UNITED NATIONS

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Economic and Social Council

Distr.
RESTRICTED

ENERGY/WP.2/R.24/Add.1
20 February 1995

ENGLISH
Original: ENGLISH/FRENCH/RUSSIAN

ECONOMIC COMMISSION FOR EUROPE

COMMITTEE ON ENERGY

WORKING PARTY ON ELECTRIC POWER
Fifth session, 3-5 May 1995
Item 5 (a) of the provisional agenda

THE ELECTRIC POWER SITUATION IN THE ECE REGION IN 1993

National equipment plans and policies

CONTENTS

GE.95-30452 (E)

Introduction

This report was prepared by the secretariat in accordance with the decision taken by the Working Party on Electric Power at its fourth session (ENERGY/WP.2/7, para. 11 (viii)). It represents the section of the annual report on national equipment plans and policies and includes information provided by countries during the fourth session and/or transmitted to the secretariat before 15 June 1994. Statements were submitted by the following countries: Belgium, France, Germany, Hungary, Italy, Norway, Poland, Romania, Russian Federation, Spain, Sweden, Switzerland, Turkey and the United Kingdom of Great Britain and Northern Ireland.

BELGIUM

[Original: French]
[3-5 May 1994]

1. The slow-down in electricity consumption which began in the fourth quarter of 1992 continued in 1993. Despite the sluggish economy, electric power consumption did increase slightly, showing average growth of 1.2% over 1993 as against 3.4% in 1992.

2. Apart from the last two months of the year when, especially during the long cold spell in November, there was a marked increase, consumption remained almost stable month-on-month from 1992.

3. Basic industry, which was much harder hit by the recession than other sectors, consumed less electricity, particularly at the beginning of the year. There was, however, a perceptible improvement in some industries over the last few months of the year.

4. The total production figures for Belgium indicate a 2% drop from 1992. The difference between consumption and production is the result of energy movements to and from abroad and the energy required for pumping. In 1993, total foreign trade in electricity (imports plus exports) amounted to 12,862 GWh, or 18.8% of the power drawn. Energy for pumping amounted to 1,012 GWh.

5. In terms of generating mix, nuclear power stations accounted for 58.9% of total production. The extremely high availability of all Belgium's nuclear facilities is worthy of note. Conventional thermal stations accounted for 39.6% of total output; solid fuel, 23.8%; gas, 13.4%; liquid fuel, 1.8%; and recycled steam, 0.6%. The balance (1.5%) came from hydroelectric and other facilities.

6. As regards current installations, units answering particularly to the objective of reducing CO_2 were brought on line in 1993. The Drogenbos 460-MW combined-cycle unit was started up and is due to come into industrial operation at the beginning of 1994. The gas turbines, rated for the same power output, at the Seraing combined-cycle unit were also fired up, and the steam turbine will be started early in 1994; the unit will go into industrial operation over the same period.

7. In terms of cogeneration, Electrabel brought a 36-MW gas turbine, the exhaust gas from which is recovered to generate steam for nearby industry, into service at Langerbrugge in 1993. A similar 36-MW unit was brought into service in Antwerp under a cooperative agreement with ESSO to generate electricity and steam. Another 22-MW cogeneration unit built in cooperation with Phenolchemie in Beveren is in the process of start-up, and will be brought into service early in 1994.

8. Replacement of the steam generators in reactor 3 at the Doel nuclear plant raised the nominal output of the reactor by roughly 70-MW as of mid-September 1993.

9. In renewable energy, a small hydroelectric plant was brought on line in the province of Liège. A new 1-MW unit was added to the wind farm in Zeebrugge.

10. A number of small power/heat units were also brought into service by producer/distributors and industrial in-house generating facilities.

11. As for the future, a 24-MW fluidized-bed unit burning coal wastes will be brought into service early in 1994. The sector has a 25% stake in the Chooz B1 and B2 (2 x 347.5-MW) nuclear reactors, which are due to start up in late 1995 or early 1996. Also in 1995 there are plans to bring a 50-MWe unit for the combined production of heat and power on line in Ghent.

12. As regards planned installations, plans to build combined-cycle units to come on line by 1997 in Ghent and in Herdersbrug, near Bruges, are under consideration. The equipment installed there would also come under the heading of moves to reduce CO_2 emissions.

13. A sectoral agreement on reduced SO_2 and NO_x emissions, signed on 18 October 1991, requires an initial contractual target for reductions in such emissions to be met in 1993. The undertakings given to the authorities have been fully respected.

14. The transmission network grew in 1993 by 10.3 km of 380-kV lines, 10.6 km of 150-kV lines, including 3.7 km of cable, and 10 km of 70-kV cable.

15. At a time of clear downturn in business investment, investment outlays in the electricity sector will be on the order of 37.9 billion francs in 1993, as against 33.8 billion francs in 1992, in addition to investments in France in the Chooz nuclear plants, where Belgium's share is put at 3.2 billion francs in 1993 as against 2.8 billion francs in 1992.

16. Average annual electricity prices increased by roughly 1.3% in 1993 for all major categories of consumer. This increase, below the inflation rate (of roughly 2.7% averaged over the year) was due to limited growth in cost parameters.

17. Tariffs remained unchanged in 1993.

18. Under its "overall plan", the Government has asked the electricity and gas sectors to reduce the burden on consumers by 2,000 million francs in 1994. The reduction will be accomplished through wage restraint measures imposed by the Government, and a collection of matching measures which the Electricity and Gas Watchdog Committee is expected to announce in early January.

19. Electricity prices should therefore fall in real terms in 1994.

FRANCE

[Original: French]
[3-5 May 1994]

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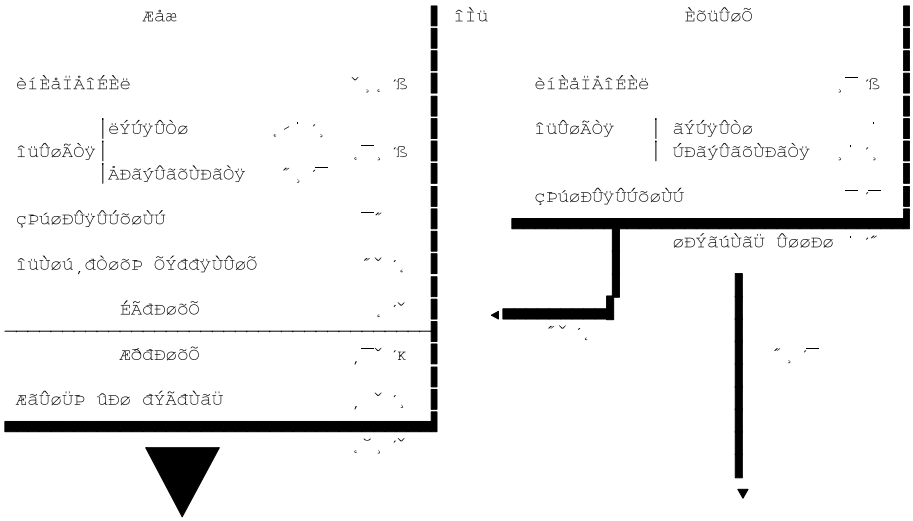

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GERMANY*

[Original: English]
[3-5 May 1994]

I. PRELIMINARY REMARKS

20. The trends observed in the electric power industry in the eastern and western parts of Germany continued to differ widely in 1993. The following will therefore begin by discussing the figures separately, broken down into the so-called "new" Laender in the east and the "original" Laender in the west of Germany.

II. TRENDS IN THE ORIGINAL LAENDER

A. Outline

21. In 1993, the trend in electric power consumption was characterized by bad cyclical situation and mild weather conditions. Gross electricity consumption fell in 1993 by 1.2% from 458.0 TWh to 453.0 TWh. At the same time, there was a slight export surplus of 0.2 TWh. At 453.2 TWh, gross electric power production decreased by 2.0%, i.e. more strongly than gross power consumption. At 103.3 TWh, total power station capacities for electric power generation declined by 0.2% against the preceding year.

B. Power consumption

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* Data for 1993 are preliminary.

22. Whilst 1992 still saw a gross national product (GNP) expansion of 0.8%, a visible contraction of -2.3% was recorded for 1993.

23. A substantial cyclical decline was recorded by the capital goods industry and, especially, in the automobile industry (-8.0%).

C. Power production

1. By operators

24. In 1993, gross domestic power production totalling 453.2 TWh was 9.2 TWh less than in 1992. The power production of public utilities fell by 2.1% (8.4 TWh) to 391.4 TWh and that of industry by 1.8%, whilst the Federal Railways saw only a slight decrease of 0.3%. Industry and the Federal Railways together produced 61.8 TWh.

2. By energy sources

25. The following is a breakdown by energy sources:

(a) Gross nuclear power production dropped noticeably in 1993, i.e. by 3.3% to 153.5 TWh. However, contributing 33.9% to electric power generation, the nuclear power share continued to be considerable. As regards the electricity supplied by the public utilities, nuclear power's contribution amounted to 38.9%, thus continuing to provide the largest share of all the energy sources;

(b) Electricity generated on the basis of hard coal is likely to have increased by 2.3%. In particular, power production by public utilities would seem to have grown (presumably by +4.3%). A total of about 144.7 TWh was produced on the basis of hard coal, i.e. some 3.2 TWh more than a year earlier. At the same time, however, more than 85% of electricity generated from hard coal still relied on domestic supplies. The share of hard coal in total electricity output was roughly 31.9%. The contributions of hard coal to electric power production was thus more or less equal to that of nuclear energy. With its share of almost 45%, hard coal remained by far the most important input fuel for industrial and Federal Railway power stations;

(c) Electricity production on the basis of lignite decreased significantly against 1992, i.e. by 6.0%;

(d) Generation by natural-gas-fired public power stations dropped heavily by 3.8% to 17.7 TWh in 1993, whereas the use of natural gas in industrial power production rose slightly by 0.8% (12.3 TWh) in 1993;

(e) The use of heating oil as an input fuel fell by 18.7% against the preceding year. At some 8.7 TWh, its total contribution was only 1.9% of aggregate electric power production, thus placing it at an extremely low level by international comparison;

(f) Favourable water conditions throughout Europe resulted in a rise of hydropower production by 3.1% to 20.1 TWh. The other renewable forms of energy played only a minor role.

D. Power station capacity

26. Installed power station capacity in the western Laender of Germany saw a slight decline of about 200 MW to 103.300 MW. The total, end-1993 gross maximum capacity of all power stations showed a share of about 43% (some 44,850 MW) accounted for by hard-coal-fired and lignite-fired power stations, whilst the share provided by nuclear power stations was about 23% (roughly 23,890 MW).

27. At 26,000 MW, oil- and gas-fired capacity dropped by about 400 MW to roughly 26,000 MW in 1993. This type of capacity is mainly used for reserve and peak-load purposes. At 11,600 MW, lignite-fired power station capacity fell by about 600 MW.

E. Line development and international grid

28. In 1993, a 380 kV dual line over a length of about 140 km and a 220 kV line over a length of 40 km were commissioned.

F. Investment by public electricity utilities

29. After gross fixed investment by public utilities had risen by +11% to about DM 10.6 billion in 1992, another sharp rise of 17% to DM 12.4 billion is expected for 1993. However, the target figures suggest a stronger decline in the future. New plants will be built only to replace existing ones.

G. Electricity prices

30. The level of prices and average revenues of the German electricity supply industry remained more or less constant in 1993. In the field of industrial consumption, prices are likely to have dropped slightly by 0.2%, while in the field of tariff consumers, especially households, an increase of 1.4% is to be expected. The coal levy declined slightly from 7.75 to 7.5%. The average revenues (including coal levy, without value-added tax) amounted to about 25.95 Pf/kWh for tariff customers (+1.4%) and 16.09 Pf/kWh for special contract customers (-0.2%). This meant a real decrease in the price of electricity in the light of an overall inflation rate of 4.2%.

III. THE NEW LAENDER

A. Overall picture

31. The continuing structural adjustment process of the economy resulted in a 2.4% decline in gross electricity consumption in 1993 from 73.2 TWh to 71.5 TWh. Imports went down by 2.6% to 3.9 TWh and exports by 3.9% to 5.3 TWh. Gross power production fell by 3.0% to 72.9 TWh. In spite of the decline of unscreened lignite by 2.2%, this energy commodity dominated with its share of 92.3% as in the preceding year.

