

# COMMISSION OF THE EUROPEAN COMMUNITIES

Les documents

COM(88) 174 final Vol. I et

COM(88) 174 final Vol. II

annulent et remplacent

le document

COM(88) 174 final

COM(88) 174 final Vol. II

Brussels, 3 May 1988

NE CONCERNE QUE LES VERSIONS F-D-E

The Main Findings of the Commission's  
Review of Member States' Energy Policies

The 1995 Community Energy Objectives

(Communication from the Commission)

## REVIEW OF MEMBER STATES' ENERGY POLICIES

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REVIEW OF MEMBER STATES' ENERGY POLICIES

Introduction

1. In its Resolution of 16 September 1986<sup>(1)</sup> the Council adopted new Community energy policy objectives for 1995 and requested the Commission to submit, approximately every two years and on its own responsibility, a detailed survey of the progress made and problems encountered in each Member State and in the Community as a whole regarding the realisation of these objectives.
2. The Resolution stated that Member States should use these objectives as a basis for defining their national energy policies, and that they should continue efforts of comparable intensity in order to achieve the horizontal and sectoral energy objectives defined in the Council Resolution. The 1995 energy objectives are therefore the current guidelines for examining the convergence and cohesion of the Member States' energy policies.
3. In writing this report the Commission is of course fully aware that only a limited period of time has elapsed since the adoption of the new energy objectives. Nevertheless the present review has to be seen in line with past monitoring exercises, particularly the last review of Member States' energy policies in 1984 (2). That review was based on the 1990 energy objectives in the Council Resolution of 9 June 1980<sup>(3)</sup> but the differences between these and the 1995 objectives do not amount to a new policy approach. Policy judgements can therefore be made on the basis of trends since the reference year of the last review (1982) and even before that time.
4. The report that follows updates developments and trends in the energy sector and looks at future prospects to the year 1995, both at Community and at Member State level. The report does not cover systematically or in detail, all the qualitative horizontal objectives of the 1986 Resolution, some of which will be the subject of separate submissions to the Council later this year, for instance:

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1) OJ N° C 241, 25.9.1986  
2) COM (84) 88 final  
3) OJ N° C149, 18.6.1980

- greater integration of the internal energy market. A first paper on this subject will be sent to the Council in the first half of 1988.
  - energy technology; evaluations of the Community's hydrocarbon technology and energy demonstration programmes will be published towards the end of the year;
  - on the restructuring of the coal industries, a memorandum on State aids for coal will be sent to the Council in mid-1988.
  - refining and petroleum product import; a communication will be sent to the Council by end of the first half of 1988.
  - price transparency; a communication to the Council will be finalized in the first half of 1988.
5. In preparing the review report account has been taken of the fact that Member States differ considerably in their economic and industrial structures, geography, energy reserves and political and administrative conditions. Where individual Member States are referred to in the context of the Community's energy objectives this is done for information purposes and does not extend the Community commitment as such to every Member State.
6. This analytical report is in two parts.
- Part One concentrates on the trends and projections at Community level, taking into account both sectoral and horizontal objectives except in such cases as those mentioned above.
- Part Two contains individual country chapters evaluating energy trends, outlook, key policy issues and specific sectoral developments at Member State level.
7. A separate Communication will be sent to the Council in parallel to present the policy conclusions to be drawn from this monitoring exercise.

