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THE ELECTRIC POWER SITUATION IN THE ECE REGION IN 1992

(Prepared by the secretariat)

Addendum 1

National equipment plans and policies

1. This document has been prepared in accordance with the decision taken by the Working Party at its third session, in May 1993 (ENERGY/WP.2/5, para. 10 (iv) and (v)). It includes the section of the annual report on "National equipment plans and policies" which contains information provided by countries at the second session of the Working Party and transmitted to the secretariat before 15 June 1993.

2. The following countries submitted written statements on national developments in electric power in 1991 and national equipment plans and policies: Belgium, France, Germany, Italy, Netherlands, Norway, Portugal, Russian Federation, Spain, Sweden, Switzerland, Turkey and United Kingdom.

BELGIUM

Notwithstanding a difficult international economic context and generally gloomy expectations, net consumption of electric power increased by 3.3% in 1992 as against 4.4% in 1991.

The 3.7% annual average rate of growth over the past five years (1988-1992) is higher than that of 2.5% used in elaborating the plan.

The consumption growth rate pattern in 1992 was uneven, in that an increase of 4.1% during the first 10 months was followed by a virtual levelling-off and even a slight downturn during the last two months of the year, consumption being influenced by the combined effect of a decline in economic activity and temperatures higher than those recorded during the same period of 1991.

Despite the difficulties encountered in certain sectors and the recession in several industrialized countries, electricity consumption in connection with industrial activities nevertheless held up well in general. Following a period of sustained annual average growth of 4.6% up to September, it slowed down starting in October, thus reducing the growth rate for industry to 3.4% for 1992.

Contrary to previous years, the services sector, not including transport, recorded only moderate growth of 3.3%.

Household and assimilated consumption increased by 3.2% despite milder weather than in 1991, particularly at the beginning and end of the year.

Compared to the other countries of the European Union, Belgium's electricity consumption growth rate is above the Union average.

Total net output of electricity by power stations in Belgium, including production for own consumption, increased by 0.2% for the year as a whole. Although output is basically related to consumption, it is also influenced by the requirements of pumped storage plants and trade with other countries. The total volume of trade in electricity with other countries (imports plus exports) amounted to 11,843 GWh, or 18.1% of the energy called up. This ratio reflects the extent to which a country has adapted an open policy in matters of trade in electricity and reveals that, in Belgium's case, its volume of trade goes beyond a mere balancing of demand and supply.

Nuclear power plants 1/ accounted for 60.2% of total electricity output as against 59.7% in 1991. Conventional thermal power stations accounted for 38.1% of the total. In terms of the fuel used, this figure can be broken down as follows: solid-fuel plants 22.7%, gaseous-fuel plants 12.9%, liquid-fuel plants 1.9% and recycled-steam plants 0.6%. The balance, namely, 1.7%, was accounted for by hydroelectric and other power plants.

1/ Namely, those situated in Belgium, including the French component of the Tihange 1 unit, but not including the Belgium component of power stations situated in France.

As regards equipment, relatively little capacity was added in 1992, namely, the Floriffoux 2 x 350 kW hydropower plant and a 250 kW combined heat and power plant at Torhout.

At the end of 1992 and beginning of 1993, a 36 MW gas turbine with exhaust gas recovery will be commissioned on the site of the Langerbrugge power plant to produce steam for industries in the vicinity. Two cooperation agreements for the combined production of electricity and steam based on similar technology have been signed by Electrabel with the following partners: ESSO for a 36 MW unit and Phenolchimie for a 22 MW unit. These installations, situated in the Anvers region, will be commissioned in 1993.

In 1993, the capacity of the Beringen production unit will be reduced from 23 to 18 MW and in 1994 adapted to the output of the new unit under construction. Moreover, the Zolder plant's 33 MW capacity will be reduced as from 1993 in relation to the reorganization of the Campine Colliery. A 24 MW fluidized bed unit at Beringen for burning coal wastes is to be commissioned at the end of 1993.

It will be recalled that, under the present equipment plan, two 460 MW gas-steam turbine units will be commissioned in 1993-1994 at Drogenbos and at Seraing. In the same context studies are being carried out with a view to the construction at Zeebrugge of two gas-steam turbine type plants, which would be brought into service in 1996-1997. Their construction depends on the conclusion of a natural gas supply contract that is being negotiated with Statoil.

A 50 MWe gas-steam turbine unit is to be commissioned at Gand in 1995 for the combined production of heat and power.

Moreover, our sector has a 25% stake in the Chooz B1 and B2 nuclear units (2 x 347.5 MW), which are to be commissioned towards the middle of 1995 and 1996.

In 1992, the transmission and interconnection network was extended by 0.2 km (220 kV lines), 41.5 km (150 kV lines) and 21.4 km (70 kV lines) respectively. Moreover, the second wires of several existing three-phase transmission lines have also been strung.

It is estimated that total investments in the electric power sector in respect of production, transmission and distribution amounted to 42.5 billion francs in 1992. In 1991 the corresponding figure was 30.8 billion francs. These amounts do not include expenditure corresponding to Belgium's stake in the two nuclear units being built at Chooz, which can be estimated at 3 billion francs in 1992 as against 2.8 billion in 1991.

Electricity prices remained virtually unchanged in 1992, the slight increase in costs (not including fuel) being offset by a reduction in the average cost of the fuel consumed at power plants (average annual reduction in the N_c parameter of 4.5%). No changes in electricity tariffs were made in 1992.

FRANCE

General results

CONSUMPTION TWh	EDF			National plan		
	1992	Variation 1992/91 %	Ratio 1992/82	1992	Variation 1992/91 %	Ratio 1992/82
Net consumption	343.8	+2.5	1.49	355	+2.5	1.46
Losses	26.3			27.5		
Domestic consumption	370.1	+1.9	1.49	382.5	+1.9	1.46
Energy exports	58.3			58.3		
Energy imports	-4.4			-4.5		
Energy consumed in pumping	5.1			5.1		
Energy received by EDF from other producers	-11.7	-22.5	0.55			

PRODUCTION TWh	EDF			National plan		
	1992	Variation 1992/91 %	Ratio 1992/82	1992	Variation 1992/91 %	Ratio 1992/82
Net production	417.4	+2.6	1.80	441.4	+1.7	1.66
Thermal	352.1	+0.2	2.11	369.8	-0.8	1.89
Nuclear	321.7	+2.6	3.22	321.7	+2.1	3.12
Conventional	30.4	-19.3	0.45	48.1	-16.8	0.52
Hydroelectric	65.3	+17.5	1	71.6	+16.8	1.01
The hydroelectric energy capability factor was 1 in 1992 and 0.85 in 1991						

EQUIPMENT as at 31 December Maximum possible capacity (MW)		EDF			National plan		
		1992	Variation 1992/91 %	Ratio 1992/82	1992	Variation 1992/91 %	Ratio 1992/82
Thermal	nuclear	56 300	+1.6	2.48	57 700	+1.6	2.48
	conventional	16 200	+0.6	0.73	22 500	-0.4	0.76
Hydroelectric		23 300	+0.5	1.19	25 100	+0.5	1.19
Annual hydroelectric energy capability (GWh)		63 900	+0.2	1.06	70 350	+0.3	1.08
Transmission							
	400 kV	20 200	+3.0	1.63	20 200	+3.0	1.63
	225 kV	25 650	+0.4	1.06	25 650	+0.4	1.06
Lines (km)	150 kV	2 060	-1.8	0.47	2 060	-1.8	0.47
	HV	49 600	+1.6	1.24	55 300	+1.5	1.21
	MV						
	LV						
400 kV lines (km of pylons)		12 800	+1.4	1.49	12 800	+1.4	1.49
Transformers	400 kV	101 300	+6.4	2.06	106 000	+6.2	1.98
(Rating MVA)	225 kV	89 000	+4.0	1.55	100 800	+3.8	1.51

Note: Domestic consumption including the EDF and GDF Service Centres of Guyana, Martinique, Réunion and Guadeloupe is estimated at 385 TWh.

Balance of energy inflows and outflows

Energy in

Energy produced:				
Electricité de France			(406 929)	417 400
EDF share in branches:				
In France	(1 754)	1 000		
Abroad	(2 956)	1 800	(4 710)	2 800
Total energy produced			(411 639)	420 200
Purchases and transit in France (not including EDF share in branches)			(13 352)	10 700
Energy received from abroad (not including EDF share in branches)			(2 377)	2 600

Energy controlled by EDF 433 500 GWh (427 368)

Energy supplied in France:				
Green + yellow tariffs				
Production and transport customers	(93 111)	(96 800)		
Electricity and gas utilities customers	(111 044)	(114 300)	(335 585)	343 800
Blue tariff	(131 430)	(132 700)		
Energy supplied abroad			(58 745)	58 300
of which foreign branches in France	(957)	300		
Total energy supplied			(394 330)	402 100
Energy consumed in pumping			(5 434)	5 100
Losses			(27 604)	26 300

Energy out

Physical trade with foreign countries

GWh

Country	Imports	Exports	Balance 1/
Belgium	2 300	2 300	-
Luxembourg	-	-	-
Federal Republic of Germany	300	10 600	E 10 300
Switzerland 2/	600	10 300	E 9 700
Italy	200	14 800	E 14 600
Andorra	-	200	E 200
Spain	1 100	3 100	E 2 000
United Kingdom	-	17 000	E 17 000
TOTAL	4 500	58 300	E 53 800

1/ E indicates exports.

2/ Of which 100 GWh imports not involving EDF (frontier trade). Physical trade in energy is considerably different from commercial trade, since energy in transit, respective water taxes, as well as agreements concerning branches, are taken into account.

GERMANY

Trends in the German electrical power industry in 1992*

1. Preliminary remarks

The trends taken by the electrical power industry in the eastern and western parts of the Federal Republic in 1992 differed widely. Therefore the figures will be considered separately, broken down to the so-called "new" laender in the east and the "old" laender in the west of the Federal Republic.

2. Trend in the old laender

2.1. Outline

The trend of electrical power consumption was characterized by weak economic growth and mild weather conditions, the latter slowing down consumption. Gross electricity consumption was decreased in 1992 by 0.7% from 460.2 TWh to 457.1 TWh. At the same time, there was again an export surplus of 3.7 TWh, in contrast to the situation in 1991. The 0.8% rise of gross output (458.8 TWh) therefore outpaced gross electrical power consumption. The increase was particularly the result of the greater use of nuclear energy. Total power station capacities for electrical power generation remained almost stable at 104.8 GW compared with the preceding year.