B. Power consumption

32. The 1.7 TWh decline in electricity consumption relative to 1992 was primarily due to the fall in demand by industry. Detailed data are not yet

available. As in 1992, the process of industrial contraction and restructuring was felt throughout 1993.

C. Power production

1. By operators

33. In 1993, gross power production totalled 72.9 TWh, thus falling 1.8 TWh from the 1992 level. The main decline was recorded for industry at 1.6 TWh (1.2 TWh thereof on the basis of lignite), whilst the decline registered for public electricity utilities was only slight, i.e. 0.3% to 61.2 TWh. On the other hand, electricity production by the Deutsche Reichsbahn, at 0.2 TWh, reached the 1992 level.

2. By source of energy

34. The contributions of the various energy sources were as follows:

(a) The most important contribution to electric power supply was again provided by unscreened lignite, which raised its share of aggregate power production slightly to 91.5%;

(b) Although the share of hard coal decreased relative to 1992, it does not yet play any noticeable role with a share of 0.4% of total production.

(c) The input of heating oil, at 1.1 TWh, fell slightly compared with the preceding year, providing only 1.5% of aggregate power production;

(d) The use of natural gas, at 2.4 TWh and a share of 3.3% of total electricity production, practically remained at the pre-year level;

(e) The share accounted for by hydropower (basically pump storage units) increased in 1993 from 1.6 TWh to 1.7 TWh because of favourable water conditions.

D. Power station capacity

35. There was a decline of about 100 MW in installed power station capacity in the conventional sector to 19,375 MW. This fall was accounted for by a number of smaller lignite-fired power plants. Unscreened-lignite-fired power stations, providing 14,500 MW, had a 75.2% share of total end-1993 gross maximum capacity whereas the remaining share was accounted for by hydropower (9.0%) that, to a large extent, is used for reserve and peak-load demand, and by natural gas, heating oil and other fuels (12.2%).

E. Line development and international grid

36. The 380 kV dual line has a length of 4,600 km, while the 220 kV line is 6,400 km long. The synchronous interconnected power transmission system between the grids in the eastern and western parts of Germany is expected to be commissioned at the end of 1994. Four 380 kV dual lines must be built for secure supply with the interconnected power transmission system of the

high-voltage network in eastern Germany (VEAG). The Redwitz-Remptendorf and the Helmstedt-Wolmirstedt lines are already operating. The other two lines are either in a licensing stage or under construction.

37. Since the Berlin Senate decided in April 1991 that a large portion of the municipal 380 kV network was to be installed as an underground cable system instead of the original overland system, it will take more time to hook up West Berlin's separate network with that of the western German grid. The linking of the interconnected power transmission system to that of the UCPTE will thus presumably not be possible before the winter of 1994/1995. To cope with bottlenecks, 110 kV cables were hooked into the East Berlin network at the end of 1992.

38. Since June 1993, the 600 MW direct-current tight coupling has permitted direct electricity exchange between the Czech Republic and the western German grid.

F. Investment by public utilities

39. For 1993, some DM 4.7 billion in gross fixed investment is expected. This increase (+53% against 1992) is to be explained by investments in producer plants, which are almost twice as large at DM 1.8 billion. However, the focus of investment is the electricity grid whose share (DM 2.4 billion) was over one third up on the pre-year value. In view of the poor conditions of the production facilities, there is a great need for modernization and replacement.

IV. ELECTRIC POWER SUPPLY IN GERMANY AS A WHOLE

40. The following are the 1993 electricity supply figures for the territory of united Germany:

	1993/1992 (percentage)	
Gross power consumption	524.5 GWh	-1.4
Gross power production	526.1 GWh	-2.1
Export balance	1.6 GWh	-
Total capacity	122.6 GWh	-0.2

41. Although energy production in the new Laender is to a large extent based on lignite, the energy supply in united Germany remains diversified and balanced. At slightly less than 29.2%, nuclear power accounts for the highest share of electric power production. The share taken by lignite lies at 28.1%, while hard coal accounts for approximately 27.5%. The remaining electricity is produced mainly from natural gas, heating oil, and hydropower.

HUNGARY

[Original: English]

[3-5 May 1994]

I. CHARACTERIZATION OF GENERAL ENERGY CONSUMPTION

42. In 1993, industrial production was higher than that of the previous year, by about 4.3%. The sale of main agricultural articles increased by about 3.5%.

43. Hungary's total energy consumption in 1993 was 1,067 PJ, according to preliminary calculations, 0.9% higher than in 1992.

44. Within the total energy consumption, the share of the producing branches amounted to 47.5%, 1% less than the previous year.

45. Domestic energy production was 48.4%. Domestic coal production reached 14.6 million tons, production of crude oil amounted to about 1.8 million tons, and production of natural gas was about 4.75 billion m^3.

II. ELECTRICITY CONSUMPTION

46. Following the 1989 stop in the increase of the gross electric power consumption and the fallback of 1990-1992, an 0.5% increase in demand was experienced in 1993.

47. The electric power industry applied monthly instead of bimonthly billing with most consumers since mid-1992, so the total net consumption shows an illusory decrease in 1993.

48. The highest peak load occurred in the electric power system on 6 January 1993, amounting to 5,612 MW. It represents a slight reduction of 1.5% as compared to the previous year but was higher than expected. The monthly average peak load was 4,728 MW, 6 MW less than the value of the previous year. No consumer demand reduction had to be imposed in 1993.

III. ELECTRIC POWER PRODUCTION

49. Production of electric power in Hungarian power stations amounted to about 32.5 TWh, 1.2 TW higher than the previous year, because of a reduction in the importation of electric power.

50. Producing availability of the nuclear power plant at Paks was decisive in the production of electric power in Hungary, which achieved 13,796 GWh in the 1,760 MW of built-in capacity with 4,440 MW PWR type units, that is, 1.2% less than the highest result to date. The share of its production was 42.4% within the domestic production of electric power. The share of coal-fired power plants reached 27.8% (28.9% in 1992) and that of hydrocarbon-fired power plants was 34.8% (21.7% in 1992).

IV. EXCHANGE OF ELECTRIC POWER

51. In this field the essential change continued in Hungary in 1993. The balance of import-export fell by 2,474 GWh, which means a reduction of 28.6%, and its share decreased about 10% of the total electric power available for

consumers (in the 1980s it was about 25%). Within this import, 851 GWh was connected with barter contracts of trading companies. The market changed, the dominant role of the long-term transfers from the former Union of Soviet Socialist Republics decreased and Hungary purchased energy from diversified markets, such as Poland and Germany. The market forces are growing.

V. INVESTMENTS

52. In the field of production, the 143 MW combined cycle gas turbine investment was finished at the Dunamenti power station and the test operation began in the last quarter. The extension with a gas turbine like Dunamenti at Budapest Power Station Company began in 1993.

53. In the field of transmission systems, the 400 kV line Györ-Wien DC and back-to-back station between Hungary and Austria were put in service.

VI. PERSPECTIVE

54. An upswing of power consumption may take place in the mid-1990s. The total consumption in the year 2000 could be in the neighbourhood of:

- 37 TWh (peak load: 6,100 MW) at a small increase in demand;

- 40 TWh (peak load: 6,600 MW) at a medium increase in demand;

- 45 TWh (peak load: 7,400 MW) at a big increase in demand.

We count on medium demands that seem to be more realistic. The medium demands mean that at the end of this millennium we will achieve again the biggest consumption reached ever (that of the year 1989).

55. The life expectancy of the main parts of our power stations was planned to be about 25 years, but most of the equipment still in operation is much older than that. The standard of efficiency, environmental pollution and uneconomical operation are the grounds for shutting them down.

56. In the medium term a second gas turbine unit may be put into operation at Dunamenti Höerömü and later on another one at Budapest Power Station Company.

57. In the next phase, between 1996-2000, in case of a medium increase a capacity of 2,100-2,400 MW should be fitted in the plans.

VII. ENERGY POLICY, ELECTRICITY ACT, PRIVATIZATION

58. Parliament adopted a new Hungarian Energy Policy on 23 March 1993. The parliamentary decision includes the following:

(a) The Government should ensure security of supply, taking account of the environment, and reducing the unilateral import dependency;

(b) The Government should prepare an energy conservation programme;

(c) The Government should ensure harmonization of interest of the coal mines and the power industry from all aspects (human, economic, etc.);

(d) New legislation regulating the power industry, in compliance with the legislation of the European community, shall be prepared.

59. To implement the decision, a new electricity Act was prepared. On 6 April 1994, the Hungarian Parliament voted through an Act regulating the electricity industry and creating the conditions for eastern Europe's first wholesale power privatization.

60. The Act breaks the national monopoly on electricity generation and distribution held by the electricity utility, MVM, allows for independent utilities and establishes the basis for a division between power generators, transmission and distributors.

61. Crucially, the legislation establishes a legal framework for setting prices. The privatization tenders are due in mid-1994, following government approval. At the preparation stage the authorities intend to allow complete foreign ownership in four generating companies that rely largely on coal-fired power plants and require modernization. However, the State plans to retain a stake of 25% in three larger conventional power complexes and to keep full control of the Paks nuclear power station, and transmission. Privatization will begin with the distribution companies.

ITALY

[Original: English]
[3-5 May 1995]

I. THE ENERGY SECTOR IN 1993

A. The macroeconomic setting

62. In 1993, Italian economic activity was very moderate: gross domestic product (GDP) decreased by around 0.7% (+0.9% in 1992) and industrial production decreased by 3% (-0.6% in 1992).

63. The moderate decrease in GDP in 1993 was paralleled by an energy intensity decrease of 0.7% (-0.4% per year in the 1983-1993 period), whereas the electric intensity increased by 1.4% (+1.0% per year in 1983-1993 period).

B. The energy setting

64. The 1993 total energy requirements including bunkers decreased by 1.4% (+0.8% in 1992) reaching 165.9 million tons of oil equivalent (Mtoe), i.e. down by 2.3 Mtoe versus 1992 (in 1992, its increase versus 1991 was equal to 1.4 Mtoe). In 1993 hydrocarbons covered 81% of total energy requirements (as in 1992) and the shares of natural gas and oil remained unchanged (25% and 56% of total energy requirements).

65. In 1993, domestic production of primary sources (32.4 Mtoe) covered 20% of total demand. The production of solid fuels (4% of total production)

decreased by 9.6% versus 1992. The production of natural gas (49% of total production) increased by 7.9% and supplied 38% of total natural gas consumption. Oil production (14% of total production) covered only 7% of total oil consumption. Primary electricity (hydro and geothermal) was more or less equal to that of 1992 and covered 33% of total production.

66. Energy net imports, including stock changes, confirmed their key role in the supply of total energy requirements: out of 133.5 Mtoe imported (136.7 Mtoe in 1992) the share of oil products was 66% (as in 1992), natural gas was 20% (as in 1992), solid fuels was 7% (as in 1992) and primary electricity 7% (6% in 1992). The energy dependence on imports decreased from 81.3% in 1992 to 80.4% in 1993.

67. Energy dependence on imports was 80% (81% in 1992) and this vulnerability is to be placed against an international background where almost all industrialized Western countries improved their energy self-sufficiency after the first oil crisis. The general 1993 picture thus appears to substantiate the wide structural gap between the energy system of other industrialized countries and the Italian one.

68. The large Italian reliance on imports had severe repercussions on the country's energy bill (i.e. payments to foreign countries for the purchase of energy sources) which was 22,000 billion lire in 1993, an increase of 2,000 billion lire. The energy bill was greater than in 1992 (+9.5%), despite the falling trend in oil prices (-9.8%) and that due to the worsening of the lira US$ exchange rate in 1993 (+26%).

69. Total final energy consumption 121.3 Mtoe (net of bunkers and of non-energy uses) decreased by 1.3%, with different trends in the various economic sectors. It decreased by 3.8% in industry as a result of the lack of dynamism in that sector. In agriculture it increased by 3.4%; in the transportation sector it increased by 1.1%; and in the "civil uses" sector it increased by 0.4%.