## PART ONE - THE COMMUNITY POSITION - OVERALL REVIEW

I. ENERGY TRENDS

1. Over the review period (1982-1986) world energy markets have changed considerably. The rapid fall in oil prices in 1986 and the Chernobyl nuclear accident have created new elements of uncertainty concerning future energy developments. In general the world and the Community's energy market have turned into a buyers market with a worldwide surplus of all forms of energy exceeding demand. However, when adopting the new Community energy objectives in September 1986 the Council was well aware of most of these developments.
2. Between 1982 and 1986 the annual rate of growth in energy demand in the Community (2.0%) was nearly as high as the average GDP growth of 2.2% p.a.. If this is compared with previous time horizons like 1975-1980 or 1980-1985 it becomes obvious that the process of decoupling economic growth from energy consumption has slowed down in the Community, and has even been reversed in some Member States like France, Belgium, the Netherlands, Ireland and Portugal. The growth in electricity demand continued to be higher than GDP growth, amounting to 3.3% p.a. between 1982/1986.
3. Since 1982 gross energy consumption in the Community increased by about 80 Mtoe or 8%, although in 1986 consumption was still only 4% higher than in 1973. Indigenous energy production rose faster than consumption and was in 1986 some 17% higher than in 1982 and about 66% higher than in 1973. Overall, therefore, net energy imports remained more or less at their 1982 level and were about 200 Mtoe lower than in 1973.
4. The structure of energy consumption changed slightly since 1982, particularly because of the growth in nuclear power. Despite the substantial fall in oil prices in 1986, inland oil consumption was lower than in 1982. The Community therefore continued its restructuring away from oil.
5. The overall structural changes are shown in the following table.

% of total gross energy consumption	1973	1982	1986
oil (bunkers inc.)	63 (647) (1)	51 (509)	47 (505)
solid fuels	23 (232)	24 (235)	22 (231)
gas	11 (117)	16 (160)	17 (187)
primary electricity,	3 (33)	9 (86)	14 (150)
of which nuclear	2 (16)	7 (66)	12 (132)
total	(1029)	(990)	(1073)

- (1) Figures in brackets give quantity of total gross consumption in Million TOE.

Two major developments in the period 1982-1986 are highlighted by these figures: the increasing share of nuclear energy and the decreasing share of oil. Solid fuels and natural gas more or less kept their market shares with a slight decrease in the use of coal.

6. With regard to indigenous production the main features of the changing energy balance at Community level were:
  - A decline in hard coal production by about 17 Mtoe and more or less stable lignite production;
  - The production of oil and nuclear increased by 28% and 100% respectively. Gas production also increased but only by 7%.
7. These trends are set out more fully in table 1.
8. Before looking in more detail at the trends in the different energy sectors it is worth noting that the progress made so far during this decade is consistent with the main 1990 objectives adopted seven years ago (see footnote 1) in terms of oil consumption and the use of coal and nuclear in the electricity sector.

## II. TRENDS IN THE DIFFERENT ENERGY SECTORS

9. The present sectoral objectives are quantitative in nature and cover energy efficiency as well as all major energy sectors. The following chapters deal with past developments, the present situation and the prospects in each sector.

### Energy Efficiency

1995 Objective:

The efficiency of final energy demand should be improved by at least 20% by 1995

- (1) The main 1990 objectives read as follows:
  1. To reduce to 0.7 or less the average ratio between the rate of growth in gross primary energy demand and the rate of growth domestic product.
  2. To reduce oil consumption to a level of about 40% of gross primary energy consumption.
  3. To cover 70/75% of primary energy requirements for electricity production by means of solid fuels and nuclear energy.

10. For the purpose of energy efficiency policy the Community Member States can be divided roughly into two groups a) those who began their energy efficiency programmes during the 1970's i.e. France, Germany, the United Kingdom, Italy, Spain, Belgium, the Netherlands, Denmark, Ireland and Luxembourg, and b) those countries who have just or are currently launching their energy efficiency programmes i.e. Portugal and Greece.
11. The performance in improving the rational use of energy (measured in terms of improvement of energy intensity i.e. the ratio of final energy consumption to gross domestic product) for the EUR-12 over the period 1973/82 was impressive, with an improvement of 20% being recorded. The corresponding figure for 1982/86 is 2.4%. The following table shows the improvement (deteriorations are minus figures) in energy efficiency in the Community Member States and for EUR-12 during the periods 1973/82 and 1982/86.

Improvement in energy intensity (%)

	D	F	I	NL	B	L	UK	IRL	DK	G	PO	S	EUR-12
73/82	21.0	26	12.6	17.3	29.5	38.8	18.8	27.6	27.9	-1.9	NA	NA	20*
82/86	-0.3	0.1	6.1	-4.3	-2.1	9.4	5.3	13	5.6	0.8	3.6	6.7	2.4

\* Estimated on Spanish and Portuguese figures supplied from sources outside Eurostat.