Details of the overall picture may be outlined as follows.

2.2. Power consumption

At 0.8%, GNP growth was distinctly lower than in the preceding year, during which the growth rate had reached the high figure of 3.6%. While GNP rose only slightly, gross electrical power consumption fell by 0.3%.

The shift of the business cycle away from the basic materials industry to manufacturing and the consumer goods industry resulted - in conjunction with the efficient use of electrical power - in the fact that the growth rate for industrial electrical power consumption lagged behind the growth of industrial production.

2.3. Power production

(a) By operators

In 1992, gross domestic power production totalling 462.5 TWh was 3.8 TWh more than in 1991. The power production of public utilities rose by 1.2% (4.6 TWh) to 399.6 TWh. Industry lowered its gross power production by 1.6%, while the Federal Railways increased it by 1.8%. Industry and the Federal Railways together produced 62.9 TWh.

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* Data for 1992 are preliminary.

(b) By energy sources

- Gross nuclear power production rose in 1992, by 7.7% to 158.3 TWh. Contributing 34.3% of electrical power generation, nuclear power's share continued to be considerable. In the electricity supplied by the public utilities, nuclear power's contribution amounted to 39.4%, thus continuing to provide the largest share of all of the energy sources.

- Electricity generated on the basis of hard coal is likely to have fallen by 5.8% in 1992. In particular, power production by public utilities would seem to have declined (presumably by - 7.1%). A total of about 140.8 TWh was produced on the basis of hard coal, i.e. some 8.6 TWh more than in the preceding year. At the same time, however, more than 85% of electricity generated from hard coal still relied on domestic supplies. Hard coal accounted for roughly 30.4% of the electric power produced, thus more or less equalling nuclear power's contribution. With its share of slightly less than 50%, hard coal remained by far the most important source of energy for industry and the Federal railways.

- Electricity production on the basis of lignite increased by 1.2% over figures for 1991.

- Generation by natural-gas-fired public power stations in 1992 fell sharply by 13.9% to 19.2 TWh. The use of natural gas in industrial power production also continued to decline in 1992 by 3.4% (11.2 TWh).

- The use of heating oil as an input fuel fell by 9.9% over the 1991 level. At some 11 TWh, its total contribution was only 2.4% of aggregate electrical power production, thus placing it at an extremely low level by international comparison.

- Water conditions that continue to be favourable throughout Europe have resulted in a rise in hydro-power production, by 14.1% to 19.4 TWh. The other renewable forms of energy played only a minor role.

2.4. Power station capacity

Installed power station capacity in the western laender of the Federal Republic rose by about 275 MW to 104,747 MW in 1992. The total, end-1992 gross maximum capacity of all power plants showed a share of about 44% (some 46,450 MW) accounted for by hard-coal-fired and lignite-fired power stations; the share provided by nuclear power stations was about 23% (roughly 23,747 MW).

At 26,350 MW, oil and gas-fired capacity dropped only slightly in 1992. This type of capacity is mainly used for reserve and peak-load purposes. At 12,500 MW, lignite-fired power station capacity remained more or less constant.

2.5 Line development and international grid

In 1992, a 380 kV dual line over a length of about 300 km and a 220 kV line over a length of 50 km were commissioned.

2.6 Investment by public electricity utilities

While gross fixed investment by public utilities in 1991 had declined (-3%) although still amounting to DM 9.6 billion, a sharp rise by 22% to DM 11.7 billion is expected for 1992. Target figures, above all in the field of electrical power generation, indicate that new plants will be built, especially to replace existing ones. At the same time, investments in the grid will reach a high level.

2.7 Electricity prices

The level of prices and average revenues of the Germany electricity supply industry remained more or less constant in 1992. In the field of industrial consumption, prices are likely to have risen slightly by 0.1%, while in the field of tariff customers, especially regarding households, an increase of 1.4% is expected. The coal levy declined slightly from 8.0% to 7.75%. The average revenues (including coal levy, without value added tax) amounted to some 25.37 Pf/kWh for tariff customers (+1.4%) and 16.02 Pf/kWh for special contract customers (+0.1%). This meant a real decrease in the price of electricity in the light of an overall inflation rate of 0.8%.

3. The new laender

3.1 Overall picture

The continuing dramatic changes in the structure of the economy resulted in a 6.7% decline in gross electricity consumption in 1992 from 78.6 TWh to 73.9 TWh. With an import level (4.0 TWh) that had risen by 7.2%, the export of electrical power declined by 3.2% to 5.0 TWh. Gross power production fell by 7.1% to 74.9 TWh. Owing to the somewhat lower decline of unscreened lignite (7.1%), this energy commodity dominated with its share of 92.3% as in the preceding year.

3.2 Power consumption

The 4.7 TWh decline in electricity consumption relative to 1991 was primarily due to the fall in demand by industry. Detailed data are not yet available. Just as in 1991, the process of industrial contraction and restructuring was felt throughout the entire year 1992. At the moment, the monthly consumption figures are 18.5% below those of the previous year.

3.3 Power production

(a) By operators

In 1992, gross power production totalled 74.9 TWh, thus decreasing 5.8 TWh from the 1991 level. The decline is largely due to public utilities

(12.9 TWh, 2.8 TWh on the basis of lignite). Gross power production in industry decreased by 2.9 TWh (-17.8%) to 13.5 TWh, while the figures for the Deutsche Reichsbahn, at 0.2 TWh, reached the level of 1991.

(b) By source of energy

- The most important contribution to electrical power supply was again provided by unscreened lignite, which raised its share of aggregate power production slightly to 92.3%.

- Although the share of hard coal increased relative to 1991, it continues to play only a minor role with a share of 0.8% of total production.

- The input of heating oil, at 1.4 TWh, fell slightly compared with the preceding year, providing only 1.9% of aggregate power production.

- The greatest fall was registered in the use of natural gas. At a share of 2.5% of aggregate power production, power production declined from 2.5 TWh to 1.9 TWh.

- The share accounted for by hydropower (basically pump storage units) increased in 1992 from 1.5 TWh to 1.6 TWh.

3.4 Power station capacity

There was a decline of about 1,000 MW in installed power station capacity in the conventional sector to 21,300 MW. This fall was accounted for by a number of smaller lignite-fired power plants. Unscreened-lignite-fired power stations, providing 16,000 MW, had a 78.2% share of total end-1992 gross maximum capacity whereas the remaining share was accounted for by hydro-power (8.8%) that to a large extent is used for reserve and peak-load demand, and by natural gas, heating oil and other fuels (13.0%).

3.5 Line development and international grid

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 eastern and western Germany is expected to be commissioned at the end of 1993/beginning 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 Remptendorf-Würgau/Redwitz line and the Helmstedt-Wolmirstedt line are already operating. The licensing procedures for the two other lines have not yet been concluded.

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 West German grid. The linking

of the interconnected power transmission system to that of the UCPTE will thus not be possible until the winter of 1994/95. To cope with bottlenecks, 110 kV cables were hooked into the East Berlin network at the end of 1992.

In August 1992, a 600 MW direct-current tight coupling was commissioned in Etzenricht for test operation. This makes possible the direct exchange of electricity between the Czech Republic and the western German grid.

3.6 Investment by public utilities

For 1992 some DM 3.2 billion in gross fixed investment is anticipated. The focus of these funds is the electricity grid whose share (1.9 billion) more than doubled compared with 1991. In 1992, more than DM 1 billion was invested in production facilities. In the future, however, the major part of investment will concentrate on production. In view of the poor condition of the production facilities, there is a great need for modernization and replacement; on the other hand, the action brought before the court by the eastern German municipalities continues to result in uncertainty and this might result in delays with regard to the implementation of investment projects.

4. Electric power supply in Germany as a whole

The following are the 1992 electricity supply figures for the territory of the united Germany.

	1992/1991	(%)
- gross power consumption	532.8 GWh	-1.0
- gross power production	537.5 GWh	-0.4
- export balance	4.7 GWh	-
- total capacity	125 GWh	-0.8

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 29.5%, nuclear power accounts for the highest share of electrical power production. The share taken by lignite lies at 29.2%, while hard coal accounts for approximately 26.3%. The remaining electricity is produced mainly from natural gas, heating oil, and hydropower.

ITALY

1. THE ENERGY SECTOR IN 1992

1.1 The macroeconomic setting

In 1992, the Italian economic activity was very moderate: GDP increased by around 1% (+1.3% in 1991), whereas the industrial production decreased by 0.6% (-2% in 1991).

The moderate increase of GDP in 1992 was paralleled by an energy intensity decrease of 0.5% in line with 1983-1992 average growth rate, whereas the electric intensity increased by 0.5% (+0.8% per year in the 1983-1992 period).

1.2 The energy setting

The 1992 total energy requirements including bunkers grew by 0.4% (+2.0% in 1991) reaching 167.5 Mtoe (million tons of oil equivalent), i.e. up by 0.7 Mtoe versus 1991 (in 1991, its increase versus 1990 was equal to 3.3 Mtoe). In 1992 hydrocarbons covered 81% of total energy requirements (80% in 1991) with an increase in use of oil (56% in 1992 and 55% in 1991) and a light decrease of the natural gas share.

In 1992, the domestic production of primary sources (31.1 Mtoe) covered 19% of total demand. The production of solid fuels (4% of total production) dipped by 11% versus 1991. The production of natural gas (47% of total production) increased by 4% and covered 36% of total natural gas consumption. Oil production covered only 5% of total oil consumption and 14% of total production. Primary electricity (hydro and geothermal) was more or less equal to the one of 1991 and covered 35% of total production.

Energy net imports, including stock changes confirmed their key role in the coverage of total energy requirements: out of 136.4 Mtoe imported the share of oil products was equal to 66%, that of natural gas 19%, that of solid fuels 9% and that of primary electricity 6%.

Energy dependence on imports was 81% 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 1992 picture thus appears to substantiate the wide structural gap between the energy system of other industrialized countries and the Italian one which is penalized.