C. The electricity demand

70. Electricity demand on the national grid (see table) grew by 0.7% (+1.6% in 1992) reaching 246.5 billion kWh (244.8 TWh in 1992). The share of total domestic energy requirements supplied by electricity went from 56.1 Mtoe in 1992 to 56.2 Mtoe in 1993, electricity penetration remaining fairly constant (33.9% in 1993 versus 33.4% in 1992. Fossil fuels accounted for 36.9 Mtoe versus 37.5 Mtoe in 1992 (-1.7%).

Italian electricity balance in 1993

	1992		1993		Changes in % 1993-1992
	Mtoe	TWh	Mtoe	TWh	
Hydro	10.07	45.78	9.80	44.7	-2.4
Geothermal	0.76	3.46	0.80	3.7	6.9
Conventional Thermal	37.53	177.00	36.94	174.6	-1.4
of which:					

Solid fuels (1)	5.81	25.81	4.74	21.3	-17.5
Natural Gas	7.22	35.17	7.94	38.6	9.8
Oil products (2)	24.50	116.02	24.26	114.7	-1.1
Total Production	48.36	226.24	47.54	223.0	-1.4
Net Imports (3)	7.77	35.30	8.70	39.4	11.6
Total availability	56.13	261.54	56.24	262.4	0.3
Auxiliaries Services		11.80		11.7	-0.8
Pumped storage		4.95		4.2	-15.2
Electricity demand		244.79		246.5	0.7
FINAL CONSUMPTION		228.01		229.0	0.4
- Agriculture		4.33		4.5	3.9
- Industry		115.84		114.3	-1.3
- Transportation		6.49		6.5	0.2
- Tertiary		45.61		47.3	3.7
- Residential		55.74		56.4	1.2

(1) Coal, lignite and other fuels.
(2) Fuel oil, gas-oil, light distillates, residual refinery-gases and oil coke.
(3) ENEL Includes net imports from National Third Producers.

71. Availability of electricity for consumption (gross generation plus net imports) recorded 262.4 billion kWh (+0.3% versus 1992). Net imports rose from 35.3 TWh in 1992 to 39.4 TWh (+11.6%), thus accounting for 16.0% of total electricity demand.

D. The electricity supply

72. The increase of demand (1.7 TWh) was supplied by greater imports from abroad (4.1 TWh) covering the decrease in national production (-3.2%). In 1993 versus 1992, analysis by energy source reveals the following:

(a) Hydroelectricity decreased from 45.8 to 44.7 TWh (-2.4%);

(b) Geothermal generation increased from 3.5 to 3.7 TWh (+7%);

(c) Generation from solid fuels 1/ decreased from 25.8 to 21.3 TWh (-17.5%), with a 10% incidence on total generation (11% in 1992);

(d) Generation from natural gas increased from 35.2 to 38.6 TWh (+9.8%) with a 17% incidence on total generation (16% in 1992).

(e) Use of oil products decreased from 116.0 to 114.7 TWh (-1.1%), maintaining the same impact on total generation (51%).

E. Electricity consumption

1/ Coal, lignite, blast furnace gas, coke-oven gas and other fuels.

73. Electricity consumption (total demand net of losses) grew from 228.0 TWh in 1992 to 229.0 TWh in 1993 (+0.4%), with different trends according to economic sector. In agriculture, it grew by 3.9% (+2.4% in 1992). In industry, it decreased by 1.3% (+0.6 in 1992), reflecting the negative trend of industrial activities. In transportation, it grew by 0.2% (+1.8% in 1992). In the "civil uses" sector (services and residential), it increased by 2.3%. Consumption rose in the services sector by 3.7% (+5.6% in 1992); and in the residential sector by 1.2% (+1.9% in 1992).

F. Balance between peak demand and capacity

74. Peak demand on the national grid as registered on 1 December 1993 increased from 40,000 MW (35,800 MW on the grid of the Ente Nazionale per l'Energia Elettrica (ENEL) to 41,000 MW (36,800 MW on the ENEL grid). In 1993, the gross capability of the Italian power system grew by 1,900 MW reaching 65,800 MW.

II. THE ELECTRICITY INDUSTRY

75. In Italy, the electricity service is provided by multiple operators: ENEL (the main one with approximately 90% of the customers). Some tens of local utilities (municipalities) and some hundreds of small private enterprises. Furthermore, a substantial share of electricity generation (12%) is represented by industrial self-production, which is not subject to particular constraints. However, in this multi-operator environment ENEL has the full responsibility for ensuring an adequate supply of electricity for the whole country.

Ente Nazionale per l'Energia Elettrica

76. The structure of the Italian electric industry was established in 1962 by the electricity nationalization law, by which a State-owned company, ENEL, was vested with the responsibility for the country-wide electricity supply service, as well as for the planning and management of the generation system, the interconnected transmission grid and the distribution network.

77. By Act of Parliament of 11 July 1992, the Italian Government took the decision to privatize some undertakings carrying out activities of an industrial or commercial nature. The new companies have issued shares of a total value equal to the net fixed assets given in the last balance sheet. The shares have been allocated to the treasury and the revenue obtained by their sale will be used to reduce the national debt and to balance the Government's books. Thus, in July 1992, ENEL became a private company (ENEL S.p.a.), with a share capital of about 12,000 billion lire still all in the hands of the Treasury.

78. The aim of the new company as set out in article 4.1 of its Statute, is to generate, import and export, transmit, transform, distribute and sell electricity in Italy and elsewhere. The company is in charge of any other related or complementary activities. ENEL may also carry out the following: consultancy and engineering activities in Italy and elsewhere in the fields defined above; any operations contributing to its aims (property market and investment operations and commercial-industrial-financial activities except

for collecting public savings). Finally, ENEL may hold shares and interests in other companies or undertakings, in Italy and elsewhere, having similar or complementary aims and may give real and/or personal security for its own bonds and those of others.

NORWAY

[Original: English]
[3-5 May 1994]

I. CONSUMPTION

79. The energy-intensive industries' consumption of electricity in 1993 was 0.7% higher than in 1992. However, the change in consumption was somewhat different in the three main groups of energy-intensive industries. The consumption in the iron, steel and ferrous alloys industries increased by 6.6%, the consumption in the aluminium and other metal industries increased by 1.4%, whereas in the chemical industry the consumption decreased by about 15.9%.

80. The gross general consumption (households, other industries, etc.) increased by 3.5% from 1992. However, adjusted for temperature conditions, the general consumption shows an increase of 1.7%, which is about the same as average over the last five years.

II. ELECTRICITY PRODUCTION AND GROSS CONSUMPTION (TWh)

	1992	1993	Percentage change
Energy-intensive industry	28.3	28.5	0.7
+ General consumption	70.8	73.3	3.5
= Gross domestic consumption (excl. electric boilers)	99.1	101.8	2.7
+ Electric boilers and pumped storage (occasional power)	9.0	9.8	9.3
+ Exports (incl. losses) - Imports	9.4	8.4	
= Production	117.5	120.0	2.1
General consumption adjusted for temperature conditions	72.4	73.6	1.7

III. PRODUCTION

81. Preliminary figures for 1993 show an increase in electricity produced of 2.1% compared with 1992. Since the electricity production system in Norway is almost entirely based on hydropower, the production is dependent on the run-off during the year. In 1993 the run-off in most parts of the country was somewhat above average.

IV. DEVELOPMENT

82. In 1993 a total of 52 MW capacity was added to the production system, of which all was hydropower. The mean annual firm power contribution to the integrated system of these additional was about 0.2 TWh. There is reason to believe that the rate of development will remain this low for the next few years. The approval of watercourse protection plan No. IV by the Storting (parliament) on 30 April 1993, has brought the hydropower potential in river systems protected from development up to 35 TWh.

POLAND

[Original: English]
[3-5 May 1994]

I. ELECTRIC ENERGY CONSUMPTION

83. The net consumption of electric energy in 1993 amounted to 98.9 TWh and was approximately 1.5% higher than in the previous year. The largest increase in consumption was observed in industry (+3.4%) - for the first time since 1990. It was the result of improved economy and achieving the increase of GDP of about 4% as compared with 1992. An adverse situation was observed as far as the electric energy used by minor consumers for household and for agriculture is concerned. For these groups of consumers an increase was recorded up to 1992 but a certain decrease (approximately 1.3%) occurred in 1993. This was mainly due to the rise in the price of electric energy (approximately 35%) which in 1993 was higher than the total inflation rate. The introduction of VAT in July 1993 (7% for electrical energy) caused an additional increase in electric energy prices.

84. At the end of 1993, the electric energy prices were equal to:

3.6 USc/kWh for industrial consumers at high voltage;

5.6 USc/kWh for small consumers at low voltage;

4.3 USc/kWh for household and agriculture at low voltage (all prices excluding VAT).

85. The consumption of electric energy for households dropped in 1993 to 1,818 kWh per consumer (1,848 kWh per consumer in 1992). The following structure of the electric energy consumption was recorded in 1993:

Industry and other large consumers		-	54.8%
Electric railway transport		-	4.7%
Other consumers supplied at LV		-	40.5%
of which:	household	-	18.4%
	agriculture (farms)	-	6.4%

86. The highest demand occurred on 1 December, amounting to 22,700 MW, signifying an increase by 1,200 MW over the 1992 figure.

II. ELECTRIC ENERGY PRODUCTION

87. The total electric energy production in 1993 in home electric power stations was equal to 133.4 TWh, i.e. 0.5% more than in 1992. Approximately 94% of the electric energy produced in utility power stations (124.3 TWh) was fed into the Polish power grid, while the energy from industrial thermal power plants was consumed mainly by self producers (ca 9.1 TWh or 6%).

88. The structure of electric energy production by public supply was as follows:

52.5 TWh (42%) - in electric power stations fired with brown coal;

68.9 TWh (55.1%) - in electric power stations fired with hard coal;

3.5 TWh (2.8%) - in hydroelectric power stations.

89. Utility thermal power stations consumed 66.2 million tons of brown coal (average calorific value - 8,300 kJ/kg) and 40.8 million tons of hard coal (average calorific value - 21,320 kJ/kg). The low calorific value of hard coal is the result of using only a small amount of enriched fuel. The situation in this field should be improved during the next few years. The p.u. fuel energy consumption for the gross electric energy production amounted to 10,220 kJ/kWh (brown coal) and 8,890 kJ/kWh (hard coal). Eighteen per cent of electric energy production is realized in a combined cycle: heat and power production. The heat production in combined heat and power (CHP) stations amounted to 195 TJ in 1993.

90. The share of electric energy production in hydropower stations was relatively small, i.e. around 2.6% of the total production (50% of this production was gained from pumped-storage hydropower stations). The number of small, private hydropower stations has been increasing systematically. However, the energy from such stations constitutes but a small part of energy produced in the system.

91. The installed capacity of all electric power stations equalled to 32,748 MW in 1993.

III. ELECTRICITY EXCHANGE, INVESTMENTS

92. Electric energy imports from Germany and Ukraine were relatively small: 4.4 TWh from Germany and 1.0 TWh from Ukraine. The main export of electric energy was directed to the Czech Republic (4.7 TWh) and to Germany (3.3 TWh), approximately 3.3 TWh was exported to Austria and Switzerland (through the Czechoslovakian and Hungarian systems).

93. The first generating unit of 360 MW was commissioned in the power station Opole and put into operation. Also, a new unit was put into service in CHP station Łódź IV, having a capacity of 105 MW. The capacity of industrial CHP stations has increased by 82 MW after commissioning new units.

94. As far as the electric power networks are concerned, two new 400 kV lines have been commissioned:

- Gdańsk - Olsztyn, length of 137 km;

- Miłosna - Nur - Narew, length of 164 km.

95. The new 400 kV lines serve for a better and more reliable supply of northern Poland.

IV. ENERGY POLICY

96. Further progress has been observed in the realization of the restructuring programme in the electric power sector in 1993. It is expected that a new improved version of the draft of the energy law will be discussed in Parliament in 1994. After its approval the market rules will be introduced step by step.

