be disposed of in Nirex' proposed facility. High level wastes are currently stored, either raw or in vitrified form, mainly by BNFL at its Sellafield site, for a minimum of 50 years to cool. No decisions on disposal have yet been taken and these will form part of a forthcoming Government review, but the Government is undertaking a research project to study this issue.

Nuclear sites are licensed by the Nuclear Installations Inspectorate (NII), the regulator responsible for ensuring their safe operation. Disposals of radioactive wastes may only be made under authorizations granted by the Environment Agency (or in Scotland the Scottish Environment Protection Agency), which succeeded their respective countries' pollution inspectorates on 1 April 1996, but under operational agreements between them and the NII, the latter oversees waste operations on licensed sites.

4.4. R&D Activities

Nuclear accounted for some 47% of the DTI's Energy R&D expenditure in 1995-96 (45% in 1994-95). This expenditure went on research into decommissioning and radioactive waste management services, safety and health, fusion and safeguards commissioned with the UK Atomic Energy Authority (a public corporation) and the Joint European Torus (JET) project run by Euratom. British Energy and BNFL are directly responsible for their own research expenditure.

4.5. International Co-operation related to Nuclear Power Plant Development and Implementation

The United Kingdom is a member of the European Union (EU), the OECD/NEA and the IAEA as well as other bilateral and multilateral organizations. The United Kingdom Government supports EU

programmes the field of nuclear safety and nuclear waste management and participates in many OECD/NEA and IAEA projects.

5. NUCLEAR LAWS AND REGULATIONS

5.1. Nuclear Regulatory Framework

The safety of UK nuclear installations, and the protection of employees and the public from the potential hazards caused by them, is governed principally by provisions in the Nuclear Installations Act 1965, the Health and Safety at Work etc. Act 1974, the Ionising Radiation Regulations 1999 made under it and the Radioactive Substances Act 1993. No site may be used for the construction or operation of a commercial nuclear installation unless appropriate approval or planning permission has been given and a nuclear site licence is granted by the Health and Safety Executive (HSE). The Nuclear Installations Inspectorate (NII) is that part of the HSE with delegated responsibility for administering the licensing function.

The NII will not grant a nuclear site licence unless satisfied that an applicant has the capacity to meet all their stringent safety requirements from design through to decommissioning, in adherence to the licence conditions attached to the site licence. So as to demonstrate to the NII that safety will be properly controlled at all stages of the plant's life, the applicant is required to produce a comprehensive written 'safety case' for each plant. The safety case must be continually revised and updated throughout the plant's operation, to take account of any changes in its operating conditions.

Ultimate responsibility for the safety of a nuclear installation is legally the responsibility of the operating company. They must execute all licence requirements to the NII's satisfaction. The principle is the same whether the operating company is in the public or private sector. The NII carefully monitors the performance of nuclear installations against exacting standards and conditions. Should there be any doubt about a licensee's ability to meet its obligations, the Inspectorate has extensive powers. It can, for example, include additional licence conditions at any time, direct the cessation of plant operation, and ultimately direct that it be shut down altogether. An operating company may surrender a licence or it may be revoked by the NII, but still retains responsibility for safety of the site until either a new licence for the site is issued or the HSE is satisfied that there ceases to be a danger from ionising radiation from the site.

The disposal of radioactive material from licensed sites is strictly controlled by means of authorizations granted by the Environment Agency and the Minister of Agriculture Fisheries and Food (MAFF) in England and Wales; and in Scotland by the Scottish Environment Protection Agency. There is close liaison between NII, the Environment Agency and the Scottish Environment Protection Agency under the terms of Memoranda of Understanding which set out the lead roles of the organizations and requirements for liaison and consultation.

5.2. Main National Laws and Regulations (Additions)

GENERAL LEGISLATION

- Atomic Energy Authority Act 1995 (Chapter 37).
- Atomic Energy Act 1946 Ch 80.
- Atomic Energy Authority Act 1954 Ch 32.
- Nuclear Installations (Amendment) Act 1965 Ch 6.
- Nuclear Installations Act 1965 Ch 57.
- Nuclear Installations Act 1969 Ch 18.
- Radiological Protection Act 1970 Ch 46.
- Atomic Energy Authority Act 1971 Ch 11.
- Health and Safety at Work etc. Act 1974 Ch 7.