The sizeable Italian reliance on imports had severe repercussions on the Italian energy bill, i.e. payments to foreign countries for the purchase of energy sources, that was 20,100 billion lira in 1992 (1.5% of GDP), out of which 13,200 billion lira for petroleum products only. The energy bill was lower than in 1991 (-9%) thanks to the falling trend of oil prices ($18/barrel in 1992 versus $19/barrel in 1991) and regardless of the worsening of the lira/$ change rate in the last quarter of 1992.

Finally, total final energy consumption (net of bunkers and of non-energy uses) remained roughly constant, but with different trends in the various economic sectors: it decreased by 1.0% in industry owing to the poorly dynamic industrial activity; it increased by 2.6% in agriculture and by 4.3% in the transportation sector (+1.5 Mtoe versus 1991); it fell by 2.6% in the "civil uses" (services and residential).

1.3 The electricity demand

Electricity demand on the national grid grew by 1.4% (+2.5% in 1991) reaching 244.3 billion kWh (241 TWh in 1991). The 1992 increase should be corrected to 1% if the fact that 1992 was a bissextile year is taken into account. The light dynamics of the electricity demand was generated by the economic crisis which accelerated in the second part of the year; with reference to the corresponding period of the previous year, electricity demand grew by 3% up to June, the growth rate was 2.5% up to September, whereas the very moderate industrial activity of the last four months of the year lowered the average growth rate to 1.4%.

Italian electricity balance in 1992

	1991		1992		Changes in % 1992-1991
	Mtoe	TWh	Mtoe	TWh	
Hydro	10.03	45.606	10.0	45.6	-
Geothermal	0.70	3.182	0.8	3.5	+10.0
Conventional Thermal of which	37.11	173.253	37.9	176.5	+1.9
Solid fuels 1/	7.43	33.096	6.2	27.1	-18.1
Natural Gas	7.46	35.870	7.0	33.7	-6.0
Oil products 2/	22.22	104.287	24.7	115.7	+10.9
Total Production	47.84	222.041	48.7	225.6	+1.6
Net Imports 3/	7.72	35.082	7.8	35.3	+0.6
Total availability	55.56	257.123	56.5	260.9	+1.5
Auxiliaries Services		11.577		11.6	-
Pumped storage		4.577		5.0	+9.2
Electricity demand		240.969		244.3	+1.4
FINAL CONSUMPTION		223.619		227.5	+1.7
- Agriculture		4.231		4.3	+1.6
- Industry		115.217		115.2	-
- Tertiary		43.181		45.7	+5.8
- Transportation		6.311		6.4	+1.4
- Residential		54.679		55.9	+2.2

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.

The share of total domestic energy requirements supplied by electricity passed from 55.6 Mtoe in 1991 to 56.5 Mtoe in 1992 (+1.6%), electricity penetration remaining fairly constant (33.7 in 1992 versus 33.3% in 1991). Fossil fuels accounted for 37.9 Mtoe versus 37.1 Mtoe in 1991 (+2.2%).

Availability of electricity for consumption (gross generation plus net imports) recorded 260.9 billion kWh, i.e. up by 1.5% versus 1991 (257.1 TWh). Net imports rose from 35.1 TWh to 35.3 TWh (+0.6%), thus accounting for 14.4% of total demand.

In 1992, ENEL supplied 212.9 TWh out of 244.3 TWh of domestic demand (87%). ENEL electricity demand increased by 1.3% versus 1991, whereas demand of the Third National Producers increased from 30.9 to 31.4 TWh (+1.6%).

1.4 Electricity supply

The increase in demand (3.3 TWh) was supplied by greater national generation (3.5 TWh), more imports (0.2 TWh) from abroad (the balance is arrived at by more self-consumption for pumping storage and auxiliary services).

In 1992 versus 1991, the analysis by energy sources shows that:

- hydroelectricity maintained stationary (45.6 TWh);

- geothermal generation increased from 3.2 to 3.5 TWh (+10%);

- generation from solid fuels 1/ decreased from 33.1 to 27.1 TWh (-18.1%), with a 12% incidence on total generation (15% in 1991);

- generation from natural gas decreased from 35.9 to 33.7 TWh (-6.0%) with a 15% incidence on total generation (16% in 1991);

- use of oil products increased from 104.3 to 115.7 TWh (+10.9%), representing the main energy source for electricity generation (51% in 1992 versus 47% in 1991).

1.5 Electricity consumption

Electricity consumption (total demand net of losses) grew from 223.6 TWh in 1991 to 227.5 TWh in 1992 (+1.7%) with different trends according to the economic sector.

In agriculture electricity consumption grew by 1.6% (+0.1% in 1991).

In industry, electricity consumption remained stationary (115.2 TWh), reflecting the negative trend of industrial activities. The overall pattern of electricity consumption in industry was the result of different trends between the first eight months of 1992 (+1.6% per month) and the last four

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

months of the year (-3.3% per month). All over the year most of industrial branches recorded a downward trend with the exception of "foodstuffs" which recorded a constant increase.

In transportation electricity consumption grew by 1.4%.

In the "civil uses" sector (services and residential) electricity consumption was negatively influenced by the climatic conditions (less warm weather in summer and less cold weather in winter) and by economic reasons (a progressive reduction in the propensity to spend money). In particular electricity consumption rose:

- in the services sector by 5.8% (+6.1% in 1991);

- in the residential sector by 2.2% (+3.7% in 1991).

1.6 Balance between peak demand and capacity

Winter peak demand on the national grid decreased from 42,400 MW (38,200 MW on ENEL's grid) to 40,000 MW (35,800 MW on ENEL's grid) and it was registered on 15 December 1992.

In 1992, the gross capability of the Italian power system grew by 4,210 MW reaching 63,900 MW.

2. THE ITALIAN ELECTRIC INDUSTRY

In Italy, the electric service is provided by multiple operators: ENEL (the main one, approximately 90% of 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.

2.1 ENEL

The structure of the Italian electric industry was established in 1962 by the electricity nationalization law, by which, a State-owned company, the "Ente Nazionale per l'Energia Elettrica" (ENEL), was vested with the responsibility for the nationwide electricity supply service as well as for planning and management of the generation system, of the interconnected transmission grid and of the distribution network.

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 lira all in the hands of the Treasury.

The aims of the new company, stated in article 4.1 of its Statute, is to generate, import and export, transmit, transform, distribute and sell electricity in Italy and elsewhere, being in charge of any other related or complementary activities. ENEL may also carry out: 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 take 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 or those of others.

2.2. The role of "Non Utilities Generators"

Laws 9 and 10 of January 1991 and the following measures have moved the institutional outlook of the electric sector towards a greater diversification of the producers. They also set up the criteria and procedures to ensure the necessary coordination of the sector's activities concerning safety, quality and cost effectiveness of the electric service. With this aim, the new norm by the Ministry of Industry has established that every six months a verification be carried out looking at the compatibility of the new initiatives. This is done according to a priority ranking which takes several things into account like the sources used, the technologies, energy efficiency and the location in relation to the energy deficit situation of that region.

The first verification of compatibility was completed in March 1993 and was characterized by the importance of the total volume of the proposals 2/ that concerned a total power of more than 8,000 MW.

2/ The proposals include plants that will be fed by by-product fuels for about 3,000 MW, while the rest is made up of natural gas plants.

NETHERLANDS

The electricity situation in the Netherlands in 1992

Electricity consumption in the Netherlands increased by 2.1 per cent in 1992. This figure is the result of a comparison between the provisional figures for the two years in question, namely, in the absence of more definitive data for 1991. It may be mentioned that this increase was accounted for almost exclusively by the household and commercial sectors. Industrial consumption declined by 1 per cent, reflecting the fact that industry in general, and particularly the metal and paper sectors, were affected by the recession.

The maximum capacity called up was correspondingly below that of the previous year.

No important changes took place as regards the production of electric energy: imports declined to some extent and the amount applied to public grids by producers for own consumption increased.

The fuel consumption pattern was similar to that of the previous year, namely, 38 per cent coal and 54 per cent natural gas. It may be mentioned that the average efficiency of conventional thermal power stations improved from 40.5 per cent to almost 41 per cent.

Future production will, as previously, be characterized by an absence of nuclear power except for the two existing nuclear units which will, for the time being, remain in operation. The future situation will be based on a new arrangement that is to be approved by Parliament next autumn. In any event, production of electricity by coal-fired plants will be reduced and that of plants burning natural gas increased. If possible this will be achieved by the combined production of heat and power or, because it is difficult to use the heat produced, by combined cycle units.

It is uncertain whether the results of tests with the demonstration coal gasification plant will change the ceiling for coal-fired installations; political discussions suggest that a higher ceiling will not be set since the decision in the matter reflected the assumption that the installation would be based exclusively on gasification. The Buggenum demonstration installations have already been partly completed and comprehensive tests will begin towards the end of this year. They are to last three years.

Imports - from France and Germany at the present time - will be supplemented or partially replaced by electricity from Norwegian hydropower stations. Talks concerning a DC connection between the two countries will probably be concluded at the end of this month. The cable may be available in about 1998 and the capacity will be 600 MW.

Further details on 1992 operations may be found in the 1992 Yearbook, which is published in Dutch and in English.

NORWAY

Consumption

The power intensive industries' consumption of electricity in 1992 was 3.0% lower than in 1991, mainly due to lack of market for these industries' products. However, the change in consumption was somewhat different in the three main groups of power intensive industries. The chemical industry decreased its consumption by about 5%, the consumption in the aluminium and other metals industries decreased by about 4%, whereas in the iron, steel and ferrous alloys industries the consumption decreased by about 1%.

The gross general consumption (households, other industries, etc.) increased by 0.4% from 1991. However, adjusted for temperature conditions, the general consumption shows an increase of 1%, which is slightly less than the average over the last five years.

Electricity Production and Gross Consumption (TWh)

	1991	1992	Percentage change
Power intensive industry	29.3	28.4	- 3.0
+ General consumption	70.0	70.2	0.4
- Gross domestic consumption excl. electric boilers	99.3	98.6	- 0.6
+ Electric boilers and pumped storage (occasional power)	8.5	9.6	
+ Exports (incl. losses) - Imports	3.2	9.5	
- Production	111.0	117.7	6.0
General consumption adjusted for temperature conditions	71.1	71.8	1.0

Production

Preliminary figures for 1992 show an increase in electricity produced of about 6% compared with 1991. Since the electricity production system in Norway is almost entirely based on hydropower, the production is dependent on the runoff during the year. In 1992 the runoff in most parts of the country was considerably larger than average.