97. The features of the electricity market have to be consistent with the overall situation of the Polish power system, particularly with ways designed to meet financial needs for indispensable new and modernized capacities. Therefore designed market models form a sound basis for industry to make a progressive transition to a more fully competitive power industry over the next 10 to 15 years. The following initial commercial arrangements will be established:

(a) The bulk (80%) of each generator's output will be sold under long-/medium-term contracts - most notably to provide adequate financial security against which essential modernization and investments (including environmental) can be made by generators. It has to be emphasized that the long-term planning of the development of the system will be performed centrally by the PPGC, as is the case in integrated systems. The integrated resources plan will cover the supply and demand side and will be performed periodically using the least cost methodology. On the basis of this plan bids and invitations for essential new and modernized capacities will be issued. The lowest competitive bidder, considering reliability and environmental effects, will be chosen and awarded the long-term contract;

(b) A portion (15%) of each generator's output can be sold under short-term contracts (up to 1 year);

(c) A small amount of each generator's output (5%) can be sold on a daily ("spot market") basis (settlements will be done in night, day, and peak time);

(d) Relatively higher profits will be attached to short-term and "spot" contracts;

(e) Separate grid charges will be established, as a basis on which supply competition can develop over time;

(f) Third party access will be guaranteed by law and gradually implemented for mashed transmission and high voltage distribution networks;

(g) Each distribution company will set its own prices.

98. At first PPGC will sign contracts with all generators interconnected to 220 kV and 400 kV grids. Generators interconnected to 110 kV network and downward will have an option to sign contracts directly with distribution companies. Competition in transmission and distribution will develop over time allowing direct contracting between generators and distributors and generators and consumers. It is contemplated that within 15 years market share of the short-term and spot contracts will be significantly expanded. Franchising will be another form of competition within distribution.

99. On the basis of the described model of the electricity market, rough estimates of price levels of electric energy in Poland were prepared. These estimates were based on the following assumptions.

100. Investment programme is realized based on a mixed equity/loan financing; domestic hard coal prices will not exceed average European prices; electricity prices at the transmission level will be stabilized at European levels after interconnection of Polish power system to UCPTE.

101. The price levels of electric energy at low voltage will increase from 5.62 USc/kWh in 1993 to 9.79 and 11.60 USc/kWh in 1995 and 2000 respectively (VAT not included).

102. All 33 distribution companies have changed their ownership being since July 1993 companies shared by the State Treasury. Further privatization is expected in the future.

ROMANIA

[Original: English]
[3-5 May 1994]

I. PRESENT SITUATION

103. Since 1990, Romania has been undergoing an in-depth process of transition to a market-oriented economy, trying to integrate and to synchronize with the mechanisms and legal background that define the world economy and more specifically that of the European Union.

104. The energy sector occupies a key position in Romania's development strategy, contributing to the global restructuring and reorganization process with an increased efficiency, providing proper generation, transmission, distribution and utilization of the electricity alongside reliable and profitable operation of the power installations.

105. The overall power installed in the country's power plants is 21,701 MW, out of which 26% is installed in hydro plants, 40% in thermal power plants fired on coal and 34% in thermal power plants fired on gas and fuel oil.

106. Out of the total capacity installed in the thermal power plants 40% is with cogeneration.

107. It should be underlined that the technological level of the power installations and units run by the Romanian Electricity Authority (RENEL) (almost 95% of the total) is deemed to be at the level of the years 1960-1970.

108. The average useful lifetime of a condensation plant is known to be 17 years, while that of a cogeneration plant is 14 years. Hence, about 20% of the installed capacities has to be retired by the year 2000 and 50% by the year 2010. Out of the total capacity installed in the hydropower plants over 60% have exceeded 20 years.

109. Like in most of the former socialist countries, in Romania, too, the development of the cogeneration system represented a national policy by 1989. The excessive development of the cogeneration systems has led to the non-observance of the design parameters, to inefficient operation and to poor supply of the consumers.

110. The structure of the electric overhead lines is as follows:

Voltage levels	750 kV	400 kV	200 kV	110 kV
Electric overhead lines	154	4 265	3 620	17 700

The materials and equipment used for these lines are also obsolete, having outdated technologies (of the seventh decade). It should be also mentioned that the construction work in most of the power plants that had started before 1989 was stopped because of RENEL's poor financing possibilities.

111. Domestic electricity consumption has also steadily decreased since 1989, showing the following evolution:

Year	1989	1990	1991	1992	1993
Percentage	100	88.2	74.6	70.1	68.4

112. In 1993, gross domestic electricity consumption was 57.3 TWh and the net consumption was 45.8%. Electricity consumption in the industrial sector went down to that of the years 1970-1975, while domestic consumption increased 1.8 times since 1989.

113. The electric power output in the year 1993 was of 55.4 TWh (97.3% RENEL) while imports accounted for 1.9 TWh.

114. The structure of RENEL electric power output was 23.5% in hydropower plants, 42.2% in thermal power plants fired on coal and 34.3% in thermal power plants fired on gas and fuel oil; 21% of the electricity output of the thermal power plants was generated in cogeneration plants.

115. In 1993 RENEL has supplied 192.6 PJ of heat, of which 30% on coal and 70% on gas and fuel oil. This level represents 74% as compared to 1989. The industrial consumption has declined 2.2 times, while that of the population has increased 1.4 times since 1989.

116. In 1993, RENEL consumed 16,210 ktoe for the generation of electric power and heat, that is: 43.8% coal, 39.5% natural gas and 16.7% fuel oil.

117. As a consequence of the decline in the energy demand and the measures taken accordingly, the amount of polluting emissions has decreased in 1993 versus 1989 as follows:

SO_2	940 kt	(72.3%)
NO_x	160 kt	(85.5%)
dust	370 kt	(80.4%)
CO_2	53 000 kt	(73.6%)

118. The overall fuel utilization efficiency in the production of the electric power and heat generated by all the thermal power plants owned by RENEL was 50.3% in 1993.

II. POSSIBLE LONG-TERM DEVELOPMENT TRENDS

119. In order to achieve a long-term least cost development programme the following aspects have to be considered. Domestic fuel is not sufficient to cover the demands of the thermal power plants. Gas and crude oil production is subject to a continuous decline due to the diminishing of the existing reserves. The lignite extractions are the only ones capable of maintaining and of uptrending the annual output. There will have to be an extension of the useful life time and an increase in the operating efficiency with some existing units by up-grading and rehabilitation works, which could determine a diminishing of the investments, of the fuel imports and of the polluting emissions.

120. Combined cycle power plants fired on imported natural gas will have to be developed, which incur the least long-term overall costs. By the year 2000 the demand of newly installed capacities will be minimum and can be met under safe conditions by finishing some ongoing thermal and hydropower plant projects that are in an advanced stage of completion and by rehabilitating some of the existing power plants.

121. Accordingly, the investments to be placed by RENEL by the year 2000 are assessed at a minimum, in accordance with RENEL's financial possibilities. It is most unlikely that by the years 2000-2005 Romania could afford providing the import of natural gas from diversified sources, on long-term contract basis. Such a strategy might be considered only after the year 2005. By that year a scenario with costs higher than those resulting from the alternative without fuel restrictions will be adopted. This alternative might be implemented by completing the units 3 and 4 from Cernavoda Nuclear Power Plant between 2000-2005.

122. The main risk factors that might influence the efficiency of the development programme are the following:

(a) Insufficient supply of the required annual lignite amount delivered to the power plants;

(b) Insufficient gas and fuel oil imports;

(c) Increase in the domestic lignite prices and in the imported gas prices.

III. MID-TERM DEVELOPMENT PROGRAMME FOR RENEL OUTPUT CAPACITIES DURING THE TIME SPAN 1994-2000

123. The mid-term development programme for RENEL output capacities during the time span 1994-2000 has the following aims:

(a) To provide a safe and sustainable energy supply;

(b) To efficiently turn to account the domestic energy resources;

(c) To enhance the power efficiency;

(d) To diminish the operating, maintenance and development costs;

(e) To finish completion of ongoing projects which proved their efficiency;

(f) To prevent environment pollution.

124. The rehabilitation programme of thermal power plants provides for the replacement by the year 2000, of the equipment with expired life time, that is about 1,550 MW out of a total amounting to 4,900 MW. The programme also provides for improving the operating performances by rehabilitating about 2,550 MW out of 6,000 MW which are in this situation. As concerns the cogeneration plants fired on lignite, it is foreseen to switch 11 420 t/h boilers over to operation on imported hard coal. The hydropower plants to be rehabilitated between 1994-2000 are of 850 MW. The programme also provides for the rehabilitation of the substations and of the 400 kV, 220 kV and 110 kV transmission and distribution lines.

125. To enhance the economic efficiency of the National Power System the dispatching system will be modernized by means of an improved teleinformation system.

126. The ongoing power plant projects which proved to be cost-efficient will be completed. Thus, for instance, out of the five 700 MW units of the Cernavoda NPP, the erection of which has already started, the programme provides for the commissioning of the first unit in 1995 (financed from the State budget). Provided a foreign financing scheme is found which permits the loan to be paid off from energy exports, the second unit might be commissioned by 1998, too. Units 3, 4 and 5 will be mothballed, their completion being reconsidered only after 2000.

127. With regard to the thermal power plants, it has been decided to commission 50% of the power installed in those plants which were under

construction in 1989 (most of them fired on lignite) to provide heating for some large cities. For the remaining 50% the construction works will be stopped, being deemed as inappropriate or inefficient.

128. For the town of Bucharest the programme considers the implementation of some up-to-date solutions based on gas turbines and heat recovery boilers (5 x 40 MW).

129. Concerning the hydropower plants, the programme provides for the completion by the year 2000 of 1,000 MW, which are under construction at present.

130. The erection works are to be accomplished mainly by domestic construction and erection companies. As for the programmes that are supported by foreign loans awarded by international financing bodies, the procurement of equipment and the selection of companies will rely on international tendering procedures.

131. The level of polluting emissions associated with the proposed programme will be in 2000 below that of the year 1989 as a result of the measures to be taken.

132. The accomplishment of the proposed development and reorganization programme will be covered by RENEL from its accounts receivable and from bank loans.

133. The programme asks for the elaboration of a package of laws and regulations concerning the energy sector, which should allow the participation of foreign and Romanian investors in the financing of the power objectives, the loan endorsement by the State, the financing from the State budget of the nuclear programme.

RUSSIAN FEDERATION

[Original: Russian]
[3-5 May 1994]

I. ELECTRICITY SUPPLY AND PRODUCTION

134. The quantity of electricity generated in Russia in 1993 was affected by the continuing decline in demand for energy related to a further dwindling in the volume of industrial and agricultural output in the country and, hence, of gross domestic product and national income. Movements in these macroeconomic indicators suggest that the decline in the country has slowed slightly, but not yet enough to stabilize the economy. Industrial output declined by 16% in 1993 as against 18% in 1992, and gross domestic product by 12% as against 19%, while national income fell by 13% as against 22%. The main causes of the continuing economic decline are still shrinking demand among consumers able to pay, a fall-off in military orders, the payments crisis - which has grown much worse - and a number of other causes.

135. As a result, forecasts of a possible stabilization in the electricity industry have not been borne out, and there has been a further 5.1% fall in

electricity production, to 956.6 TWh in 1993 as against the 5.6% drop to 1,008.5 TWh in 1992. That energy production has fallen significantly more slowly than the macroeconomic indicators is chiefly due to stable, even slightly increased, electricity consumption in daily life and agriculture, and to greater energy consumption per unit of output in industry resulting from an under-use of manufacturing capacity pending a structural reorganization that has yet to take hold. Russia's electricity balance is shown in table 1.

136. Consequently, electricity consumption per unit of national income in 1993 continued to rise and was (according to preliminary figures) 7.3% higher than in 1992 under comparable conditions. At the same time, electricity production per head of population has fallen from 7,312 kWh in 1990 to 6,450 kWh in 1993.

Table 1

Electricity balance in Russia
(TWh)

Year	Power generated	Electricity consumed*						Import/export balance
		Total	Industry and construction**	Agriculture	Transport	Services and utilities	Grid losses	
1985	962	964.4	596.8	73.7	91.1	122.2	80.6	-2.4
1990	1 082.2	1 073.8	644.7	96.4	103.8	144.7	84.2	+8.4
1991	1 068.2	1 056.1	622	103.4	96.7	150.1	83.9	+12.1
1992	1 008.5	992.2	575	102.9	86.8	147.5	80	+16.3
1993	956.6	936.3	524.1	103.5	81.5	151.2	76	+18.7

* 1993 figures for electricity consumed are provisional.