- Nuclear Industry (Finance) Act 1977 Ch 7.
- Atomic Energy (Miscellaneous Provisions) Act 1981 Ch 48.
- Criminal Justice Act 1982.
- Energy Act 1983 Ch 25.
- The Atomic Energy Authority Act 1986 Ch 3.
- Atomic Energy Act 1988 Ch 7.
- Electricity Act 1989.
- Criminal Law Act 1989.
- Environmental Protection Act 1990 Ch 43.
- Radioactive Material (Road Transport) Act 1991 Ch 27.
- Atomic Weapons Establishment Act 1991 Ch 46.
- Radioactive Substance Act 1993 Ch 12.
- Nuclear Installations (Dangerous Occurrences) Regulations 1965 (SI 1965/1824).
- The Nuclear Installations (Insurance Certificate) (Amendment) Regulations 1969 SI 1969/64).
- The Nuclear Installations Regulations 1971 (SI 1971/1381).
- The Nuclear Installations Act 1965 etc. (Repeals and Modifications) Regulations 1974 (SI 1974/2056).
- Nuclear Installations (Expected Matter) Regulations 1978 (SI 1978/1779).
- Nuclear Installations (Prescribed Sites) Regulations 1983 (SI 1983/919).
- The Nuclear Installations Act 1965 (Repeal and Modifications) Regulations 1990(SI 1990/1918)
- The Fire Certificate (Special Premises) Regulations 1976 (SI 1976/2003).
- The Notification of Installations Handling Hazardous Substances Regulations 1982 (SI 1982/1357).
- Air Navigation (Restriction of Flying) (Nuclear Installations) Regulations 1988 (SI 1988/1138).
- Environmental Protection (Prescribed Processes and Substances) (Amendment) Regulations 1992 (SI 1991/614).
- The Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1974 (SI 1974/1735).
- The Radioactive Substances (Road Transport Workers) (Great Britain) (Amendment) Regulations 1975 (SI 1975/1522).
- The Radioactive Substances (Carriage by Road) (Great Britain) (Amendment) Regulations 1985 (SI 1985/1729).
- Control of Pollution (Radioactive Waste) Regulations 1976 (SI 1976/959).
- The Control of Pollution (Radioactive Waste) Regulations 1989 (SI 1989/1158).
- Radioactive Substances (Records of Convictions) Regulations 1992 (SI 1992/1685).
- The Public Information for Radioactive Emergencies Regulations 1992 (SI 1992/2997).
- The Ionising Radiations Regulations 1999 (SI 1999/3232).
- The Nuclear Material (Offences) Act 1983 (Commencement) Order 1991 (SI 1991/1716).
- Extradition (Protection of Nuclear Material) Order 1991 (SI 1991/1720).
- The Nuclear Installations (Application of Security Provisions) Order 1993 (SI 1993/687).
- Nuclear Reactors (Environmental Impact Assessment For Decommissioning) Regulations 1999 (SI 1999/2892).
- The Exports of Goods (Control) Order 1992 (SI 1992/3092).
- The Radioactive Substances (Prepared Uranium and Thorium Compounds) Exemption Order 1962 (SI 1962/2711).
- The Atomic Energy (Mutual Assistance Convention) Order 1990 (SI 1990/235).
- Environmental Protection Act 1990 (Commencement N^{o} 3) Order 1990 (SI 1990/2565 (Ch 67)).
- The Radioactive Substance (Substances of Low Activity) Exemption (Amendment) Order 1992 (SI 1992/647).
- The Radioactive Substances (Uranium and Thorium) Exemption (Scotland) Order 1962 (SI 1962/2766).
- Radioactive Substance (Testing Instruments) Exemption Order 1985 (SI 1985/1049).

- The Radioactive Substances (Substances of Low Activity) Exemption Order 1986 (SI 1986/1002).
- The Radioactive Substances (Waste Cloud Sources) Exemption Order 1963 (SI 1963/1831).
- The Radioactive Substances (Uranium and Thorium) Exemption Order 1962 (SI 1962/2710).
- The Environment Protection Act 1990 (Commencement N° 7) Order 1991 (SI 1991/1042).
- The Radioactive Substances (Substances of Low Activity) Exemption (Amendment) Order 1992 (SI 1992/647).
- The National Radiological Protection Board (Extension of Functions) Order 1974 (SI 1974/1230).