Development

In 1992 a total of 362 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 additions is about 1.1 TWh.

The Energy Act which came into force on 1 January 1991 brought with it many changes on the Norwegian power market. The distribution utilities lost their electricity supply monopoly position in their concession districts. Everyone now has the right to purchase electric power from anyone and to have it delivered on the grid at prices that are monitored by Norwegian Water Resources and Energy Administration. The competition for power deliveries to the distribution utilities and to major consumers has become very keen among the electric power generation utilities.

This, together with a market with a surplus of electric energy, has resulted in a low rate of hydropower development in spite of government financial support for uprated/refurbished power plants. There is reason to believe that the situation with a low rate of development will continue in the next few years.

PORTUGAL

This paper contains information indicating results for last year (1992) and forecasts for this year (1993), as well as future prospects.

It was prepared for this session of the Economic Commission for Europe and is based on data for the mainland part of the country supplied by the Portuguese National Electricity Company. 1/

The figures presented below do not cover the Atlantic Islands of the Azores and Madeira owing to the difficulty of obtaining the necessary data in time.

A. Results for the past year

A.1. Energy consumption

In 1992, electric energy demand in the Portuguese grid rose by 2.8%, from 26,364 GWh in 1991 to 27,094 GWh in 1992 - an increase of 730 GWh. With corrections for temperature and the number of working days, the rate of increase is 3.4%.

Information on the operation of the Portuguese Electricity Company's grid is presented in table 1 below.

A.2. Peak capacity

In 1992, peak capacity was reached on 23 January (5,316 MW), representing an increase of 4.1% over the previous year.

A.3. Hydroelectric power production and capability factor

Hydropower production in 1992 amounted to only 4,958 GWh, 45.2% less than during the previous year.

Hydropower production was well below normal and covered 25% of consumption. At the end of the year, reservoirs were 44% full.

The hydroelectric energy capability factor in 1992 was 0.41.

A.4. Trade with foreign countries

In 1992 an import surplus of 1.3 TWh as against one of 0.1 TWh the previous year was recorded in trade with foreign countries.

1/ These data correspond to 95% of the total for mainland Portugal.

TABLE 1

Energy situation in Portugal

		1992	1991	92/91 %
1. TOTAL PRODUCTION	GWh	27 585	27 564	+0.1
1.1. Hydroelectric production	GWh	4 958	9 050	-45.2
1.2. Total thermal power production	GWh	22 627	18 514	+22.2
Coal	GWh	10 865	9 969	+9.0
Fuel oil	GWh	11 761	8 543	+37.7
Gas turbine	GWh	1	1	+62.8
2. TRADE WITH FOREIGN COUNTRIES	GWh	1 341	92	+1 358.2
3. ENERGY RECEIVED FROM PRODUCERS FOR OWN CONSUMPTION	GWh	130	84	+53.8
4. ENERGY CONSUMED IN PUMPING	GWh	611	190	+222.1
5. TOTAL CONSUMPTION	GWh	27 094	26 364	+2.8
Corrected for temperature				+3.2
6. PEAK CAPACITY	MW	5 316 (23.1)	5 109 (16.1)	+4.1
7. INSTALLED CAPACITY	MW	6 923	6 621	+4.6
Hydro	MW	3 369	3 067	+9.8
Thermal	MW	3 555	3 555	0.0
8. RESERVOIR SITUATION (31 December)	GWh	1 125	1 000	+12.5
Percentage of maximum value		44	43	
9. FUEL CONSUMPTION				
Domestic coal	10^3t	207	277	-25.5
Imported coal	10^3t	3 333	3 155	+5.6
Fuel oil	10^3t	2 846	2 019	+41.0
10. HYDRO CAPABILITY FACTOR				
Calendar year		0.41	0.83	
Hydrological year		0.37	0.86	

B. Future prospects

B.1. Forecast development of demand

The forecast increase in electricity demand will slow down in the next few years and amount to about 3%.

B.2. Current investment programme, planned new commissionings and new construction envisaged for the coming years

Total installed capacity reached 6,923 MW, with hydropower stations accounting for 3,369 MW and thermal power stations for 3,555 MW.

The second unit of the Alto Lindoso plant (315 MW) and the Touvedo (28 MW) and Caldeirão (32 MW) plants as well as the three units of the Pracana plant (2 x 7.5 + 25 MW) will be commissioned in 1993.

In the thermal production sector, the first unit of the Pego plant (4 x 300 MW) fuelled with imported coal will be commissioned in 1993.

RUSSIAN FEDERATION

Generally speaking, electricity supplies to the Russian national economy and people in 1992 were reliable.

However, consumers in certain regions of the Far East and Eastern Siberia experienced shortages and interruptions in supply owing to inadequate generating capacity and fuel supplies.

The following table presents the main electricity production indicators for Russian electric power plants in 1990-1992.

Indicator	1990	1991	1992
Electricity consumption (billion kWh)	1 073.8	1 054.8	992.0
Electricity production (billion kWh)			
Total	1 082.1	1 068.2	1 008.6
of which: thermal power plants	797.0	780.1	716.5
nuclear power plants	118.3	120.0	119.8
hydropower plants	166.8	168.1	172.3
Installed capacity at end of year (billion kWh)			
Total	213.1	213.1	213.0
of which: thermal power plants	150.0	150.0	149.6
nuclear power plants	20.0	20.0	20.0
hydropower plants	43.1	43.1	43.4
Capacity commissioned (thousand kWh)	4 000	2 070	657
Generating equipment decommissioned (thousand kWh)	1 100	700	769

The electric energy situation became more difficult during the past few years owing to the disintegration of the previous economic management system. This resulted in the disruption of traditional links between the electricity industry and suppliers of electric equipment, spare parts and materials situated in the territory of newly created States.

A decline in budgetary appropriations, high interest rates and unfavourable economic development trends in the country have had the general effect of sharply reducing investments in the electric power industry. Capacity commissioned at electric power plants declined from 4 million kW in 1990 to 657,000 kW in 1992.

The fact that not enough new plant was commissioned resulted in capacity shortfalls at 80% of all power plants. Difficulties in supplying electric power plants with fuel also arose, owing to the decline in petroleum and coal production and the disruption of previously stable relationships with fuel suppliers.

The shortage of boiler fuel oil and coal at electric power plants in the Far East was particularly acute.

The disintegration of the USSR also shattered the optimum pattern of inter-system capacity and electricity transfers, and a number of regions found themselves connected to the Russian grid through the grids of the newly independent States.

The Pskov region, for example, obtains about 100% of its electricity from the Estonian, Latvian and Belarus grids.

The Kaliningrad region obtains 80% of its electricity from the Lithuanian grid.

The Northern Caucasus is connected to the Russian grid through the Ukrainian power network and the Sibirsk base-load power plant through the Kazakhstan system.

In the course of 1992, 3,323 km of HV lines of 35 kV and above were commissioned (the work being financed from a variety of sources). This figure is about five times less than that for the average year of the twelfth five-year plan (in respect of Russian territory). No 750 or 1,150 kV units were commissioned during the year. The longest 500 kV transmission lines put up and commissioned during the year are as follows:

1. The section between the Iriklinsky State district power station and the Gazovaya substation (116.8 km),

2. The Kurgan-Petropavlovsk section (181.3 km), and

3. The Tambov-Penza HV line (260 km).

The total amount transformer capacity of 35 kV and above commissioned in 1992 amounted to 7,613 MVA, which is also considerably lower than in previous years. In 1992 a number of existing 500 kV substations were enlarged. For example, 500 kV auto-transformers were installed at the Beskudnikovo, Chagino and Lipetskaya substations, and the 500 kV transformers at the Yuzhnaya and Tagil substations (Uralenergo) were replaced. A number of 220 kV units were commissioned in the Magadansk, Ulyanovsk and several other grids.

In September 1992, the Government of the Russian Federation approved the "Outline of Russia’s energy policy in the new economic context". Referring to prospects for the development of the country’s electric power industry in the near future, this document suggests that it can hardly be expected that production of fuel and energy resources will be stabilized in 1993, although an attempt will be made to halt the rate of decline. For example, it is anticipated that production of electricity will decline by 2% in 1993 as

compared with 1992, and that production of primary energy resources will be about 3.5% lower in 1992 (the decline was 6%). Moreover, electricity production at hydropower plants will fall by 4 to 6% (160-163 TWh) and by 1.5 to 3.5% (120-123 TWh) at nuclear power plants. Electricity production will decline by 2% at thermal power plants, reflecting a drop in demand. In the circumstances there are no incentives to modernize and refurbish electric power plants and this may well, in the near future, result in halting construction of new plants with a total capacity of about 70,000 MW.

SPAIN

1. The economic and energy situation in 1992

Economic and energy data indicative of Spain's economic situation in 1992 are presented in table 1 below.

Table 1: Economic and energy data for Spain in 1991-1992

	1991	1992	%
End energy consumption (Mtce)			
Total energy	62.7	62.3	-0.66
Electricity	11.4	11.5	0.80
Gross domestic product (10^9 1980 pesetas)	20 778.4	20 988.1	1.00
Population (thousand)	39 025	39 085	-
Employment (thousand)	12 609	12 366	-1.93
Consumer price index (%)	5.5	5.4	-

End energy consumption in 1992 amounted to 62.3 Mtce, representing a decline of 0.66% compared with 1991.

End consumption of electricity amounted to 11.5 Mtce, representing an increase of 0.80%.

The gross domestic product expressed in constant 1980 prices and at market prices amounted to 21 billion pesetas - an increase of 1%.

In terms of total energy, elasticity in relation to the GDP is negative (-0.66%).

In 1992 the elasticity of electric energy was 0.80%.

The energy component of the GDP in 1992 was 3 tce/10^6 pesetas, representing a decline of 1.65% compared with 1991.

The electricity component of the GDP was 0.5 tce/10^6 pesetas - a decline of 0.20% compared to 1991.

The final electricity share in the global energy market rose by 0.27% in 1992, and now amounts to 18.39%.

2. Electricity consumption

Total annual electricity consumption, losses included, was 0.5% higher than in 1992, increasing from 147,353 GWh in 1991 to 148,057 GWh in 1992.

Consumption by consumers supplied by public utility companies increased: by 0.34% on the Spanish mainland and by 2.82% on the Spanish islands.

Public utility companies supply approximately 98% of the Spanish electricity market.