These figures show that the countries who instigated energy efficiency programmes following the 1973 oil crisis made significant improvements in the efficient use of energy up to 1982. Greece, Portugal and Spain were the only countries to record deteriorating energy intensities during this period. While it would be gratifying to conclude that the policies of the Member States were wholly responsible for this performance, the period 1973/82 was one of substantial industrial restructuring and energy price rises.

The figures for 1982/86 show that the improving trend in energy intensity has been arrested in many Member States and indeed that it has been reversed in four. This performance is in marked contrast to that of 1973/82 and occurred in a period when industrial restructuring was substantially completed and energy prices were stagnating and then falling sharply.

12. Most Member States have reviewed their energy efficiency policies in the light of the changed energy market conditions and the experiences gained with various initiatives. The result of this re-appraisal has been the reduction (if not the total elimination) of direct subsidy programmes for energy efficiency investments. There is now a concentration on information programmes and a desire to allow the market in energy efficiency to function independently. Three Member States, i.e. the United Kingdom, the Netherlands and France, have or are carrying out major reviews of energy efficiency organisations set up in the 1970's with a view to making them more cost effective and setting new terms of reference.

Only Italy, the Netherlands and Denmark have maintained their energy efficiency R&D spending at historical levels, while all other Member States have substantially reduced their allocations to this area. For example, the Federal Republic of Germany has reduced its allocation for energy efficiency R&D by a factor of more than three since the high of 110 MECU recorded in 1981.

13. There are sometimes discrepancies between the initiatives announced by the Member States as part of their energy efficiency policy and what is in fact happening. For example both Italy and Greece have announced a wide range of energy efficiency initiatives but in reality few of these initiatives have been implemented. The range and scope of the Member States initiatives are shown in the accompanying table.



	I	F	UK	D	B	NL	GR	DK	S	P	L	IRL
1. Information	X	X	X	X	X	X	X		X	X		X
2. Energy audits	X	X	X	X	X	X	X	X	X	X		X
3. Grants	X	X	X	X		X		X		X	X	X
4. Advice to local authorities			X		X							
5. Provision of educational material		X	X				X		X			
6. Demonstration programmes	X	X	X	X	X	X	X		X		X	X
7. Support for energy mgt.	X	X	X				X		X	X		X
8. Ministerial actions			X									
9. Eng. labelling	X			X	X		X	Buildings x				
10. Voluntary agreements				X					X			
11. Fiscal measures	X	X						X		X	X	
12. Legislative actions ( insulation etc. )				Building Standards x		Building Standards x						