5.3. International, Multilateral and Bilateral Agreements

AGREEMENTS WITH THE IAEA

• Amendments of Article VI & XIV.A of the IAEA statute	Ratified:	2 January 2001
• Voluntary offer INFCIRC/263	Entry into force:	14 August 1978
• Additional Protocol (GOV/1998/30)	Signature:	22 September 1998
• Improved procedures for designation of safeguards inspectors	Both proposals not acceptable. Offers support in improving procedures	17 February 1989
• Agreement on privileges and immunities	Entry into force:	19 September 1961
• Supplementary agreement on provision of technical assistance (for Hong Kong) by the IAEA	Entry into force:	4 February 1983

OTHER RELEVANT INTERNATIONAL TREATIES etc.

• NPT	Entry into force:	27 November 1968
• EURATOM	Member	
• Convention on physical protection of nuclear material	Entry into force:	6 October 1991
• Convention on early notification of a nuclear accident	Entry into force:	12 March 1990
• Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force:	12 March 1990
• Vienna conventions on civil liability for nuclear damage	Signature:	11 November 1964

• Paris conventions on civil liability for nuclear damage	Signature:	23 February 1966
• Joint protocol	Signature:	21 September 1988
• Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage		Not signed
• Convention on Supplementary Compensation for Nuclear Damage		Not signed
• Convention on nuclear safety	Entry into force:	24 October 1996
• Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Entry into force:	18 June 2001
• ZANGGER Committee	Member	
• Nuclear Export Guidelines	Adopted	
• Acceptance of NUSS Codes	Summary: Codes found appropriate as guidelines. Generally consistent with national regulatory requirements.	11 October 1988
• Nuclear Suppliers Group	Member	

REFERENCES

[1] IAEA Energy and Economic Data Base (EEDB).

[2] IAEA Power Reactor Information System (PRIS).

[3] Data & Statistics, the World Bank, www.worldbank.org/data.

Appendix

DIRECTORY OF THE MAIN ORGANISATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

NATIONAL ATOMIC ENERGY AUTHORITY

Export Control and Non-Proliferation Directorate (XNP)
Department of Trade & Industry
4 Abbey Orchard Street
London, SW1P 2HT — Tel: +44-20 7215 0720
United Kingdom — Fax: +44-20 7215 0722

NUCLEAR RESEARCH INSTITUTES

United Kingdom Atomic Energy Authority
Building 521
Harwell
Didcot — Tel: +44-235 431000
Oxfordshire, OX11 0RA — http://www.ukaea.org.uk/

Central Laboratory of the Research Councils (CLRC) — http://www.cclrc.ac.uk/

OTHER NUCLEAR ORGANISATIONS

Nuclear Electric Ltd
Barnwood HQ
Barnett Way — Tel: +44-1452 652222
Gloucester, GL4 3RS — Fax: +44-1452 652776
Main activities: Responsible for operating AGR and PWR nuclear power stations in England and Wales

British Energy Generation (UK) Ltd
3 Redwood Crescent
Peel Park
East Kilbride — Tel: +44-13552 62000
Glasgow, G74 5PR — Fax: +44-13552 62626
Main activities: Responsible for operating AGR nuclear power stations in Scotland — http://www.british-energy.co.uk/

Scottish Power: — http://www.scottishpower.plc.uk/

Magnox Electric plc
Berkeley Centre
Berkeley — Tel: +44-1453 810451
Gloucestershire, GL13 9PB — Fax: +44-1453 812529
Main activities: Responsible for operating Magnox nuclear power stations in the UK.