A breakdown of the increase in net electricity consumption by type of consumer is given in table 2 below.

Table 2: Consumption by type of consumer GWh

	1991	1992	(%)
Household consumption	33 422	33 943	1.56
Other low-voltage consumers	33 110	34 200	3.29
High-voltage consumers	80 822	79 914	-1.12
TOTAL	147 353	148 057	0.48

Consumption by households increased by 1.5% and that of other low-voltage consumers rose by 3.29%, whereas that of high-voltage consumers declined by 1.12%.

In 1992 the maximum capacity called up was 25,214 MW for an average temperature of 4.14° C.

3. Installed electric equipment

Electric equipment installed as at 31 December 1992 is shown in table 3 below.

Table 3: Installed equipment as at 31 December 1992

	MW	% Total
Hydroelectric power plants	18 700	36.8
Conventional thermal power plants	21 315	46.9
Nuclear power plants	7 400	16.3
TOTAL	45 415	100.00

In 1992 installed capacity amounted to 184 MW, of which 68 MW was accounted for by hydropower plants, 86 MW by thermal power plants and 30 MW by the wind power farm at Tarifa.

4. Grid development

The extension of high-voltage networks is indicated in table 4 below.

Table 4: Length of high-voltage networks

	Length (km)	
	As at 31.12.1991	As at 31.12.1992
400 kV	12 831	13 138
220 kV	15 058	15 263
132-110 kV	18 960	19 008
TOTAL	46 849	47 409

5. Status of hydroelectric reservoirs

The status of reservoirs associated with hydropower production is indicated in table 5 below.

Table 5: Status of hydroelectric reservoirs

	GWh	
	As at 31.12.1991	As at 31.12.1992
Capacity of annual reservoirs	8 031	8 181
Capacity of perennial reservoirs	9 995	10 035
TOTAL CAPACITY	18 026	18 216
Reserve in annual reservoirs	2 584	3 962
% full	32.2	48.4
Reserve in perennial reservoirs	2 821	3 693
% full	28.2	36.8
Total reserve	5 405	7 655
% full	30.0	42.0

It will be noted that in 1992 reservoirs were 12% fuller than in the previous year.

6. Electric energy balance

Spain's provisional electric energy balance for 1992 is presented and compared with 1991 figures in table 6 below.

Table 6: Electric energy balance (GWh)

	1991	1992	Variation %
Gross hydroelectric power output	27 437	20 032	-27.0
Gross conventional thermal power output	73 959	82 168	11.1
Gross nuclear energy output	55 578	55 782	0.4
Total gross output	156 974	157 982	0.6
Consumption by auxiliary services and losses in power station transformers			
Hydroelectric power stations	419	306	-27.0
Conventional thermal power stations	4 730	5 098	7.8
Nuclear power stations	2 362	2 371	0.4
Total net output	149 463	150 207	0.5
Energy consumed in pumping	1 433	2 791	94.8
International trade in electricity	-677	641	-
Energy called up for the market	147 353	148 057	0.5
Network losses	14 367	14 436	0.5
Net energy delivered	132 986	133 621	0.5

7. Future prospects

At the present time the National Energy Plan, approved by Parliament in 1992, is in force. This new Plan will remain in force up to the year 2000. Average annual electric energy growth under this Plan is to be 3.4%.

SWEDEN

Gross consumption of electricity (including transmission and distribution losses) in Sweden in 1992 was - according to preliminary statistics - 141.2 TWh. This is about 2.8 TWh less than in 1991.

These figures, however, include power delivered on interruptible terms, used mainly for large boilers in the residential/commercial sector, including district heating networks. These deliveries depend very much on the actual power situation and thus on the availability of water for hydropower production and the performance of the nuclear plants. The interruptible electric energy delivered was 8.3 TWh in 1991 and 8.1 TWh in 1992.

If we exclude interruptible power, firm deliveries amounted to 132.8 TWh in 1991 and 130.3 TWh in 1992. We can also note that both years 1991 and 1992 were warmer than normal, causing a decrease in heating consumption of about 1.2 TWh in 1991 and about 1.9 TWh in 1992. This indicates that electricity consumption decreased about 1.4% after correction for interruptible power and climatic variations. This fall in electricity consumption is mainly due to diminishing industrial demand caused by the recession. There has been a yearly decrease of 1.8% and 1.5% in GNP for the last two years. In 1991 electricity use in the industrial sector fell by 4.6% and in 1992 by 3.5%.

Hydropower production increased from 62.3 TWh in 1991 to 72.7 TWh in 1992, compared with a normal year's production of 63.5 TWh. The reason for this remarkable high figure has been the shut-down of five of Sweden's 12 nuclear reactors during the last months of the year, causing a decrease in nuclear production from 73.5 TWh in 1991 to 60.8 TWh in 1992. The increased use of hydropower to make up for nuclear production losses has drawn on the water reservoirs. They are now at their lowest level in 10 years.

The story of the shut-down of the nuclear reactors started in July, when defects in the emergency cooling system were found in the Barsebäck 2 plant during annual maintenance and refuelling. In the middle of September the safety authorities withdrew the operation licence of this and four other BWR reactors of the same design. Modifications have taken place and today all but one of the five reactors are back in operation.

Supplementary production of conventional thermal power is usually kept at a low level. In 1991 it amounted to 6.7 TWh, which was less than 5% of total electricity production. The main part comes from combined heat and power stations and industrial autogeneration. In 1992 production of conventional thermal power rose to 7.5 TWh, as backup oil-based plants were used to a greater extent because of the problems with the nuclear reactors.

Net exports of electricity from Sweden to the other Nordic countries were 1.4 TWh in 1991, increasing to 2.1 TWh in 1992. Total exports amounted to 11.0 TWh in 1992 and total imports were 8.9 TWh. However, during the last quarter of the year, when the five nuclear reactors were shut, Sweden was a net importer of electricity. In particular there has been an increased import of electricity from conventional thermal stations in Denmark to the southern part of Sweden due to the shut-down of the two Barsebäck reactors.

The Swedish power system today is not dependent on oil apart from peak load production and reserve capacity. In many households (one third of the single family houses), however, there is a possibility to switch between oil and electricity for heating. Oil heating is mainly used in winter when electricity prices are high. But this also means that the power system is indirectly affected by changes on the international oil market. Higher oil price means higher consumption of electricity.

THE ELECTRICITY MARKET

Deregulation of the power sector

In early 1992, the Swedish Government presented a bill, "An Electricity Market with Competition", setting goals and recommending strategies for reforming the electricity market, including changing the existing Electricity Act of 1902. The new guidelines should replace the present system for regulating the electricity market (concessions, delivery obligations and price control).

A government's electricity law committee was commissioned, which will make its recommendations by the end of June this year. The main task for the committee is to draft new and modern legislation reflecting the new principles and guidelines.

The committee is asked to "pave the way for effective price formation by a system of keener competition for the consumers". Anyone holding a line concession or an area concession should, in principle, have an obligation to make his network available for transiting, at a reasonable price, to anybody asking to use it (so-called third party access, TPA). The committee's proposals will include an increased access to the regional networks as well as the area networks.

The operation of an electric network should, in the future, be conducted as a separate economic activity and its costs should be accounted for in a transparent manner. The same principle for cost accounting should be used by all network owners. The tariffs and other terms of transiting should be open and thus publicly known.

A system of concessions carrying rights and obligations should exist also in the future. The committee should consider possible conditions for new concessions and possible changes in concessions already granted without violating the basic rights of holders of such concessions.

The interconnecting links with neighbouring countries should be regarded as important parts of the national grid. As a matter of principle the State-owned public utility "Svenska Kraftnät" should own and operate such a portion of the interconnection links that is sufficient to ensure that Swedish electricity producers and consumers can make contracts with consumers or suppliers abroad.

After the electricity law committee's report is published, a Government bill based on the conclusions is likely to be presented during the 1994 spring session of Parliament. Accordingly, the earliest date that the new statutes could get into force is 1 July 1994.

Also due in June this year are the results of an investigation carried out by Svenska Kraftnät into setting up a trading market in electricity for short-term purchases. The main task of the committee is to analyse the advantages and disadvantages of such a trading market, taking into account the experiences from the power pool in England and Wales and the "electricity bourse" in Norway. The committee should also look into potential connections to other Nordic trading markets and analyse how the optimization of production is affected. Legal aspects of a trading market in electricity should also be taken into account.

Increased market concentration

The structure of the Swedish electricity market is continuously changing in the direction of increased concentration, implying fewer and bigger actors. The tendency of an increased degree of vertical integration, caused by the fact that producers are buying from distributors, is likely to continue. Faced with the forthcoming deregulation of the electricity market, the generators are keen on securing their market shares by controlling distribution and supply towards smaller consumers. Moreover, quite a lot of the local authorities are willing to sell their energy businesses because they have financial difficulties.

There is also a tendency to increased concentration in electricity generation. During the last two years the number of large producers, covering around 90% of the market, has decreased from 11 to 8. The generating companies are buying from other producers and generating plants in order to get bigger and acquiring a more suitable production mix. In particular, there is a strong desire within the generating companies to have a greater portion of hydropower. The most important event in this field, during 1992, is the acquisition of Båkab Energi Ab (about 5 TWh electricity production, most of which is hydropower) by Sydkraft Ab, the second biggest electricity producer in Sweden.

Energy taxes

Since 1 January 1993, Sweden has had a new set of energy and carbon dioxide taxes, which, compared to the old system, means lower rates for the industry sector and higher rates for all other energy users. Industrial users now pay no energy taxes at all and a carbon dioxide tax that is only one fourth of the general rate (SKr 0.08/kilo compared to SKr 0.32/kilo).

So far electricity production has been exempted from carbon dioxide tax. But a study commission on biomass fuels recommends that electricity produced from coal, oil and natural gas be taxed by SKr 0.08/kilo on carbon dioxide emissions. The Government's bill on climate policy, presented in February this year, proposes that the carbon dioxide tax should apply to new fossil-fuelled plants. The taxes on combined heat and power are currently being investigated by an interdepartmental committee.