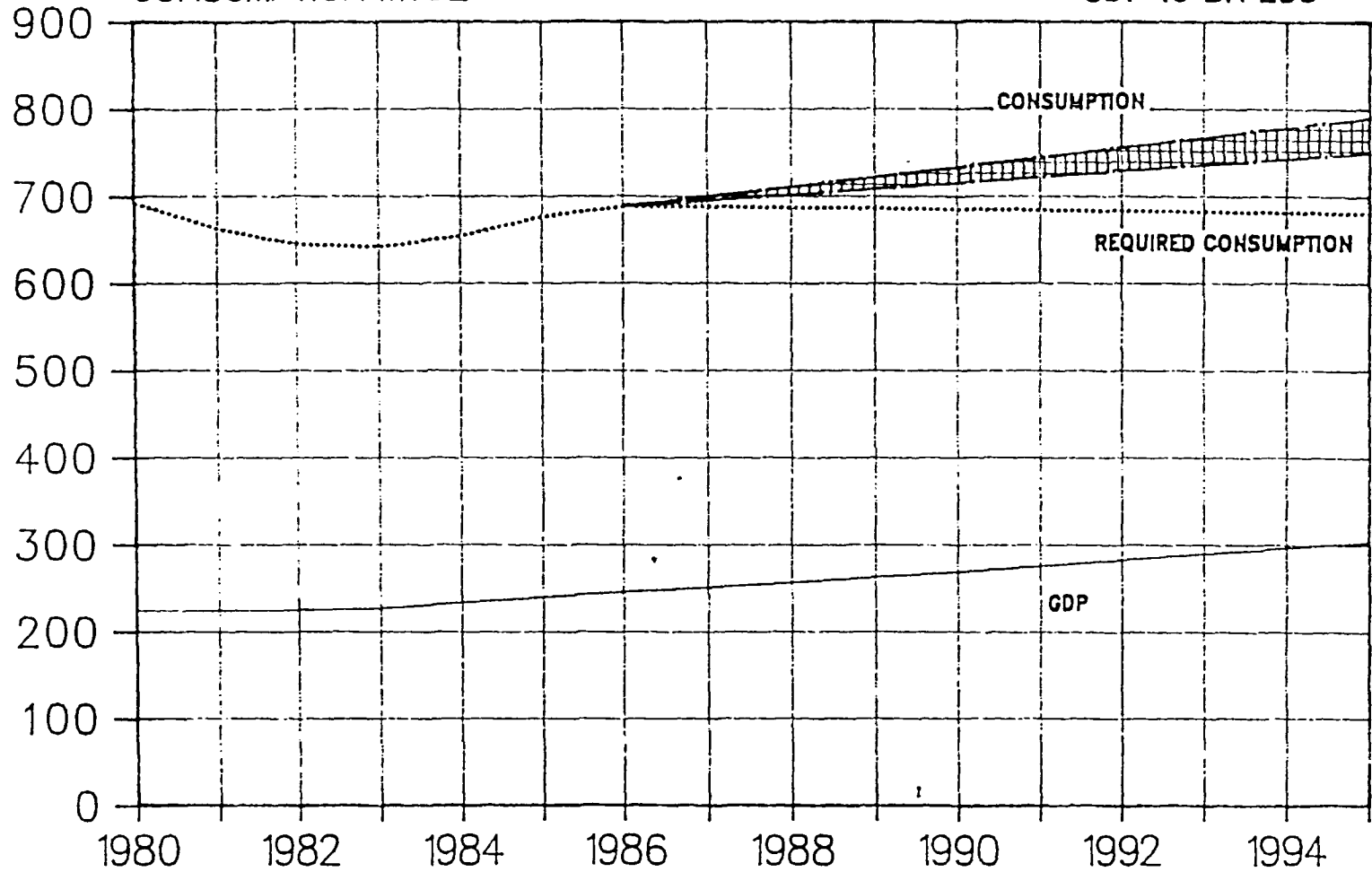
TABLE: Energy Efficiency Initiatives in the Member States .

14. There are still obstacles to the adoption of both cogeneration and third party financing as mechanisms to improve the rational use of energy. Some Member States are beginning to see the advantages presented by cogeneration and Italy has recently made provisions to encourage private generation up to 3,000KW. Luxembourg has just announced that the Government will create a state company which will promote the use of third party financing. Other Member States should follow these two examples.
15. One area in which there has been a significant advance has been the labelling of electrical appliances and housing. Labelling, both as an informational tool to the consumer and as a check on the energy consciousness of the manufacturers, represents a positive and measurable response of industry to the call for greater energy efficiency. The Danish experience with the energy certification of housing has proved the usefulness of this regulatory tool and this example should be followed by other Member States.
16. Now that the twin drives of industrial restructuring and energy price have been removed from the energy efficiency process, Member States will experience greater difficulty in achieving their energy efficiency objectives. Falling energy prices have lengthened payback periods for energy efficiency investments and have led to a degree of complacency in the pursuit of energy efficiency goals. This complacency can be seen in the swinging cuts already made in energy efficiency allocations, the reviews and curtailment of the activities of state energy efficiency organisations and the significantly reduced importance of energy efficiency R&D in the overall R&D policy.
17. Energy intensity can change from year to year but the Community (EUR 12) trend over the review period (1982/1986) is a clear slowdown in the rate of improvement. If this trend cannot be significantly improved there is no possibility of the Community attaining the 1995 energy efficiency objective. The accompanying figure shows the evolution of final energy consumption and GDP over the period 1980/86 and projects these parameters to 1995. Also included in the graph is the level of consumption required in 1995 to correspond with the 1995 energy efficiency objective. This graph illustrates that if current trends continue energy consumption will be between 70-110 Mtoe higher in 1995 than required by the objective. This additional 70-110 Mtoe corresponds to approximately 8-13 BECU at current oil prices.