AEA Technology
Building 329
Harwell
Didcot — Tel: +44-235 431000
Oxfordshire, OX11 0RA — http://www.aeat-env.com/

UK Nirex Ltd
Curie Avenue
Harwell
Didcot
Oxfordshire, OX11 0RH

Tel: +44-1235 825500
Fax: +44-1235 831239
http://www.nirex.co.uk/

British Nuclear Fuels plc (Head Office)
Risley
Warrington
Cheshire, WA3 6AS

Tel: +44-1925 832000
Fax: +44-1925 822711
http://www.bnfl.com/website.nsf/index.htm

British Nuclear Fuels plc (Fuel Manufacture)
Preston
Lancashire, PR4 0XJ

Tel: +44-1772 762000
Fax: +44-1772 762155

British Nuclear Fuels plc (Fuel Enrichment)
Capenhurst
Cheshire, CH1 6ER

Tel: +44-151-339 4101
Fax: +44-151-347 3661

British Nuclear Fuels plc (Reprocessing)
Seascale
Cumbria, CA20 1PG

Tel: +44-19467 28333
Fax: +44-19467 28987

Urenco Ltd
18 Oxford Road
Marlow
Buckinghamshire, SL7 2NL

Tel: +44-1628 486941
Fax:+44-1628 475867
http://www.urenco.com/

National Radiological Protection Board (NRBP)
Chilton
Didcot
Oxon, OX11 0RQ

Tel: +44-1235 831600
Fax: +44-1235 833891
http://www.nrpb.org.uk/

Department of Environment, Transport and the Regions
Ashdown House
123 Victoria Street
London, SW1 6RB

Tel: +44-20 7890 3000

HM Nuclear Installations Inspectorate
Rose Court
2-10 Southwark Bridge Road
London, SE1 9HS

Tel: +44-20 7717 1000

Nuclear Safety Directorate — http://www.hse.gov.uk/nsd/nsdhome.htm

The Uranium Institute (UK) — http://www.uilondon.org/index.htm

Uranium Institute's Glossary of Nuclear Terms — http://www.uilondon.org/gloss.htm

News Briefings
(The Uranium Institute, London) — http://www.world-nuclear.org/nb/nbhome.htm

British Nuclear Energy Society — http://www.ice.org.uk/about/assoc.html#six

British Nuclear Industrial Forum (UK)	http://www.bnif.co.uk/html/frame_set.htm
Nuclear Technologies, Ltd.	http://www.nuclear.co.uk/
RadPro Limited (UK based professional consultancy)	http://www.radpro.co.uk/

OTHER RESEARCH INSTITUTES

Daresbury Laboratory	http://srs.dl.ac.uk/index.htm
JET Joint Undertaking (European experiment in UK)	http://www.jet.uk/
UKAEA Culham (UK)	http://www.fusion.org.uk/

OTHER ORGAINZATIONS AND SITES

The British Library	http://www.bl.uk/
JET Preprints and Reports (by IoP)	http://www.iop.org/Jet/welcome
Journal for Corrosion Science and Engineering (UMIST, UK)	http://www.cp.umist.ac.uk/JCSE/
New Journal of Physics (IoP and DPG)	http://www.njp.org/
The Institute of Physics (electronic publications)	http://www.iop.org/
The Atomic Data and Analysis Structure ADAS (UK)	http://patiala.phys.strath.ac.uk/adas/adas.html
University of Sheffield	http://www.shef.ac.uk/
Friends of the Earth (Scotland)	http://www.foe-scotland.org.uk/
Friends of the Earth (UK)	http://www.foe.co.uk/
Programme for Promoting Nuclear Non-Proliferation PPNN	http://www.soton.ac.uk/~ppnn/
Verification Technology Information Centre (VERTIC)	http://www.fhit.org/vertic/
World Energy Council (WEC)	http://www.worldenergy.org/wec-geis/
The BP Statistical Review of World Energy	http://www.bpamoco.com/worldenergy/
Energy Group University of Reading	http://www.reading.ac.uk/AcaDepts/st/home/energygp/
International Geothermal Association	http://www.demon.co.uk/geosci/igahome.html
Institute of Physics (Learned Society, UK)	http://www.iop.org/IOP/
Business Research Group (BRG)	http://www.brg.co.uk/

ICI Group	http://www.ici.com/
The Constants and Equations Pages	http://tcaep.co.uk/index.htm
BBC Education Web Guide	http://www.bbc.co.uk/plsql/education/webguide/pkg_main.p_home
Conferences & Exhibitions by the Institute of Physics	http://www.iop.org/IOP/Confs/
Conferences on Physics (PhysicsWeb)	http://www.physicsweb.org/events/