Statistical data on the electric power situation

Country: Sweden
Years: 1991-1992

	Units of measurement	1991	1992 (preliminary)
1. Gross consumption 1/ of electrical energy of which	TWh	141.2	138.4
- industry		50.9	49.1
- household sector, commerce, public lighting		78.4	77.4
- transportation		2.5	2.4
- losses		9.4	9.7
2. Maximum demand (including transmission and distribution losses)	GW	24.2	23.9
3. Net production of electrical energy			
- hydro (public utilities + auto-producers)	TWh	62.0	72.7
- thermal (public utilities + auto-producers)		6.7	7.5
- nuclear		73.5	60.8
- total (public utilities + auto-producers)		142.6	141.0
4. Exchanges with foreign countries	TWh		
- net export		1.4	2.1
- total imports from the following countries:		6.2	8.9
Denmark		0.8	1.5
Finland		0.7	0.7
Norway		4.7	6.7
- total exports to the following countries:		7.5	11.0
Denmark		1.8	5.4
Finland		2.7	4.5
Norway		3.0	1.2
5. Equipment			
Added production capacities bought into service during the year			
hydroplants	MW	-13	0
(public utilities + auto-producers)	GWh	60	0
thermal plants (public utilities + auto-producers)	MW	270	-14
Nuclear plants	MW	30	22

1/ Including deliveries on interruptible terms, mainly to electric boilers in the residential/commercial sector. In 1991 those deliveries were 8.3 TWh; in 1992 8.1 TWh.

SWITZERLAND

The electricity situation

End electricity consumption increased by 0.6% last year; per capita demand therefore remained virtually unchanged (+0.2%), the increase in this sector never having been so small since 1976. Production amounted to 57.3 billion kWh, representing an increase of 2.3% over the previous year. The export surplus increased to 4.3 billion kWh from 2.8 billion kWh in 1991, although there was an import surplus of 0.7 billion kWh during the winter months (first and fourth quarters).

Per capita consumption: unchanged

Per capita consumption of electricity rose by 0.2% compared with 1991. This is much less than the average of the 10 previous years (average increase of 2% between 1982 and 1992). This is hardly surprising in view of the following factors which had the effect of reducing demand:

First and foremost the economic recession: for the first time in 10 years the real gross domestic product declined (decline estimated at 0.5% compared with 1991).

Temperatures were considerably higher than their long-term mean. The number of heating degree days was 5% lower than the average for the previous 20 years. There was a decline of 8% compared with 1991.

Individual efforts as well as various programmes and campaigns promoting the rational use of energy (Energy 2000 programme; Confederation and cantonal legislation; energy conservation campaigns launched by electricity producers) helped to moderate electricity demand. A major effort was made at all levels, as was explicitly noted by Mr. Adolf Ogi, President of the Confederation and Chief of the Federal Department of Transport, Communications and Energy.

The tendency for demand to rise was nevertheless favoured by a slight increase in the resident population, the construction of housing (30,000 units) and the increasing use of electronic appliances by households and enterprises.

In absolute terms, consumption rose by 280 million kWh compared with the previous year; this is approximately the amount of electricity required by two towns such as Sierre and Chiasso and barely less than the annual output of the Filisur and Tiefencastel power stations (Forces motrices grisonnes).

The production sector (industry, services, transport and agriculture) accounted for 70% of electricity consumption and households for the rest.

Stable production conditions

The year 1992 proved to be an excellent from the electricity production standpoint, Swiss power stations achieving their third best-ever output figure. The main reasons were as follows:

Owing to their reliability and relatively large reservoir reserves, hydropower plants produced almost 34 billion kWh, corresponding approximately to the average of the past 10 years. Water availability was also in line with the long-term average.

Production by the five nuclear power stations levelled off at a high 22 billion kWh, which was the second highest figure achieved since the introduction of this technology in Switzerland (1969). The average utilization rate of these plants was almost 86%.

Hydropower plants accounted for 59% of the total amount of electricity produced, nuclear plants for 38% and thermal power stations for 3%. Without nuclear production, in other words, counting only the output of hydropower plants and conventional thermal power stations, there would have been a shortfall of 35% in the electricity demand in 1992. Nuclear power stations accounted for almost one-half of total production during the two winter quarters.

Export surplus but net importer in winter

For the fourth consecutive time, Switzerland was a net importer during the two winter quarters of 1992. Following 1989 (net imports 0.9 billion kWh), 1990 (1.2 billion kWh) and 1991 (0.1 billion kWh), net imports in the winter of 1992 amounted to 0.7 billion kWh. This relatively modest figure was due to favourable conditions during the fourth quarter: run-of-river hydropower plants enjoyed abundant precipitation while at the same time demand declined (-2.1%). Net exports during the summer period amounted to 5 billion kWh. For the year as a whole, therefore, there was a net export surplus of 4.3 billion kWh (exports: 26 billion kWh, imports: 21.7 billion kWh).

Electricity production and consumption in 1992

	Billion kWh	Change compared with previous year (%)
I. Electricity production		
Hydroelectric power plants	33.7	+ 1.9
Nuclear power plants	22.1	+ 2.2
Conventional thermal power plants	1.5	+11.9
Total	57.3	+ 2.3
II. Consumption by storage pumps and transmission and distribution losses	5.1	- 8.8
III. Electricity consumption	47.9	+ 0.6
IV. Net exports	4.3	+53.4
Per capita electricity consumption in kWh	6 940	+ 0.2

Source: Federal Energy Office.

TURKEY

I. ELECTRICAL ENERGY POLICY

The national energy policy in Turkey is mainly based on ensuring secure and stable conditions of energy supply at favourable prices, so as to make it possible to achieve economic growth and social progress.

In the framework of this strategy, the provisions which have to be taken are summarized below:

- Whenever it proves more economic, domestic resources are given first priority;

- Efficient utilization of the resources and energy conservation will be ensured and supported;

- More importance will be attached to research of domestic primary resources;

- Environmental protection and public health protection rules and measures will be applied in energy production;

- Along with the public sector, the participation of foreign capital and the private sector in energy investment will also be promoted;

- Without the subsidies of energy pricing, a more rational structure in energy pricing will be applied;

- Utilization of imported energy resources will be considered where this proves economical. However, diversification in resources and places of import will be taken into account;

- Opportunities for more feasible interconnections and higher electrical energy exchange with neighbouring countries will be sought;

- To meet the increasing electricity demand at an internationally accepted level of security and quality as required for economical and social progress.

In short, efforts will be made to produce electrical energy in a reliable, economical and continuous manner at places and times where and whenever needed.

II. PRIMARY RESOURCES USED FOR ELECTRICITY PRODUCTION

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

The total hydro potential for electricity is 121 billion kWh/year of which at present only 21% 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.

Domestic lignite reserves are capable of producing approximately 110 billion kWh/year. These lignite reserves are of low calorific value and high sulphur, moisture and ash content. Presently, production capacity of our existing lignite-fired power plants is about 32 billion kWh/year (which represents the 29% of the total potential). By the end of 1995, 35% of the total lignite potential will have been used for production of electrical energy.

The share of imported NG in the total electricity generation was approximately 16% in 1992. This corresponded to 2.9 billion cubic meter of gas which was mainly consumed in two large power plants near Istanbul.

Fuel-oil only accounts for 8% of the total electric energy produced during the last year.

Distribution of electrical energy and installed capacity of Turkey, by primary resources are given in Diagram 1 and Diagram 2 respectively, for the year 1992.

III. LATEST SITUATION AND DEVELOPMENTS IN POWER SUPPLY (BY THE END OF 1992)

1. Electricity consumption

According to preliminary data, the gross domestic product (GDP) grew by about 1.7% in 1991. As a consequence, the electricity consumption increased with low growth rate by 11.0% or rose to 54.7 billion kWh in 1992, thus leading to an annual consumption rate per capita of 934 kWh. As of the end of 1992, the breakdown of the total consumption of electricity in Turkey by the major sectors is observed as follows (see Diagram 3):

Industry	57.5%
Households	22.3%
Commercials	6.2%
Governmental offices	3.8%
Others	10.2%

2. Electricity production

Total gross electricity production grew at a yearly rate of 11.7% and reached 67,311.9 GWh in the year 1992. The hydropower production increased by 17% compared with its 1991 value and reached 26,544.8 GWh. As a consequence, the share of hydropower in electricity generation increased, accounting for 40% of the total annual generation. During the last year, to meet the growing demand, the thermal electricity generation rose from its 1991 value of 37,563 GWh, increasing by 8.5% on the average and amounted to about 40,767 GWh (it was 37,563 GWh in 1991). This amount corresponds to 60% of the total

generation of 1992. Of the total thermal power generation of 40,767 GWh, 27% (10,809 GWh) was generated from natural gas, 60% (24,553 GWh) from lignite and hardcoal and 13% (5,405 GWh) from fuel-oil, diesel and geothermal.

3. Installed capacity

At the end of 1992, the total installed capacity of Turkey with 8.7% annual increase reached 18,713.6 MW, with 8,378.7 MW in hydropower plants and 10,334.9 MW in thermal power plants. In 1992 seven hydroelectric power plants with 1,269.2 MW installed capacity and five thermal power units with 404.5 MW installed capacity were taken into operation.

In 1992, power plants with 166.7 MW installed capacity were taken out of operation because of the end of their economic life.

Developments of installed capacity and generation for Turkey at six-year intervals between 1970 and 1992 are shown in Table 1 and Table 2. It should be noted that drastic development took place during the last decade, the installed capacity sharply rising (approximately four times) between 1981 and 1992.

Now, the existing 18,713.6 MW and its associated generation capacity is well above the adequate level to supply the country's present peak demand (approximately 11,113 MW) and total gross supply levels (about 67,186.5 GWh) reliably with sufficient reserve requirements.

4. Transmission and distribution

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

- 380 kV and 154 kV for EHV and HV transmission
- 33 kV and 10.5 kV for MV distribution
- 0.4 kV for LV systems.

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 situated in the western or north-western regions of Turkey. This situation is probably the essential factor that accounts for the present extensive EHV interconnected system with distances between 500 and 800 km across the country.

The TEK transmission system basically consists of EHV (380 kV) and HV (154 kV) transmission lines, 380/154 kV auto-transformers and 154/MV step-down power transformers. The system also contains adequate series and shunt compensation installed for several economical and technical advantages. Total length of 380 kV and 154 kV lines reached approximately 9,558 km and 22,340 km respectively by the end of 1992. On the other hand, total capacities of 380/154 kV auto-transformers and 154/MV step-down transformers reached respectively 10,860 MVA and 23,173 MVA by the end of the same year.