** Including power stations' own requirements.

137. Overall, electricity production in Russia in 1993 was back at 1985 levels and, according to available estimates of the state of the economy in 1994, over the coming year there may yet occur a further, albeit considerably slower, decline in electricity production to around 910-920 TWh.

138. The decline in consumption has eased electricity supplies in the country. A number of regions, however, continued to experience difficulties in obtaining a balanced supply of electrical energy and power: notably Buryatia, the Chita region, the northern Caucasus, where there is still a severe shortage of generating capacity, and the Far East, where a shortage of fuel resources was another reason for difficulties with energy supplies.

139. Changes in generation and generating mix are shown in table 2.

Table 2

TWh/%

	1990	1991	1992	1993
Electricity production	1 082.2/100	1 068.2/100	1 008.5/100	956.6/100
From:				
Conventional power stations	797.1/73.7	780/73.1	716.2/71.0	662.2/69.2
Hydroelectric power stations	166.8/15.4	168.2/15.7	172.6/17.1	175.2/18.3
Nuclear power stations	118.3/10.9	120.2/11.2	119.7/11.9	119.2/12.5

140. As table 2 shows, there has been a steady tendency in recent years for the proportion of electricity from conventional thermal stations to decline, and that from nuclear and hydroelectric stations, which do not need to buy fuel at steadily and rapidly rising prices, to increase. Amidst the general decline, output from hydroelectric stations is increasing slightly and nuclear plants are in effect maintaining output at the level of their current capacity and system capabilities; the decline in electricity output is all occurring at conventional thermal power stations.

II. INSTALLED CAPACITY, ADDITION OF CAPACITY AND INVESTMENT

141. As investment in the electric power industry has fallen off sharply in recent years, there has been a marked fall-off in the addition of new capacity from 4 GW in 1990 to 0.6 GW in 1992, not even enough to offset a bare minimum of decommissioning of obsolete equipment. As a result, installed power station capacity and the mix of that capacity have in effect been stable over this period. In 1993, although investment in the industry continued to decline, earlier provisions in the form of power stations under construction came to maturity, thus significantly boosting the new capacity added,

to 2.4 GW. Hence after a protracted pause installed capacity was increased somewhat in 1993, while at the same time over 1 GW of obsolete plant was taken out of operation.

142. Changes in the installed capacity and mix at power stations are shown in table 3.

Table 3

Installed capacity at Russian power stations
GW/%

	On 31 Dec. 1991	On 31 Dec. 1992	On 31 Dec. 1993
Total	213.1/100	212.0/100	213.4/100
incl.:			
Conventional	149.5/70.1	148.3/70.0	148.7/69.7
Hydroelectric	43.3/20.4	43.4/20.5	43.4/20.3
Nuclear	20.3/9.5	20.3/9.5	21.3/10.0

143. A number of large installations were brought into operation in 1993, including a 1-GW reactor at the Balakovo nuclear station, a 215-MW unit at Gusinoozersk and a 210-MW unit at Pskov and, under the reconstruction and refitting programme, two 200-MW units at Belovo and Tom-Usinskoe and 100,000-kW installations at the Mosenergo Nos. 11 and 12 district heating plants. An 800-MW generating unit at Nizhnevartovsk was put into operation but has not yet been brought permanently on line.

144. As energy production declines, the use of installed capacity has continued to fall as illustrated by the following figures.

Table 4

	1990	1991	1992	1993
Hours of operation of mean installed capacity at power stations				
Total	5 074	5 014	4 735	4 482
incl.:				
Conventional	5 350	5 210	4 793	4 713
Hydroelectric	3 845	3 875	3 972	4 345
Nuclear	5 915	5 940	5 920	5 596

145. Hence the use of power station capacity in Russia has come right down to the levels seen in developed Western countries, where it is traditionally lower but because of ample reserves of capacity.

146. A comparison of investment in the Russian electricity industry in 1994 with previous years, as shown in table 5, reveals that investment continues to fall. The main reasons are the steady decline in budget allocations and the dwindling proportion of enterprises' own funds invested, owing to widespread defaults on payments for electricity and heat and a desire to restrain the growth of electricity tariffs.

Table 5

Investments in the electricity industry (at 1991 prices)	bn. roubles		
	1992 reported	1993 reported	1994 planned
Total investment	10.7	7.4	5

147. The various sources of financing for capital investment in 1994 are shown in table 6.

Table 6

	bn. roubles/%
Total investment	5/100
incl.:	
enterprises' own resources	4.77/95
budget resources	0.16/3
borrowing	0.07/2

148. Given the steady decline in the size and proportion of budget allocations available for the development of the electricity industry, power companies' own resources will play an increasingly important role, as will an off-budget fund established by decision of the Russian Parliament to provide financial support for the power industry and electrification, which will be financed in part from a component in the unit cost of power.

III. MARKET CHANGES IN THE ELECTRICITY INDUSTRY

149. Pricing and energy tariffs in the electricity industry in 1993 were subject to government regulation; this enabled regional energy commissions to set tariffs for electricity and heat at levels permitting power companies to finance their own operations without exerting a monopolistic influence on prices, while prices for fuel resources were partly free and rising, and prices for other raw materials, equipment and supplies were unconstrained. The average electricity tariff in December 1993 was around 26 roubles per kWh, as against 1 rouble 88 kopeks per kWh in December 1992. It is intended to continue this pricing policy in 1994, subject to a number of organizational and practical refinements to the State regulations concerned which are intended, provided some order is brought to the payments scene, to enable the industry to function normally in financial terms under market conditions.

150. At the same time, further action must be taken in 1994 to create a stable financial situation and create the sources of investment the nuclear power industry vitally needs.

151. Decree No. 923 by the Russian President, dated 15 August 1992, on the management of the electric power complex in the Russian Federation upon privatization, and a number of subsequent directives, brought a variety of forms of ownership to the electricity industry in 1993. Regional joint-stock power companies have been established and are in operation, as is the Russian EES Rossii corporation, and a number of other patterns of ownership are also being applied. The nuclear power industry remains basically State-owned in view of its special characteristics. Experience with these new patterns has confirmed their viability and workability under market conditions and at the same time shown a need for further refinements, in particular more demonopolization and a reconciliation of the interests of the electricity industry with those of the constituent entities of the Russian Federation.

SPAIN

[Original: French]
[3-5 May 1994]

I. THE ECONOMIC AND ENERGY SITUATION IN 1993

152. Spain experienced negative economic growth in 1993, with gross domestic product declining by 0.6%.

153. Total energy consumption diminished by 0.5%, but there was a 0.5% growth in final consumption of electricity.

II. ELECTRICITY CONSUMPTION

154. Gross electricity consumption, including grid losses, was 149 TWh in 1993. This was a 0.2% increase over 1992. The negligible increase was largely due to the economic crisis and to the mild climate in 1993.

155. Growth in domestic use was 2.5, but high-voltage consumption declined by 2.5 owing to the economic crisis mentioned above. Low-tension consumption was unchanged from the previous year.

III. BALANCE OF INTERNATIONAL TRADE

156. Electricity imports in 1993 were 1,643 GWh, and exports were 353 GWh, yielding an import balance of 1,290 GWh, twice the size of the previous year.

IV. ELECTRICITY PRODUCTION

157. Gross electricity production was 157 TWh.

158. Hydroelectricity production in 1993 was 25.2% higher than in the previous year, output from nuclear plant was maintained, and there was an 8.6% decline in conventional thermal production.

Electricity balance (GWh)			
	1992	1993	Change %
Gross hydroelectricity production	21 476	26 880	25.2
Gross conventional thermal production	81 248	74 260	-8.6
Gross nuclear production	55 782	55 840	0.1
Total gross production	158 506	156 980	-1.0
Consumption by auxiliary services and losses in transformers at power stations			
Hydroelectric plants	347	435	25.4
Conventional thermal plants	4 981	4 580	-8.1
Nuclear plants	2 371	2 375	0.2
Total net production	150 807	149 590	-0.8
Energy for pumping	2 791	1 910	-31.6
Balance of international trades	641	1 290	101.2
Power drawn on the market	148 657	148 970	0.2
Grid losses	14 197	14 220	0.2
Net power supplied	134 460*	134 750*	0.2

* Including the power sector.

Capacity installed as of 31 December 1993		
	MW	% Total
Hydroelectric plant	16 770	36.7
Conventional thermal plant	21 382	47.0
Nuclear plant	7 400	16.3
TOTAL	45 482	100.0

Hydroelectric reservoirs		
	GWh	
	On 31 December 1992	On 31 December 1993
Annual reservoir capacity	8 181	8 181
Perennial reservoir capacity	10 035	10 236
TOTAL CAPACITY	18 216	18 417
Holdings in annual reservoirs	3 962	3 800
Percentage full	48.4	46.4
Holdings in perennial reservoirs	3 693	3 200
Percentage full	36.8	31.3
Total holdings	7 655	7 000
Percentage full	42.0	38.0

SWEDEN

[Original: English]
[3-5 May 1994]

I. ELECTRICITY CONSUMPTION

159. Total electricity consumption in Sweden during 1993 amounted to 140.2 TWh with an increase of 0.5%. The increase was primarily due to colder weather. Electricity deliveries to disconnectable electric boilers as a substitute for oil declined to 7.4 TWh. Disregarding electric boilers, and taking into consideration the colder weather, temperature-adjusted contracted supplies of electricity amounted to 133.1 TWh in 1993.

160. Business conditions improved during the last six months of 1993, particularly for export-oriented industries. During that period, electricity consumption in industry increased, and the full-year figure, approximately 47.5 TWh, was somewhat lower than in 1992.

161. The recession also effects electricity consumption in the residential and service sectors. Within the service sector, the rate of increase is now appreciably lower then during the 1980s. The use of electric heating in homes with the capacity to use oil declined somewhat, due to relatively low oil prices.

II. PRODUCTION AND DISTRIBUTION OF ELECTRICITY

162. Electricity is unique in that it is both generated and used at the same instant. Demand for electricity varies over the course of the day, week and year. The generating system and the distribution network, i.e. the entire supply chain, must be dimensioned to meet these variations, which may also include both unexpected and scheduled interruptions of service.

163. It is also not possible to distinguish among suppliers of the electricity in the distribution network. All customers connected to the network are able to use the electricity without prior notice, regardless of which producer supplied it to the network.

III. STABILITY OF SUPPLIES

164. Variations in demand over the short term can usually be predicted on the basis of such factors as weather conditions, production patterns in industry and the varying electricity needs of other customers. Other variations are linked to temperature changes and fluctuations in business conditions.

165. Vattenfall's generation system has a very well-dimensioned supply capacity over both the short and the long term. Hydropower is dimensioned to meet large and rapid variations in consumption and other electricity generation. Vattenfall has at its disposal two thirds of the total storage capacity in Swedish reservoirs, providing a very favourable and competitive regulatory capacity. In addition, there are a number of thermal power plants and gas turbines that can quickly be taken into operation to meet peak loads.

IV. EXPORT OF ELECTRICITY

166. Electricity exports amounted to 7.3 TWh, of which 5.4 TWh was temporary power that was mainly sold to power companies in Denmark and Finland. Sales in accordance with long-term contracts amounted to 1.7 TWh. The customers were primarily power companies in Germany and Finland.

V. VATTENFALL'S ELECTRICITY GENERATION

167. Vattenfall's generation system is extremely easy to regulate. Variable production costs are very low, when viewed in an international perspective, and under normal conditions electricity generation does not produce any environmentally damaging emissions. More than half of all electricity is generated by nuclear power plants, while slightly less than half is derived from hydropower. Less than 1% is generated from fossil fuels. In 1993, more electricity was generated from hydropower, and less from nuclear power than is normally the case.

A. Hydropower

168. In 1993, hydropower once again noted a record year, with affluence 40% above normal levels and electricity generation totalling 38.2 TWh. After a very strong and intense spring run-off, water reservoirs were well filled. Thereafter followed abnormally large amounts of rain in July and August.