# EEC: FINAL ENERGY CONSUMPTION / GDP 1980-1995

CONSUMPTION MTOE

GDP 10 BN ECU



18. The current policies being adopted by Member States, consisting of removal of subventions, reduced allocations for energy efficiency, reduction of the activities of state energy efficiency organisations and reduced emphasis on energy efficiency R&D are unlikely to create the right conditions for changing the present trend. It is unlikely that policies which do not integrate information programmes, regulation and mechanisms to accelerate investment will be successful in improving energy efficiency, especially in periods of low energy prices.

In view of the much slower rate of improvement in energy intensity and the reduced scale of energy efficiency programmes it is unlikely that the Community will attain the 1995 energy efficiency objective unless stronger actions are adopted.

19. If the 1995 energy objective on energy efficiency is not achieved then this will influence most of the remaining sectoral energy objectives. Even if these sectoral objectives were achieved in percentage terms they would only be realised at a higher consumption level than previously foreseen.

#### Oil

##### 1995 objective

Oil consumption should be kept down to around 40% of energy consumption and net oil imports thus maintained at less than one-third of total energy consumption in the Community in 1995.

20. Oil is still the Community's main fuel source. However its share in gross energy consumption decreased from 63% in 1973 to 47% in 1986. The downward trend in oil demand was first stopped in 1986 under the influence of drastically falling oil prices. Primary inland oil demand increased by 3% in 1986. However it is now clear that a significant proportion of this demand increase was caused by a build up of consumer stocks.

It would be premature to regard the 1986 developments as signalling a reversal of past trends. Provisional demand figures for 1987 again suggest a slight decrease or stability in oil demand.

21. Key factors in determining future oil demand will be the transport and households sectors, which in 1986 represented about 65% of total inland oil consumption. The share of oil in household consumption has fallen since 1973. Consumption for transport purposes is however constantly growing and, at present, there are no signs that this trend might be reversed in the near future. In industry some further possibilities to substitute oil exist despite the substantial efforts already undertaken in the past. The following tables show the trend of inland oil consumption since 1973 and the share of oil in the different consumption sectors.

inland oil consumption 1973 - 100	1982	1986
non energy consumption	77	88
electrical power stations	68	44
industry	56	44
transport	123	136
households	69	72
others	68	61
Total Mtoe	(482.4)	(474.3)

share of principal sectors in inland oil consumption %	1973	1982	1986
non energy consumption	11	10	12
electrical power stations	13	11	7
industry	19	14	11
transport	23	36	40
households	25	22	23
others	9	7	7

22. These figures underline that the transport sector is and will be the most important single determinant of the Community's future oil requirements.
23. The share of total oil in gross energy consumption in 1986 in the various Member States varied widely around the Community average of 47%.

Share of oil in gross energy consumption (%)  
1986

L	UK	D	F	NL	B	EUR 12	IRL	ESP	DK	I	HE	P
38	38	44	44	45	47	47	53	56	57	62	64	82

24. Only Luxembourg and the United Kingdom are already below the Community guideline of a 40% oil consumption share for 1995; Italy, Greece and Portugal a long way above. In Italy and Portugal oil continues not only to play an important role in the traditional consumption sectors but also in the power station sector.
25. Between 1982 and 1986 the share of oil in gross energy consumption was reduced in all Member States, except Luxembourg. For the Community the decrease amounted to 4%, from 51% to 47%. Even higher reductions took place in Portugal (-7%) and Denmark, France, Greece and Spain (all -9%).
26. Net oil imports in 1986 remained some 20 Mtoe below 1982 and some 290 Mtoe below 1973. However in 1986 net imports compared with the preceding year increased by nearly 20 Mtoe, because of net back purchases having depressed oil prices. The increase in 1986 imports contributed to an expansion of crude oil stocks (+4mtons) and petroleum product stocks. On various occasions the Commission has expressed the opinion that security risks do not arise from the use of oil itself but from the degree of reliance on oil which needs to be supplied from politically unstable regions.
27. In 1986 the Community's net oil imports represented 33% of gross energy consumption. This is a substantial improvement with regard to the 1973 situation (62%) and a continuation of progress even since 1982 (38%).
28. As in the case of oil consumption, the degree of oil import dependence in the Member States differs widely.