As for the rural electrification, it has shown a remarkably high rate of increase especially during the last decade. The number of the total electrified villages in Turkey at the end of the foundation year of TEK (1970) was merely 2,371 (6.6% of the total). This figure reached 35,968 (99.9%) at the end of 1992. Thus, the basic rural electrification requirement is met on a nationwide scale at present, though more intensive use of it in social life and industrial applications still lies ahead as the target of future rapid developments.

IV. ELECTRICAL POWER AND ENERGY DEVELOPMENT OF TURKEY IN THE FUTURE

1. Energy and power demand

Medium- (1992-1995) and long-term electrical power and energy demand forecasts and corresponding optimum generation expansion plan to meet them with adequate reliability are continuously worked out with the aid of special sophisticated computer models.

The two major energy models used in Turkey for Electricity Expansion Planning are MAED (Model for the Analysis of Energy Demand) for the analysis of the future energy demand and WASP (Wien Automatic System Planning Package) for the power plant expansion planning.

The energy demand analyses having been done on the basis of three scenarios, "high", "base" and "low". These are characterized as follows: "high" assumes a fairly good economic development with a yearly GDP growth rate of 7.5% to 8.0%, while "low" is characterized by GDP growth rates between 4.5% and 5.0%. The "base" scenario represents an average development with annual GDP increases of 5.2% to 6.0% which is taken as a target in the five-year development plan.

According to the results of most recent studies of base scenario, the national energy and power demand with a yearly average growth rate of 8.7% will reach 93,000 GWh 15,000 MW for the year 1995, 139,000 GWh 22,400 MW for the year 2000, 207,000 GWh 34,000 MW for 2005 and 308,000 GWh 50,600 MW for 2010, respectively.

2. Generation and installed capacity development

Through the planned additions to be materialized during the period 1993-1995, it is envisaged that the existing national installed power plant capacity will rise to 20,764 MW, with generation capability of producing 100,219 GWh by the end of 1995 to meet the energy and power demand.

Table 3 shows the generation-consumption balance for the medium-term (1993-1995). It can be seen from this table that, with commissioning of the power plants currently under construction, Turkey does not seem to incur any energy or capacity shortage problem in the medium period.

Largest power plants added to the power system during 1992 are shown in Table 4. On the other hand, breakdown of the total installed power and generation projected for the year 1995 are shown in Diagrams 4 and 5.

For the long-term period (1996-2010), in order to meet the estimated electricity and peak power demand, the installed capacity of about 23,170 MW (1996) should be increased to 31,200 MW until 2000, 44,770 MW until 2005 and finally to 64,800 MW by the end of 2010. At the beginning of this period, one third (34%) of the generation will consist of hydropower plants, 35% of lignite power plants, 23% of natural gas and 8% of other fuel type power plants. The share of lignite-fired power plants and hydro plants are gradually decreasing from 35%, 34% in 1996 to 26%, 20% in 2010 respectively, while the share of natural gas is increasing from 23% to 28% and the share of imported coal power plants will reach to 19% in year 2010. Table 5 shows the generation-consumption balance for the long term (1996-2010).

V. INTERCONNECTIONS

Existing interconnections

GEORGIA

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

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

There has been 314.8 GWh of export through this line.

BULGARIA

A 400 kV transmission line, commissioned in 1975, exists between Bulgaria and Turkey with a transmission capacity of 500 MW.

One end of the line is connected to Babaeski substation in Turkey and the other end to Dimodichev substation in Bulgaria. This line was used to feed an isolated part of Thrace Region until 1986.

Later it was used to feed an isolated region in Bulgaria and for the energy transfer to Romania through Bulgaria and to Albania through Bulgaria and Yugoslavia. There has been 568.4 GWh of energy import through this line resulting from the exchanges in 1991.

AZERBAIJAN

The construction of the double circuit 154 kV Iğdir (Turkey) - Babek (Nahcivan) transmission line with a transmission capacity of 100 MW is completed. There has been 38.3 GWh of energy export through this line since 28 January 1993.

ARMENIA

A 220 kV transmission line presently exists between Turkey and Armenia with a transmission capacity of 300 MW. This transmission line is connected to the Kars 154/220 kV substation in Turkey and to Leninakan 220 kV substation in Armenia.

SYRIA

A 66 kV transmission line exists between Çağ-Çağ (Turkey) and Kamishli (Syria) with a transmission capacity of 40 MW.

IRAQ

According to the agreement signed on 28 November 1985, yearly 400 ± 20% million kWh energy transfer from Iraq to Turkey with 70 ± 10% MW capacity is foreseen via PS3 (Turkey) - Zakho (Iraq) by a 400 kV line operated at 154 kV. Power transfer at 154 kV is limited from Turkey to Iraq due to the increase of domestic loads in this region.

All transfers mentioned above were carried out in "isolated" or "directed" mode of operations. No synchronous operation is effected with the neighbouring power systems for the time being.

Interconnections under construction

IRAN

The construction of Doğubeyazit (Turkey) - Bazargan (Iran) 154 kV transmission line is in progress.

Technical and economical studies for 400 kV interconnection between Turkey and Iran are also in progress.

Plans for future interconnection

Five countries (Egypt, Iraq, Jordan, Syria, Turkey) interconnection

According to the protocol signed by the Ministers of Energy of the five countries on 16-17 January 1989, Egypt, Iraq, Jordan, Syria and Turkey started their studies on the interconnection of their electrical networks. A feasibility study for the interconnection of the five countries was carried out by the Consortium Ontario Hydro and Hydro Quebec International. The study was financed by the Arab Fund and the Islamic Development Bank.

The last draft report on the feasibility study was sent to the related countries in December 1990, and a meeting was held on 3-4 March 1992 in Cairo, with the participation of four countries (Iraq did not participate) and the financing institutions. The feasibility report was discussed in the meeting and a final report including the comments of the countries was prepared and sent to each country.

The studies were performed under three main headlines; namely the investigation of feasible interchange alternatives and interchange capabilities, the study for the transmission systems to meet the interchange requirements and the study for policy and tariffs to represent the basic principles.

The recommendation of the study is to implement the Initial Stage interconnection facilities in 1997 which would consist of the following 400 kV interconnections:

Aleppo (Syria)	- Birecik (Turkey)	124 km
Cizre (Turkey)	- Kesek (Iraq)	129 km
Qaim (Iraq)	- Der Zor (Syria)	165 km
Adra (Syria)	- N. Amman (Jordan)	210 km

In addition to the lines mentioned above, the necessary reinforcements in the national network of each country are to be completed by 1997.

After finalizing the initial stage shown in figure-1, the transfer capacity will be about 300 MW among the five countries, except between Iraq and Turkey where the interconnection capability is to be expected about 400 MW.

It is recommended that the countries should move to the next stage of the interconnection, as soon as operating experience indicates that they will be able to realize potential benefits. If this becomes the case, the interchange capability at the next stage of the interconnection will be about 600 MW among all countries, except between Turkey and Iraq, where the interchange capability is to be expected as 800 MW.

During 10-11 October 1992 a meeting was held in Damascus, between the Minsters of Energy of the five countries and the Director General/Chairman of the Board of Directors of the Arab Fund. The meeting was also attended by the Directors and technical staff of the Electricity Utilities of the five countries. After the presentation of the conclusions and recommendations of the feasibility study, the five Ministers agreed on the following:

1. To go ahead with the execution of the initial stage of the interconnection of the electrical networks of the five countries as recommended by the study in two steps:

- The first step: (Amman S.)-(Amman N.)-(Adra)-(Hama 2)-(Aleppo F.)-Birecik), to be completed by 1997.

- The second step: (Hisie)-(Der El-Zorr)-(Qaim) to be completed by 1998 and (Kesek)-(Cizre), to be completed by 2000.

Any two countries can speed up the interconnection between them as they see fit.

2. Agree on the principle of considering wheeling charges which usually involve a transfer of capacity and associated energy or of energy only, from one country to another country through intermediate countries.

3. Agree on the principle of considering an extra charge over the wheeling charges for compensating intermediate countries that have invested in additional facilities without getting commensurate benefits, (i.e. reserve capacity saving).

4. To form a committee from representatives of the electric utilities of the five countries to prepare the following:

- General Trading Agreement.

- Construction Agreement.

- Interconnection Agreement.

The topics to be included in each of the above agreements will take into consideration the recommendations of the Study Report.

The General Trading and Construction Agreement will be finalized during the meeting to be held in Amman on 17-19 May, then the agreements will be approved during the Ministerial meeting on 12-13 June 1993. The Interconnection Agreement will be finalized by the end of 1993.

UCPTE

Turkish Electricity Authority is considering the possibilities to join UCPTE in the future years. As a matter of fact, systematic efforts have already been initiated towards the achievement of this goal, considering the requirements concerning the recommendations, procedures and rules of the Union.

Results of a joint study with the Public Power Corporation (PPC) of Greece were included in "Task Force on Load Flow Studies" prepared by SYSTINT Group of UNIPEDE/UCPTE Working Group. According to these studies based on the years 1992-1995-2000, the 400 kV lines foreseen between Greece and Turkey allow the scheduled exchanges without any problem.

- The values of these exchanges are ± 600 MW or - 600 MW for one or 1,400 MW for Turkey to Greece for two 400 kV lines.

SYSTEUR Group of UNIPEDE/UCPTE Working Group has sent the first results of load flows studies for the different scenarios of East-West Interconnection for the year 2015.

- This interconnection allows energy exchanges between UCPTE and Turkey up to 1,300 MW.

ENVIRONMENTAL PROGRAMMES FOR COAL-FIRED POWER PLANTS

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 principle is the consideration of environmental issues in the power generation.

In this respect, The Environmental Law of Turkey became valid in August 1983 and related legislations, "The Control of Air Pollution Regulation" was put into force in November 1986 and the legislation for water pollution was issued in September 1988.

In order to supply clean energy and to mitigate the environmental impacts of coal-fired power stations which utilized low quality lignite and had been constructed before the Environmental Legislation, some rehabilitation and refurbishing programmes became necessary.

Because the domestic lignite having a high sulphur content and/or low calorific value is 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 to the thermal power stations, existing or under construction, is of considerable importance in environmental measures.