B. Nuclear power

169. As a result of the favourable supply of hydropower, it was possible to reduce generation in nuclear power plants.

170. Electricity generation at Ringhals 2 amounted to 19.7 TWh. Ringhals 2 was shut down from the middle of May until Christmas for repairs to the reactor tank cover.

171. On 31 December 1993, Ringhals 4 had been in operation for 1,241 days without a single unscheduled service interruption. Few reactors in the world have exceeded this figure.

172. Electricity generation in Forsmark was 22.2 TWh. Of this 5.7 TWh was supplied to minority owners. In 1993, Forsmark once again attained an availability exceeding 90%.

173. An investigation of the safety of nuclear power in Sweden, headed by Provincial Governor Gunnar Brodin, showed that the overall safety level was satisfactory.

C. Fossil fuels (oil)

174. It was not necessary to operate Vattenfall's fossil-fuelled plants during the year, as other generating capacity was sufficient. Fossil-fuelled plants are normally only used as a reserve when electricity sales are high, the weather is extremely cold, or when interruptions occur in electricity generation.

D. Electricity purchases in Sweden

175. Electricity purchases in Sweden in accordance with long-term contracts amounted to 2.7 TWh during the year. These supplies are mainly provided by customers with their own generation facilities. Temporary power purchases amounted to 0.7 TWh and related primarily to supplies within the framework of generation optimization.

VI. ELECTRICITY IMPORTS

176. In the beginning of 1993, a contract was signed with a Norwegian power company for deliveries up to and including September 1995. Within the framework of this contract, 2.2 TWh was imported during the year. Smaller quantities are also imported from Finland each year in accordance with long-term agreements. Imports of temporary power amounted to 1.2 TWh during the year.

VII. FUTURE PROSPECTS

177. Regulations regarding taxes on energy and carbon dioxide for the manufacturing industries and the greenhouse industry were changed in 1993. The terms of the existing customer contracts are such that Vattenfall will be successively forced to bear the economic consequences of the less favourable conditions for natural gas resulting from the new energy taxes.

178. The new energy taxation system has sharply reduced opportunities for profitable geographic expansion of the natural gas system.

179. Increased sales are required to improve capacity utilization in the trunkline and improve the company's profitability. Additional changes in energy taxation, however, may further reduce profitability and limit expansion of the natural gas network. Discussions are in progress with Dangas concerning future purchase volumes.

VIII. VATTENFALL'S PRODUCTION IN AN ENVIRONMENTAL PERSPECTIVE

180. Environmental issues are of central importance to Vattenfall, over both the short and the long term. Environmental matters affect all stages of the electricity process, from generation to consumption.

181. Vattenfall bases the generation of its electricity almost exclusively on hydropower and nuclear power. Thus, in principle, no greenhouse gases or acidifying substances are released.

182. During 1993, Vattenfall's generation of electricity based on fossil fuels was insignificant.

183. Emissions from nuclear power facilities - which account for half of the electricity generated by Vattenfall - are extremely low, and well below permitted levels. The heated cooling water, which is released into the ocean, does not represent a significant problem from an environmental viewpoint. The most dangerous waste product deriving from nuclear power production - the spent nuclear fuel - is handled in the manner prescribed by the nuclear

inspectorate and other public authorities. The handling of the nuclear waste is financed directly via fees applied to all electricity generated by nuclear power.

A. Environmental activities framework

184. In 1993, Vattenfall established a Group-wide environmental policy. This is applied in the environmental action programmes formulated by the individual business units.

185. Vattenfall has previously followed the recommendations of the International Chamber of Commerce in its principles for environmentally conscious management, the ICC standards.

186. Within the Vattenfall Group, an environmental audit function has been established. The internal environmental audit is intended to ensure that Group operations are performed in close conformity with environmental legislation and Vattenfall's own environmental policy.

B. Focus on environmental improvements

187. During 1993, environmental measures were completed at the thermal power plants in Stenungsund, Stallbacka and Marviken, among other locations. To date, approximately SEK 340 M has been invested in environmental improvements at Vattenfall's reserve and primary power facilities.

188. In addition, the Vattenfall nuclear power programme contains a special action plan for safety and the environment.

189. Since the emission of Freon from heat pumps has a harmful effect on the ozone layer, the cooling agent in larger and older heat pumps is currently being replaced.

190. In recent times, the health effects associated with electrical and magnetic fields have been discussed. Vattenfall supports research in this field through its involvement in the branch organization Elforsk. No clear-cut research findings are available as yet, however. Vattenfall is also pursuing its own technical development to find better designs and working methods to reduce power frequency fields and thus cut down exposure levels for both the general public and Vattenfall personnel.

191. Vattenfall has also carried out a systematic survey of environmentally harmful waste products resulting from previous operations. A case in point is the impregnation plant in Åsbro near Hallsberg, which is continuously monitored, and where measures for handling waste products are planned jointly with the county administrative board.

192. A major clean-up programme is in progress in Västerås, where decontamination of the decommissioned thermal power plant is nearing completion.

193. During 1993, environmental guidelines for personnel responsible for the purchasing side of Vattenfall's operations were drawn up. It is anticipated that the introduction of environmental thinking will yield beneficial long-term results.

C. The role of electricity in creating a better environment

194. It has long been the case that the use of electricity has significant environmental benefits. Provided that electricity is generated in an environmentally acceptable way, using electricity means taking good care of the environment.

195. Many of the environmental programmes carried out in the last 20 years have depended on the availability of good supplies of electricity. The reduction in oil imports as a result of increased use of electricity during the 1970s and 1980s has had a lasting effect.

196. It should also be possible for electricity to replace fossil fuels in industry, leading to benefits for the environment. An example is the iron and steel industry. A more pronounced transition from coke and oil to electrical heating would also have obvious environmental advantages.

197. In the transport sector, there is a drive to increase the use of electricity as a power source, thereby reducing emissions and other environmental problems resulting from the use of motor vehicles.

198. During 1993, Vatttenfall exported a great amount of electricity to Denmark and other countries. The imported electricity enabled Denmark to make an equivalent cut in the amount of electricity generated at fossil-fuel-fired plants, thus contributing to a reduction of atmospheric pollution in the Nordic countries.

199. Vattenfall's strategic cooperative venture with Denmark and Germany on electricity distribution, will have positive consequences for the environment.

SWITZERLAND

[Original: French]
[3-5 May 1994]

Introduction

200. Electricity consumption over the past year fell by 1.3%. Per person, the decline was 2%. The last such decline (of 2.2%) was in 1975. Now as then, the reasons for this are chiefly economic. In 1993, Switzerland's power stations generated 59.3 TWh, 3.4% higher than in the previous year. For the first time in five years, there was an export surplus even over the winter season (1.7 TWh). Over the year as a whole, the export surplus was 7.2 TWh (4.3 TWh in 1992). These figures are not yet indicative of a break in the trend.

201. The drop in demand for electricity (final consumption was down 0.6 TWh, or 1.3%) was not distributed evenly over the year. It was 2.5% in the first

three quarters, but there was a 2% increase at the end of the year, due chiefly to falling temperatures. Over the year, however, the weather was not a decisive influence: the number of degree-days of heating remained the same.

202. The reduced electricity consumption mainly reflects economic recession. Gross national product continued to fall (down 0.8% from 1992, according to National Bank Estimates). One third of the decline in demand was due to the final decommissioning of Alusuisse's electrolytic cell in Chippis and lower aluminium production in Steg.

203. On the other hand, an increased population, housing construction (roughly 30,000 new apartments) and the ever-greater density of electrical devices and equipment in households and in the economy again made for greater consumption. Without these factors, the downward movement would have been still more pronounced.

I. ENERGY 2000: ANOTHER POSITIVE FACTOR

204. Efforts to promote the rational use of energy under the Energy 2000 programme (including Federal and cantonal energy legislation and economy drives in the electricity industry) are thought to have blunted the demand for current. Mention should also be made of the replacement of household electrical devices, as modern products tend to use 30 to 50% less power.

205. The 627-GWh drop in consumption from the previous year is barely twice the yearly electricity consumption of the city of Lucerne (322-GWh according to "Statistique 1993 des villes suisse"), or the total output of the Laufenburg hydroelectric station.

II. EXCELLENT GENERATING CONDITIONS

206. Up 3.4%, at 59.3 TWh, output from Switzerland's power stations hit a new record. There were several reasons:

- Thanks to higher-than-average flow rates and a high replenishment rate in storage lakes, hydroelectric installations generated 36.3 TWh. This is almost 9% above the average for the past 10 years. After the extensive precipitation in the fourth quarter, output was over 27% above that of the corresponding quarter of 1992.

- The excellent availability of Switzerland's five nuclear power stations enabled them once again to produce very high output: at 22 TWh, the 1993 results are remarkable. The operating availability of the nuclear installations together was 85.1% (85.6% in 1992).

207. The generating mix was as follows: 61% of total energy produced came from hydroelectric stations, 37% from nuclear stations and 2% from other thermal installations.

III. EXPORT SURPLUS EVEN IN WINTER

208. Between 1989 and 1992, the winter season (January to March and October to December) always required an import surplus to meet requirements; during the year under review, however, the same period resulted in an export balance of 1.7 TWh. The decisive period was the end of the year, while the first quarter still showed a slight import surplus, of 0.2 TWh. The export surplus for the summer season was about average for the previous 10 years. Over the 12 months (exports 31.1 TWh, imports 23.9 TWh), the export surplus was 7.2 TWh.

Electricity production and consumption, 1993		
	TWh	Change from previous year (%)
I. Production		
- Hydroelectric	36.3	+ 7.5
- Nuclear	22.0	- 0.4
- Conventional thermal	1.0	-31.4
Total	59.3	+ 3.4
II. Consumption by storage pumps, transmission and distribution losses	4.9	- 6.1
III. Consumption	47.2	- 1.3
IV. Export balance	7.2	+67.8
Per capita consumption (kWh)	6 790	- 2.0

Source: Federal Energy Office

TURKEY

[Original: English]
[3-5 May 1994]

I. ELECTRICITY PRODUCTION

209. Total gross electricity production grew at a yearly rate of 9.5% and reached 73,720 GWh in 1993. Hydropower production increased by 27.8% compared with its 1992 value. As a consequence, the share of hydropower in electricity generation increased, accounting only for 46% of the total annual generation. During the last year, to meet the demand, the thermal electricity generation fell from its 1992 value, decreasing by 2.5% on average. This amount corresponds to 54% of the total generation of 1993. Of the total thermal power generation, 27% was generated from natural gas, 60% from lignite and hard coal and 13% from fuel oil, diesel and geothermal.

210. In 1992 Turkish Electricity Authority (TEK) electricity production was 92% of the national electrical, energy production. The share of the private companies' energy production was 2.5% of the total production, with the remaining 5.5% coming from autoproducers.

II. ELECTRICITY CONSUMPTION

211. Electricity consumption in Turkey increased at the rate of 9% in 1993 and the industrial consumer sector had the largest share in the consumption as in the previous years. Consumption per capita was 1,225 kWh during the same year.

212. As of the end of 1993 the breakdown of the total consumption of electricity in Turkey by the major sectors was as follows: 58.4% industry; 21.3% household; 6.1% commercial; 3.7% government offices and 10.5% others.

III. TRANSMISSION AND DISTRIBUTION

213. Standard voltage levels are employed in transmission and distribution as follows:

(a) 380 kV and 154 kV for transmission;

(b) 33 kV and 10.5 kV for MV distribution;

(c) 0.4 kV for LV systems.

214. The most outstanding feature of the TEK transmission system is the fact that the bulk of the hydraulic potential and some important lignite reserves are adversely located in the eastern or south-eastern part, whereas the country's heaviest load centres are mainly located in the western and north-western regions of Turkey. This situation is probably the essential factor that accounts for the present extensive EHV (extra high voltage) interconnected system with distances between 500 and 800 km across the country.

215. Total length of 380 kV and 154 kV lines reached approximately a total of 32,000 km by the end of 1992. On the other hand, capacities of 380/154 kV autotransformers and 154 MV step-down transformers reached approximately 34,000 MVA in total by the end of the same year.