Share of net oil imports in gross energy consumption (%)  
1986<sup>1)</sup>

EUR 12	L	DK	F	NL	D	B	ESP	IRL	I	HE	P
33	38	39	41	41	43	48	51	55	60	65	82

The Community's relatively favourable net oil import dependence derives from the unique position of the United Kingdom as a net exporter of oil. Figures related to all other Member States which are above the Community average have to be interpreted carefully, because they include imports from other EC-countries as well as from third countries. They however show that for many of these countries a further diversification of fuels in the overall energy mix remains essential.

<sup>1)</sup> importations from other Member States included

29. Before the recent fall in oil prices, the Commission's analysis (Energy 2000) (1) showed that a significant rise in total oil consumption between now and the end of the century was unlikely. But, in 1986, because of the fall in the \$ price of oil and the depreciation of the US\$ against European currencies, the average price paid for crude oil in the EC was over 60% lower than in 1985. Against this new background the Commission staff presented at the end of 1986 a preliminary re-examination of the energy outlook to 1995(2), suggesting that the previous trend of static or falling oil consumption could well be reversed if oil prices remained low, depending on the rate of growth in oil demand for transport and on the competitiveness of natural gas. This analysis concluded that oil's share in gross energy consumption could lie closer to 45% than the 40% stated in the 1995 objectives.
30. Current projections, including a recent run of the Commission's MEDEE model, show the following figures

Share of oil in the Community's gross energy consumption in 1995

Energy 2000 adjusted to EUR 12	Submissions from Member States	Latest Commission estimate
42%	43%	42-45%

31. Oil industry forecasts tend to put both the absolute level of oil demand in 1995 and oil's share in the energy balance at a lower level than these figures imply. Ongoing work by the Commission staff also suggests that the volume of oil demand in 1995 may now be rather lower than thought likely a year ago and that the share of oil in total demand could also be closer to the bottom than to the top end of the range, although still above 40%.
32. The main reasons for this judgement are two-fold. Economic growth expectations for the near future have had to be scaled down already from 2.6% per year to 2.2% for 1987 and 2.3% for 1988. The most recent developments at the world's financial and stock markets suggest great uncertainty about the short and medium-term economic climate which could mean some further scaling down of growth forecasts. Secondly, the gas industry has managed to regain quicker than expected its competitive position vis-à-vis oil and now seems unlikely to lose market share. Oil and energy prices on the other hand could well stay low for some time to come. There is a growing body of opinion that the present price of around \$18 per barrel could be unsustainably high in the short to medium-term given low demand expectations world-wide and a more optimistic world energy picture. If this proves to be true, there could be some important implications for energy efficiency trends.

(1) SEC (85) 324 of 25.2.1985

(2) Room document for High Level Energy Group on 12.11.1986.

33. Bearing all these factors in mind, therefore, it is now expected that the share of oil consumption in 1995 could lie closer to the 40% objective than previous Commission projections have indicated. This view is not however a justification for complacency because of the unstable economic situation and the volatility of the oil market, future oil consumption trends need to be monitored quite closely so that appropriate countermeasures can be proposed if adverse developments happen.

As long as the price of other fuels remains competitive the Community should be in a position to nearly achieve its 1995 oil consumption objective.

34. With an oil consumption share of 40% or slightly higher it should be possible to maintain the present level of the Community's net oil import dependence of 33%. The correctness of this conclusion will to a large degree depend on the Community's indigenous oil production in 1995. However at present it seems that the working hypothesis adopted earlier putting the level of oil production in 1995 not above 100 mtoe may have been too pessimistic. At present oil prices it seems unrealistic to believe that the Community's oil production could be reduced in the next seven years by one third. Recent re-evaluations of the North Sea's reserve potential, together with the rate of new finds, seem to confirm that a drastic production decline to 100 mtoe is not likely to happen unless prices fall drastically from their present level and a new climate of uncertainty is created.

The Community's net oil import dependence in 1995 should be in the range of 32-34% of gross energy consumption provided that investment in the North Sea is maintained at currently planned levels.