However, because of their high investment costs, it is not possible to integrate FGD plants to all of the existing thermal power stations at the same time. For that reason, the retrofit FGD plant will be realized according to the priority list prepared by the consideration of the location of plants and the conditions of surroundings and their environmental impacts on agriculture, forest, human health, tourism potential, etc.

The first FGD plant has been constructed in Çayirhan Power Station (2 x 50 MW) and was taken into operation in 1991. Since then the subject plant is in operation with a satisfactory cleaning efficiency reaching far beyond the guarantee value of 95%.

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

For the new thermal power stations, FGD plants will be considered in the planning phase.

Besides the retrofit FGD plants, other refurbishing and rehabilitation programmes are under investigation and execution. The programme is called "Coal Pollution Abatement Project" which is being carried out in cooperation with World Bank. The items included in this project are summarized as follows:

Yatağan Thermal Power Plant (3 x 210 MW) which is in operation since 1983 was chosen as a pilot plant for the mitigation of environmental impacts of lignite-fired power stations. The programme covers, besides the FGD plant to be installed, the subjects related to the transfer of ash, recultivation of ash stock-yard, liquid waste treatment and disposal system, and landscaping of the plant site and surrounding.

Repowering of Soma-A Power Plant (2 x 22 MW) also takes place in our programmes. Although the economic life of the subject plant has been completed, it was the intention to covert the conventional boilers to fluidized bed technology. The cost-benefit analysis has been carried out by determining the actual state of each plant part, the remaining life-time of each piece of equipment, the frequency, the cost of repairs and replacements, etc.

Other activities, such as the improvement of electro-filters in some old power stations, rehabilitation programmes for the management of liquid and solid wastes, installation of emission monitoring and recording instruments to the thermal power stations, etc., take place in our programmes.

UNITED KINGDOM

Structure of the industry

The United Kingdom electricity supply industry was restructured as a result of the 1989 Electricity Act. The main features of the new competitive system are as follows:

In generation and transmission, the effect of the 1989 Act was to divide the former Central Electricity Generating Board (CEGB) in England and Wales into four new companies. Two fossil fuel based generating companies, National Power and PowerGen, were floated on the stock exchange in March 1991. A third generating company, Nuclear Electric plc, took over the nuclear assets of the CEGB, and remains in Government ownership. Finally, the National Grid Company (NGC), owned jointly by the 12 distribution companies in England and Wales, runs the high voltage network facilitating the bulk transmission of energy between generators and suppliers and operates the "pool" system in England and Wales. The NGC also took over the pumped storage generating capacity of the CEGB.

In distribution, the publicly owned area boards in England and Wales were floated on the stock exchange in December 1990 as twelve regional electricity companies (RECs). Each continues through its Public Electricity Supply Licence (PES) to enjoy a local franchise for customers of 1 MW and below. The RECs operate the distribution network within their area, with lines ranging from 132 kV down to 240 V, and supply electricity to their customers. They are also major players in electrical appliance retailing and electrical installation contracting.

In Scotland, there are two vertically integrated generation, transmission and supply companies, floated on the stock exchange in June 1991, and a nuclear generation company which remains under Government ownership.

In Northern Ireland, the Government is privatizing the integrated generation, transmission, distribution and supply company, Northern Ireland Electricity (NIE). NIE's four power stations were sold privately in March 1992, and a new company with a local licence for transmission, distribution and supply, Northern Ireland Electricity plc, will be floated on the stock exchange in 1993.

Main developments in 1992

Maximum demand on the National Grid's transmission in England and Wales was 44,867 MW, occurring on 4 January 1992. The annual peak was somewhat lower than the 1991 figure of 47,231 MW. The transmission systems in Scotland and Northern Ireland also recorded slightly lower peaks than in 1991. Maximum demand on the Scottish Power system was 4,046 MW on 23 January 1992 (4,222 in 1991), while the Scottish Hydro Electric peak was 1,521 MW on 21 December 1992 (1,528 in 1991). Peak demand on the Northern Ireland transmission system was 1,322 MW on 10 December 1992 (1,377 in 1991).

Generating plant construction and development

Total net generating capacity for the major United Kingdom electricity generating companies (see schedule) at the end of 1992 was 67,909 MW. During the course of the year, 858 MW of plant capacity was taken out of service by PowerGen. Two new power stations were opened during 1992. The first phase (450 MW) of the 900 MW Killingholme B combined cycle gas turbine (CCGT) plant was opened by PowerGen, and Scottish Hydro-Electric opened a 230 MW open cycle gas turbine plant at Peterhead in Scotland.

Work on the construction of Nuclear Electric's Sizewell B PWR station (1,175 MW) in Suffolk continued during the year and the project remains eight months ahead of the CEGB's original committed programme.

The construction by National Power of a 650 MW (3 x 150 MW GT, 1 x 200 MW steam) CCGT station at Killingholme on South Humberside began in January 1991 and is due to be commissioned in Autumn 1993. Construction work began on a second CCGT owned by National Power, the 500 MW Deeside Station, which is due for completion in 1994. PowerGen continued work on a second new CCGT plant at Rye House in Hertfordshire, also due for completion in 1994.

Since privatization, independent generators have opened one new CCGT station, the 224 MW plant at Roosecote, owned by Lakeland Power. However, further schemes are in progress. There area a total of 10 new CCGT power stations under construction in addition to those belonging to National Power and PowerGen as mentioned above. The construction programme of Teesside Power's 1,725 MW CCGT combined heat and power (CHP) station at the ICI Wilton Chemical Complex on Teesside is progressing according to schedule and is due to come on line in April 1993. Construction has started on a 240 MW CCGT plant at Brigg, which is scheduled for completion in November 1993. The plant is owned by Regional Power Generators, a partnership between Yorkshire Electricity and the Finnish company IVO. British Nuclear fuels is constructing a 170 MW combined heat and power (CHP) plant at Sellafield, due for completion in 1993. Eastern Electricity is building a 360 MW CCGT station at Peterborough which will be commissioned in Autumn 1993, and construction of a similar plant at Corby is under way, financed by East Midlands Electricity. Corby is also due to come on line in Autumn 1993.

The four remaining independent projects now under construction are also scheduled for completion in 1995. Barking Power is constructing a 1,000 MW CCGT station at Barking in East London. The project is jointly owned by three regional electricity companies (London Electricity, Southern Electric and Eastern Electricity), BICC and Canadian Utilities. Keadby Power, jointly owned by Scottish Hydro Electric and Norweb, is constructing a 680 MW CCGT at Keadby. Medway Power, a consortium comprising Seeboard plc, Southern Electric plc and AES Electric, is building a 660 MW CCGT on the Isle of Grain, and Derwent Cogen, a consortium comprising Mission Energy, Courtaulds and Southern Electric plc are constructing a 214 MW CHP station at Spondon.

Good progress has been made on the retrofitting of flue gas desulphurization plant at National Power's Drax power station in Yorkshire, which is scheduled to start operation in stages between 1994 and 1996. To reduce NO_2 emissions, low NO_x burners are being fitted at three stations and

precipitator enhancements to reduce dust equipment are also to be installed as necessary at large stations to reduce dust emissions further. PowerGen has started work on the installation of FGD plant at Ratcliffe-on-Soar. Work has begun on the first of four units, which is due to be operational in 1994 with the others following within the subsequent two years. In total, 8 GW of coal-fired power plant will be retrofitted in this way.

Planned power stations

National Power has obtained planning consent to build a CCGT station at Little Barford in Bedfordshire (640 MW). Didcot B in Oxfordshire (1,500 MW) and Staythorpe C in Nottinghamshire (1,500 MW) are awaiting the outcome of public enquiries before the projects can proceed any further. PowerGen has submitted an application for consent to build a 1,350 MW CCGT power station at Connah's Quay in North Wales. PowerGen has also applied for consent to build a CCGT station at Plymouth in Devon (350-450 MW). Planning permission has been granted to Nuclear Electric for a PWR station at Hinkley Point which is similar to the Sizewell B design. A decision to proceed with the building of the station will be taken in the light of the Government's review of the nuclear industry in 1994.

There are a considerable number of schemes involving private generators which are at various stages in the planning process (see list attached). The vast majority of these are for the construction of CCGT plant. The 1,000 MW Neptune scheme, involving Scottish Hydro-Electric and Northern Electric, has now been combined with another project by Indeck Energy to build a 450 MW CCGT in Teesside. The Neptune Consortium now plans to build a 1,200 MW CCGT station. The project depends on the results of a public inquiry into the upgrading of the local NGC system.

The examples listed are by no means exhaustive and there are numerous other projects at various stages of development.

Electricity companies are also involved in a large number of small-scale projects using renewable sources of energy. The United Kingdom Government intends that over 1,000 MW of new renewable capacity will be installed by the year 2000. One hundred and ninety seven schemes have been accepted for development, and the major electricity companies are involved in roughly half of these. Several wind turbine stations are in the planning stage. These are predominantly located in Cornwall, Wales and Cumbria, and amount to 95 MW of capacity. In addition there are plans for several waste incineration plants (311 MW of new capacity), landfill gas schemes (91 MW), sewage gas schemes (48 MW) and hydro-electric schemes (21 MW).

One project completed in 1992 was the provision by NIE of mains supply electricity by means of a hybrid 0.3 MW wind/battery/diesel scheme to Rathlin Island off Northern Ireland.

Transmission system

Length (circuit km) of lines in service in 1991/92 was as follows:

Length of lines	Circuit km
132 kV	24,196
275 kV	6,235
400 kV	10,513

The expansion, strengthening and refurbishment of the transmission network continued throughout 1992 to ensure that the system can accommodate new entrants to the electricity market. In particular, the system has been strengthened in the North East of England, with the construction of three new 400 kV sub-stations to accommodate the Teesside Power project. New sub-stations at Killingholme and Sizewell are also in the process of completion. Work is also in progress on the upgrading of the interconnector between the Scottish Power and NGC systems. This will result in a doubling of capacity from 800 MW to 1,600 MW, and will involve the upgrading of the existing 275 kV transmission interconnector from 275 kV to 400 kV. The project is expected to be completed in two stages ending in 1993/94 and 1994/95.

Northern Ireland Electricity and Scottish Power have agreed on the installation of a 250 MW interconnector between the two grid systems. The project is presently the subject of a public inquiry. The interconnector will involve the laying of a 60 km sub-sea cable from the Antrim coast to the southern Scottish coast and is expected to be completed by 1996.