IV. PRIMARY RESOURCES USED FOR ELECTRICITY PRODUCTION

216. The most outstanding primary resources currently being utilized for electricity production are domestic hydro and lignite reserves. During recent years, imported natural gas (NG) has also been playing an increasingly important role in power generation, as against fuel oil whose share is steadily decreasing.

217. The total hydro potential for electricity generation is 122 billion kWh/year, of which at present only 26.9% is being utilized for this purpose. By the end of 1995, with the commissioning of the ongoing hydro projects, 31% of the total potential will have been exploited.

218. Domestic lignite and hard coal reserves are capable of producing about 120 billion kWh/year. This lignite is of low calorific value and high sulphur, moisture and ash content. Current production capacity of Turkey's existing lignite-fired power plants is about 36 billion kWh/year (33.0% of the total potential).

219. The share of imported natural gas in the total electricity generation was 15% in 1993. This corresponded to 2.9 billion cubic metres of natural gas which was consumed mainly in two large power plants near Istanbul(2,550 MW).

220. Fuel oil only accounted for 7% of the total electric energy produced during 1993.

221. Nuclear and imported coal resources are also being considered in long-term generation planning studies.

V. ENERGY AND POWER DEMAND OF TURKEY IN THE FUTURE

222. Energy demand with a yearly average growth rate of 8.0% is expected to reach 87 billion kWh in 1995, 130 billion kWh in 2000 and 271 billion kWh in 2010.

223. The corresponding peak demand is expected to reach 14,065 MW in 1995, 20,990 MW in 2000 and 43,590 MW in 2010.

VI. GENERATION AND INSTALLED CAPACITY DEVELOPMENT

224. According to the long-term generation investment plan study, in order to meet the estimated energy and peak demand, the installed capacity of the system will increase approximately threefold during the 16 years of the planning period, reaching 60,034 MW in 2010. On the other hand, breakdown of the total installed capacity for the year 2010, is 38.4% hydro and 61.6% thermal. By the end of the planning period (2010), 82% of total lignite and hard coal reserves will have been exploited including the units in operation, under construction and in the planning stages.

225. Results of long-term generation planning studies indicate that in order to meet the demand 32 lignite hard coal-fired units (with generation capacities between 150-350 MW). Fourteen imported natural gas-fired power plants (680 MW each block). Twelve imported coal-fired units (500 MW each) and two nuclear power plants (1,000 MW each) need to be in service by the end of the planning period (2010).

226. About 67% of our hydro capacity, including hydro projects that are in operation, under construction and in the planning stages, which totals 23,049 MW, will have been exploited by the end of the planning period.

227. In summary, about 26,571 MW of thermal and 12,777 MW of hydroelectric generation capacity will be added to Turkey's generation system between 1995 and 2010.

228. As a result of the long-term electric energy generation expansion study, at the beginning of this period (1995), 37% of the total generation is

expected from hydropower plants and 63% from thermal power plants. The breakdown of thermal generation is 37% of lignite and hard coal power plants, 17% of natural gas and 9% of other fuel type power plants. The share of lignite-fired power plants and hydro plants is gradually decreasing from 37% and 37% to 30% and 25% respectively, while the share of natural gas is increasing from 17% to 25% and the share of imported coal-fired power plants will reach to 12% and the share of nuclear will reach to 4% in the long-term planning period (year 2010).

229. Between 1972 and 1974, the location for a nuclear power plant was chosen in the south of Turkey (Akkuyu-Mersin). After that, preliminary studies on infrastructure were completed and site licence was granted in 1976.

230. Based on the result of the generation expansion study, the first nuclear power plant can be added to the system until 2005.

VII. PRIVATIZATION

231. First privatization studies in the Turkish electric energy industry started with the issue of a related Law on 19 December 1984. Under this Law, companies other than the Turkish Electricity Authority (TEK) are allowed to conduct business in generation, transmission, distribution and trade of electric energy. Such companies can therefore build and operate electrical installations, generate electricity and sell its production to TEK or other nominated distribution company in its territory.

232. This model, commonly known as the Build-Operate-Transfer (BOT) model, was implemented to ease the investment burden of TEK and to facilitate domestic and foreign capital flow to industry.

233. The capacity of generation plants offered to be built under BOT is around 10,000 MW. The Law also constitutes the legal base for autoproducers of electric energy. Autoproducers generate electric energy for their own use and sell excess generation to TEK or buy from TEK if they are unable to meet demand from their own production.

VIII. INTERCONNECTIONS

234. Cooperation in the field of electric energy through interconnections between neighbouring countries is a very effective and useful tool for improving social and political relations among the related countries in addition to the well-known technical and economical benefits such as reduction and/or postponement of capital investments, reduction in operation and maintenance costs, frequency stabilization and better reliability.

235. Turkey has existing and planned interconnections with neighbouring countries.

236. Up to now, Turkey and its neighbouring countries have not operated in synchronization but during the last years attempts have been made for synchronous operation and studies have been undertaken in this regard.

A. Turkey - Black Sea Economic Cooperation Interconnection

237. Azerbaijan, Georgia, Armenia and Bulgaria are the Black Sea Economic Cooperation (BSEC) member countries that have interconnections with Turkey.

238. The following projects were defined to be studied in the meeting of BSEC member countries held in December 1992 in Antalya (Turkey):

(a) Establishment of a data bank concerning the energy systems of BSEC member countries;

(b) Realization of interconnection between Greece and Turkey;

(c) Interconnection of south-east Black Sea region countries (Armenia, Azerbaijan, Georgia, Russian Federation and Turkey);

(d) Feasibility study for a natural gas and/or a hydroelectric power plant in Georgia;

(e) Feasibility study to determine the methods of power exchange from east to west via Turkey from Azerbaijan and Georgia, or vice versa;

(f) Feasibility study for natural gas power plants to be constructed for the use of member countries on the route of a natural gas pipeline to Europe;

(g) Feasibility study to strengthen the existing Bulgaria-Romania-Turkey interconnections.

B. Turkey - Azerbaijan

239. There is a 34.5 kV transmission line constructed between Aralik (Turkey) and Sederek (Nahicevan), with a transmission capacity of 10 MW. There was a 13 million KWh of export through this line in 1992.

240. Construction of the double circuit 154 kV Iğdir (Turkey) - Babek (Nahicevan) transmission line with a transmission capacity of 100 MW was completed and energy transfer at 30 MW peak has started.

C. Turkey - Georgia

241. There exists a 220 kV transmission line with a transmission capacity of 300 MW between Turkey and Georgia.

242. This transmission line is connected to Hopa 154/220 kV substation in Turkey and to Batum 220 kV substation in Georgia.

243. The full capacity of the interconnection cannot be utilized until the interconnected system of Turkey in the north-east part of the country is developed to remove all technical limitations in energy transfer.

244. There had been 715 million KWh of import and 948 million KWh of export through this line by the end of 1993.

D. Turkey - Azerbaijan - Georgia interconnection

245. System studies including Armenia must be performed on the technical and economical feasibility of this 380 kV interconnection in accordance with the decision made on 25 June 1992.

E. Turkey - Armenia

246. A 220 kV transmission line presently exists between Turkey and Armenia, with a transmission capacity of 300 MW.

F. Turkey - Bulgaria

247. A 400 kV transmission line exists between Bulgaria and Turkey, with a transmission capacity of 500 MW.

248. The construction of this line was finished in 1975. The end of the line is connected to Babaeski substation in Turkey and the other end to Dimodichev substation in Bulgaria. The line was used to feed an isolated part of the Thrace region in 1986. Later it was used for feeding an isolated region in Bulgaria and for the energy transfer to Romania through Bulgaria and the former Yugoslavia.

G. Turkey - Greece

249. The study for the AC interconnection between Greece and Turkey's 400 kV power systems has been carried out in accordance with the 17th meeting of the Coordinating Committee for the Development of Interconnection of Balkan countries.

H. Turkey - Islamic Republic of Iran

250. The construction of the Doğubeyazit (Turkey) - Bazargan (Islamic Republic of Iran) 154 kV transmission line was completed. The line is 73 km long, with a transmission capacity of 100 MW.

251. Technical and economical studies of 400 kV AC connection between Turkey and the Islamic Republic of Iran are in progress.

252. The project on energy transfer from Turkmenistan to Turkey through this connection is under discussion.

I. Five countries interconnection (Turkey-Egypt-Syrian Arab Republic-Iraq-Jordan)

253. The study on the interconnection of Turkey, the Syrian Arab Republic, Iraq, Jordan and Egypt electrical networks foresees the construction of two 400 kV transmission lines between Turkey and the Syrian Arab Republic and Turkey and Iraq.

254. After the construction of the above-mentioned 400 kV transmission lines, transfer capacity of 300 MW between the countries will be reached at the first stage. This capacity will increase 600 MW at later stages.

255. General Trading Agreement and Bilateral Construction Agreements for the interconnection of five countries have been signed and have entered into force.

256. A draft interconnection agreement is being discussed and will be finalized until the completion date of commissioning of the interconnection lines.

J. MEDELEC - UNIPEDE - UCPTE studies

257. Studies relating to Mediterranean countries interconnections and east-west European countries interconnections are in progress.

IX. ENVIRONMENTAL PROGRAMMES FOR COAL-FIRED POWER PLANTS

258. In Turkey, in the former development plans the main principle was to supply continuous, safe and economic energy by the utilization of domestic sources. However, today, another main principle is the consideration of environmental issues in power generation.

259. In this respect, the Environmental Law of Turkey came into effect in August 1983 and related regulations on air pollution control came into force in November 1986. Legislation on water pollution was passed in September 1988.

260. In order to supply clean energy and to mitigate the environmental impact of coal-fired power stations using low-quality lignite that had been constructed before the environmental legislation was passed, some rehabilitation and refurbishing programmes became necessary.

261. Because the domestic lignite having high sulphur content and/or low calorific value are used in thermal power generation, the SO_x emissions are much higher than the specified limits in "The Control of Air Pollution Regulation". Therefore the integration of flue gas desulphurization (FGD) plants into the thermal power stations, existing or under construction, is of great importance.

262. However, because of their high investment costs it is not possible to integrate FGD plants into all of the existing thermal power plants at the same time. For that reason, according to the priority list prepared by the consideration of the location of plants and the conditions of surroundings and their environmental impact on agriculture, forest, human health, tourism potential, four FGD plant projects have been already included in the investment programme. In accordance with the same priorities, and within financial possibilities, FGD facilities for the rest of the existing thermal power plants will be included in the investment programme and will be realized in the near future.

263. The first FGD plant was constructed at Cayirhan Power Station (2 x 150 MW) and began operation in 1991. Since then the plant has been operating with a satisfactory cleaning efficiency reaching far beyond the guaranteed value of 95%.

264. According to the programme of retrofitting FGD plants, the bidding documents for Orhaneli Power Plant (1 x 210 MW) the Kemerköy Power Plant (3 x 210 MW) have been collected, and the bidding documents of FGD of Yatağan Power Plant (3 x 210 MW) are under preparation. Additionally, detailed feasibility studies for the retrofitting with FGD plants of Yeniköy Power Plant (2 x 210 MW) and Soma Power Plant (6 x 165 MW) have been completed.

265. In the generation expansion planning study, FGD plants for the new lignite, hard coal and imported coal fired power plants were considered.

266. Thus, solutions should be found to maintaining the balance between energy needs, environmental protection and the economy.

267. Besides retrofitting with FGD plants, other refurbishing and rehabilitation programmes are under investigation and execution. The programme called "Coal Pollution Abatement Project" will be carried out in cooperation with the World Bank.

268. Other activities, such as the improvement of electrofilters in some old power stations, rehabilitation programmes for the management of liquid and solid wastes, installation of emission monitoring and recording instruments in the thermal power stations are included in Turkey's programmes.

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

[Original: English]
[3-5 May 1994]

I. SUPPLY AND DEMAND IN 1993

A. Electricity supplied

269. Year-on-year totals for electricity supply in the United Kingdom have been remarkably stable since 1991. Net electricity supplied in 1993, including industrial own-generation, was 300 TWh, up O.6% on 1992. 1991 remains the year of highest output in the United Kingdom, when 301 TWh were supplied. For those generating companies which form the public supply system, net supplies were 281 TWh, also representing a 0.6% increase over 1992.