### Natural Gas

#### 1995 Objective

To maintain the share of natural gas in the energy balance on the basis of a policy aimed at ensuring stable and diversified supplies.



36. At the end of 1986, the Commission issued a Communication to the Council on Natural Gas (COM(86) 518 final), analysing natural gas demand and supply and security of supply to the turn of the century and beyond. The analysis and recommendations contained in the Communication remain valid but will not be repeated here except to update information in the light of this review exercise. The Council conclusions on natural gas of 2nd June 1987 are of particular significance in the present context.
37. Demand for natural gas in the Community grew by 26 Mtoe since 1982 and by 71 Mtoe since 1973. Even in 1986, when falling oil prices put natural gas in a difficult competitive position, this rising trend of natural gas consumption was not stopped. The share of natural gas in the Community's energy balance increased slightly from 16% in 1982 to 17% in 1986. The share of natural gas in gross energy consumption varies widely among Member States.

Share of natural gas in gross energy consumption  
1986

P	HE	ESP	DK	L	F	B	IRL	D	EUR 12	I	UK	NL
0	0	3	6	10	12	14	15	15	17	21	23	44

Between 1982 and 1986 substantial changes concerning gas consumption happened in Denmark where the share of natural gas in gross energy consumption increased from zero to 6% and in Italy where the market share increased by 4%. In Ireland the share decreased from 20% to 15% in 1986.

38. In the period 1973 to 1986, the increase in inland natural gas consumption was most significant in the residential and commercial sector where consumption more than doubled. Increases were also apparent in the industrial sector and for non-energy use, but in these sectors growth rates were lower. Gas consumption for electricity generation fell below the 1973 level. The following tables show the trends of inland natural gas consumption since 1973 and the share of natural gas in the final consumption sectors.

inland natural gas consumption 1973 = 100	1982	1986
non energy consumption	197	193
power stations	87	93
industry	110	119
residential and commercial	209	260
others	69	107
Total Mtoe	(160.3)	(186.8)

share of principal sectors in inland gas consumption	1973	1982	1986
non energy consumption	5%	7%	6%
power stations	20%	13%	12%
industry	36%	29%	27%
residential and commercial	31%	47%	50%
others	8%	4%	5%

39. Indigenous production of natural gas increased by 7% since 1982 and is at present running at more than 124 Mtoe p.a. Because natural gas consumption is growing faster than indigenous production, net natural gas imports as a percentage of total natural gas consumption increased to about 34% in 1986 (29% in 1982). Despite this rise in import dependence, the June 1987 Energy Council was still able to conclude that the Community's security of supply outlook had improved considerably since 1982 because:
- expectations of future imports are now lower than they were,
  - underground storage will exceed earlier estimates by 20% in 1990 and
  - a sufficiently diversified supply structure exists until at least the turn of the century.
40. In 1986 the main third country suppliers to the Community were Norway, the Soviet Union and Algeria with 34%, 39%, 26% of external supplies respectively. Having concluded new natural gas sales contracts with four Community countries in 1986 Norway's role as a Community supplier of significance is assured well into the next century. This external supply structure will not change significantly up to 1995.
41. In the face of competitive disadvantage caused by the fall in oil prices during 1986, particularly in the industrial sector, gas companies in many countries were quick to adapt natural gas consumer prices. As a result, natural gas markets were to a large extent successfully defended. In the first half of 1987, natural gas had, by and large, regained its competitive position vis-à-vis oil products. The indications are that natural gas consumption in 1987 has shown a substantial increase over 1986, partly due to this regained competitiveness but helped also by considerably colder weather in the early part of the year.
42. Natural gas consumption for power generation appears to have increased during 1987 and, by the end of the year, could be more than 10% higher than in 1986. Between 1982 and 1986 gas use for power generation increased in only four Member States, DK, I, NL and UK. In the case of Denmark and Italy this increase is mainly a result of delays in the extension of the internal gas supply system. The policy question of using natural gas in power stations will be examined under "Electricity" (see paragraph 60).

43. As concluded by the Energy Council in June 1987, forecasts from Member States show that the present share of natural gas in the Community's energy balance should be more or less maintained to 1995.
44. The Commission's projected energy balances for 1995 confirm these forecasts from Member States. Projections currently available to the year 1995 show the following percentages concerning the share of natural gas in the Community's gross energy consumption (1986 = 17%).