B. Maximum demand

270. Maximum demand on the National Grid Company transmission system in England and Wales was 47,740 MW on 29 November 1993. This compares with the 1992 peak of 44,639 MW on 9 December 1992, and the all-time high of 47,925 MW on 12 January 1987. Maximum demand on the Scottish Power system was 4,127 MW on 14 December 1993, an increase over the figure of 4,046 MW recorded in 1992. Peak demand on the Scottish Hydro-Electric system was 1,662, compared with 1,521 in 1992. Maximum demand in Northern Ireland increased from 1,322 MW in 1992 to 1,375 MW on 12 January 1993.

C. Electricity imports

271. Net imports to the United Kingdom, via the French interconnector, increased more slowly than demand as a whole, by 0.1%, to 16.7 TWh.

II. CHANGING PATTERNS OF FUEL USE

A. Generation fuel mix

272. There were significant shifts in the choice of fuel for power generation in 1993. Output from coal and oil-fired plants fell by 13.4%, whereas output from the nuclear stations rose by 15%. Production from combined cycle gas turbines (CCGTs) reached 22.5 TWh, having been only 3 TWh in 1992, a reflection of the commissioning of several new gas-fired power stations during the year. Production from hydroelectric plants was down by 25% in 1993, the result of low rainfall in the north of Scotland, where most plants are situated.

B. Gas-fired generation in 1993

273. As the statistics show, a key feature of the year has been the commissioning of several new CCGT power stations. Owing to the increasingly competitive generation business, gas is now the preferred fuel choice for new generation in the United Kingdom. CCGTs offer short construction times and comparatively low capital costs. Thermal efficiency rates are considerably higher than for coal-fired plants, and emissions of harmful greenhouse gases are considerably lower.

C. The decline of coal for electricity generation

274. An important consequence of the move towards gas-fired generation has been the decline in the demand for coal among the United Kingdom's main power generators. This situation was exacerbated by the need of the generators to diversify their sources of coal, and increase their imports of cheaper, low-sulphur coal, with its resulting environmental benefits.

275. Contracts for the supply of coal from the British Coal Corporation (BCC) to the two major electricity generators, National Power and PowerGen, agreed at the time of electricity privatization, were due for renewal in April 1993. It was clear that the quantities previously purchased by the generators could not be sustained. In April, new contracts were agreed. National Power will purchase 96 million tonnes of coal from BCC over five years, and PowerGen 64 million tonnes. These agreements have been supplemented by "back-to-back" contracts with the electricity distribution companies for the sale of the resulting electricity. ScottishPower also agreed on new contracts for coal supplies.

D. The "Coal Review"

276. The fall in demand for British coal from the power generators had implications for the size of the British coal industry. The resulting need for pit closures led to a wide-ranging government review of the market for coal and for energy generally. The result was the publication of a

White Paper entitled "The Prospects for Coal". The paper confirmed the Government's commitment to a competitive market in electricity and in primary fuels for generation, and was thus warmly welcomed by the electricity industry.

III. NEW COMBINED CYCLE GAS TURBINES IN 1993

277. Since the privatization of the United Kingdom electricity industry, plans for a total of some 28 new CCGT power stations were drawn up. By the end of 1993, 16 new CCGT stations with a combined capacity of 10,300 MW were either operating or under construction. Others are in the planning stage, but at present, the total number of projects likely to reach completion in the foreseeable future is estimated to be 20. In 1992, just two new CCGTs were in operation; Lakeland Power's 220 MW Roosecote Station, and the first 450 MW module of PowerGen's Killingholme. 1993 saw the completion, or near completion, of several new stations, many of them operated by independent power producers. This represents a major challenge to the existing generators.

278. The largest new plant commissioned during the year was Teesside Power's 1,875 MW CCGT at Wilton on Teesside, officially opened in April. Wilton is also the world's largest combined heat and power installation. Four of the regional electricity companies, MEB, Northern Electric, SWEB and SWALEC, are equity partners in the scheme.

279. PowerGen completed commissioning of their Killingholme power station by adding the second 450 MW of capacity to the 450 MW commissioned in 1992. The company's 704 MW Rye House CCGT, 20 miles from London, became the first new power station to open in the south east of England for over 10 years. Full commercial operations began in November 1993.

280. A 360 MW CCGT operated by Peterborough Power began testing during the year and became fully operational in September.

281. The last new CCGT plant to be commissioned in 1993 was Regional Power Generators' Brigg station, the result of a partnership between Yorkshire Electricity and the Finnish utility IVO. The project began full commercial operations in December 1993.

IV. MAJOR PLANTS UNDER CONSTRUCTION

A. Combined cycle gas turbines

282. Construction work on National Power's Killingholme station was completed, and the plant began testing during July 1993. Full commercial operations started in February 1994. National Power also began construction of two additional CCGTs in 1993; a 500 MW station at Deeside in North Wales and a 680 MW plant at Little Barford. The Welsh station is due for completion towards the end of 1994, and Little Barford in 1995.

283. Corby Power, a consortium including East Midlands Electricity and ESB International completed work on a 350 MW CCGT at Corby. Having undergone final commissioning and testing during 1993, the project became fully commercial in February 1994.

284. PowerGen began the construction of a 1,400 MW station at Connagh's Quay in North Wales. The target date for start up is 1996.

285. Construction is at an advanced stage for three new CCGTs operated by independent power producers. Barking Power, a consortium involving several regional electricity companies, will complete a 1,000 MW station in east London during 1994. The construction of Keadby power station, a project involving Scottish Hydro-Electric and Norweb, is expected to begin operating in January 1995. Medway power is building a 660 MW plant on the Isle of Grain, which is scheduled for completion in August 1995.

286. Work is at an early stage in the construction of a 1,200 MW CCGT at Seabank near Bristol. The Seabank power consortium includes MEB and British Gas.

B. Sizewell B

287. As well as the completion of several CCGTs, 1994 will see the commissioning of Nuclear Electric's Sizewell B pressurized water reactor in Suffolk. The project is presently four months ahead of the CEGB's original schedule, and should be supplying electricity to the national grid by September 1994.

V. COMBINED HEAT AND POWER

288. The development of combined heat and power (CHP) stations using natural gas as a fuel has increased significantly since electricity privatization, in both large- and small-scale projects. The completion of the large Teesside station has already been mentioned. In 1994, a joint venture called Fellside Heat and Power, a partnership between Hydro-Electric and British Nuclear Fuels, will bring on line a 157 MW CHP plant at Sellafield. Another major project under construction is the 214 MW Derwent Cogeneration plant at Spondon. Start up of the station is expected in 1995. In central London, a 32 MW plant owned by Citigen will begin operation in April 1994. The capacity of the plant will increase in two stages; to 60 MW by 1996 and up to 90 MW in 1998.

289. Aside from these large projects, the development of smaller, CHP stations has increased significantly since electricity privatization. At present, some 2,000 MW of capacity are operational, but this is expected to rise to 5,000 MW before the end of the decade.

VI. RENEWABLES

290. The share of renewable energy in electricity production has been increasing since 1989. Electricity distribution companies are now required to purchase a proportion of their electricity from renewable sources under the Non-Fossil Fuel Obligation, as renewables are not, at present, competitive

with fossil fuels. The additional costs associated with these purchases are raised through a levy on fossil fuel production. To date, over 100 small scale schemes have begun generating electricity. The Government has recently increased the targets for renewable generation; 1,500 MW of new plant is envisaged by the year 2000.

291. Many of the projects commissioned to date have been either wind farms or plants using biofuels, such as sewage gas, landfill gas, and municipal solid waste combustion.

292. During 1993, Celt Power opened two new wind farms in Wales, with capacities of 5 MW and 7 MW. National Wind Power commissioned three new wind farms of similar size. Wind Resources Ltd., opened a 10 MW farm, and West Coast Wind farms a 5 MW plant.

293. Fibrogen opened a 14 MW power station which uses chicken litter as a fuel. Slough Estates opened a 12 MW energy from waste scheme, and Thames Water completed two generating plants using sewage gas with a combined capacity of 12 MW. The above are just a few notable examples. Several other schemes came on line during the year, many of them with generating capacities of less than 5 MW.

VII. PLANT UNDER PLANNING CONSIDERATION

A. Combined cycle gas turbines

294. In addition to plants under construction, many companies are planning to construct new power stations, although in several cases these projects may not reach development. The decision to proceed depends on a number of factors; successful applications for planning consent, the completion of financing arrangements and fuel-supply agreements. Most, although not all, of these plans involve the construction of CCGTs.

295. Plans for three large stations owned by independents are at an advanced stage, having made successful planning applications. Humber Power have received planning consent for a 750 MW station, scheduled for completion by 1996. Kingsnorth Power plans a 730 MW station in Kent, scheduled for completion in 1996. Eastern Generation is planning a 320 MW CCGT at King's Lynn, and a construction contract will probably be granted in 1994, with a completion date estimated for 1997. These examples are by no means exhaustive, and several other schemes are envisaged.

B. New nuclear plant

296. Nuclear Electric has plans to develop additional PWRs after the Sizewell B plant is commissioned. The company has received planning consent to build Hinkley point C, a 1,188 MW PWR, and is examining the possibility of building twin PWRs at this location, depending on the decommissioning date for one of the older reactors at Hinkley. The company has also applied for planning consent to construct further twin PWRs at Sizewell, with 2,614 MW of capacity. At present, there is a moratorium on the construction of new nuclear power stations.

297. The realization of Nuclear Electric's plans will ultimately depend on the review of the future of the nuclear power industry, to be conducted by the Government in 1994. The nuclear-generating companies have welcomed this process, and are confident that the sector has a long-term future in terms of economic success, environmental benefits and its contribution to a broader fuel base.

VIII. PLANT CLOSURES

A. Coal-fired stations

298. The commissioning of more efficient gas-fired plants led to the closure of several ageing coal-fired stations operated by National Power and PowerGen. National Power closed the following stations: West Thurrock (1,022 MW), Agecroft (232 MW), Padiham (112 MW), and Lister Drive (110 MW). Part closures of other plant reduced the company's coal-fired capacity by a further 1,171 MW. PowerGen closed the 448 MW Drakelow B station, as well as four of the six 94 MW units at Castle Donnington. Gas turbines at Bulls Bridge and Leicester added a further 242 MW to closures.

B. Nuclear plant

299. In July, Nuclear Electric's 390 MW Trawsfynydd MAGNOX reactor was officially withdrawn from service. The station has not produced electricity since 1991, and becomes the third of the United Kingdom's nuclear power stations to start decommissioning. Another nuclear station scheduled for decommissioning is the 250 MW Dounreay fast breeder reactor operated by AEA Technology. The plant ceased to generate electricity in March 1994, the result of the Government's decision to end the United Kingdom's fast breeder programme.

IX. TRANSMISSION SYSTEM

300. Work was completed on the first phase of the transmission interconnector between the high voltage systems of ScottishPower and the National Grid Company. Capacity has increased by 350 MW, to 1,200 MW. In 1995, when work on the National Grid Company side is complete, capacity will rise to 1,600 MW.

301. Preliminary work continued on the construction of a 250 MW interconnector between the ScottishPower system and Northern Ireland, via a sub-sea cable. The project also involves the upgrading of the transmission system in south-western Scotland. The issuing of contracts for construction will take place in 1995, and the project is targeted for completion by 1997.

302. Over half the capital expenditure of the National Grid Company was allocated to the upgrading of the network. The company has continued, in its capital programme, to upgrade the network and to facilitate new connections for new power stations as they come on line.

X. ENVIRONMENTAL PROTECTION

303. British electricity companies have made significant strides towards improved environmental performance. Emissions of CO_2 in terms of units generated, continue to decline. A number of factors have contributed to this success; new CCGTs produce substantially lower emissions than coal-fired plant. The output of Britain's nuclear reactors, which produce no CO_2 emissions, has reached record levels. The development of CHP and renewables have also made their contribution, as has the involvement of the electricity distribution companies in energy efficiency initiatives such as the Energy Savings Trust.

304. Both National Power and PowerGen are committed to substantial investment programmes to reduce the acid rain gases, SO_2 and NO_x. A programme to install flue gas desulphurization equipment to a total of 8 GW of coal-fired plant is under way. Both companies reached 1993 Government targets for these emissions by 1991.

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