Share of natural gas in gross energy consumption  
1995

Energy 2000 adjusted to EUR 12	Submissions from Member States	Latest Commission estimate
17%	18%	16 - 17%

Forecasts from Member States to the year 2000 suggest that the market share of natural gas should be more or less maintained around the present level. However, there are those who expect natural gas to increase its share of energy demand in the years to come due, among other reasons, to the plentiful supplies which are available to the Community.

45. Developments in 1987 and recent short-term forecasts for 1988 indicate that demand for natural gas could increase somewhat more sharply than previously anticipated. Much will depend on developments in the industry and power generation sectors. It is unlikely, however, that increases in natural gas demand will be such as to substantially alter the market share of natural gas in the period under review.

The share of natural gas in the Community's energy balance should be maintained up to 1995. Recent developments have further contributed to ensuring stable and diversified supplies.

Solid Fuels

46. The 1995 objectives on solid fuels cover two goals. First to increase the share of consumption and secondly to improve the competitiveness of solid fuels production in the Community.

1995 Objective

The share of solid fuels in energy consumption should be increased

Within the Community's energy policy solid fuels make an important contribution to diversifying energy supplies and reducing oil consumption. Since 1973, however, no success has been achieved in increasing the overall consumption of solid fuels. In comparison with 1982 consumption of solid fuels has even decreased slightly to 232 Mtoe in 1986. The share of solid fuels in gross energy consumption fell from 24% in 1982 to 22% in 1986.

Share of solid fuels in gross energy consumption

%

	B	D	DK	ESP	F	HE	I	IRL	L	NL	P	UK	EUR-12
1982	25	32	33	26	16	24	10	22	46	8	3	33	24
1986	19	29	37	25	10	33	10	31	42	9	10	32	22

47. In fact solid fuels consumption increased substantially only in the power station sector, where in 1986 some 60% of all solid fuels were used in the Community. Deliveries to coking plants decreased regularly since 1973 and in the near future no change in this trend can be expected because of the depressed situation in the Community's steel industry. Apart from these two major consumption sectors, demand in other industries and in the domestic sector decreased drastically after 1973 and then increased in other industries in the 1982/86 period. Consumption trends by sectors can be seen from the following tables:

inland solid fuels consumption 1973 = 100	1982	1986
power stations	137	138
coking plants	79	72
steel industry	60	64
other industry	100	122
domestic sector	55	53
others	64	50
Total Mtoe	(234.5)	(231.7)

share of principal sectors % in inland solid fuels consumption	1973	1982	1986
power stations	45	61	62
coking plants	33	26	24
domestic sector and others	22	13	14

48. From these developments it can be seen that Community efforts to stimulate solid fuels consumption have so far only been achieved in the power station sector and in other industries than steel. The two Council recommendations of 24 May 1983 concerning the encouragement of investments for the utilisation of solid fuels in industry (COM83/250/CEE) and in public buildings and district heating (COM83/251/CEE) have so far not been followed in an appropriate way by all Member States and have therefore only been of marginal effect at Community level. However in those cases, like in France, where specific promotional programmes have been developed, the results obtained have been very positive. A more detailed communication concerning the application of these two recommendations and its results will be sent in parallel to the Council. At present it can be concluded, that although all Member States agree on the need to increase the share of solid fuels in the Community's overall energy consumption, this desirable development has so far not happened.
49. Whether such an increase will happen between now and 1995, despite that being foreseen by Member States submissions, is a subject of uncertainty. Coal consumption forecasts in the past have tended to overestimate its growth potential. According to scenarios analysed by the Commission the share of solid fuels in gross energy consumption (1986=22%) could develop up to 1995 as follows:

<u>Share of solid fuels in gross energy consumption</u>		
1995		
<u>Energy 2000 adjusted to EUR 12</u>	<u>Submission from Member States</u>	<u>Latest Commission estimate</u>
24%	23%	21-23%

50. A major determinant in this context will be the development of electricity demand up to 1995. Coking coal consumption is not likely to increase in the steel sector and solid fuels demand in the industrial and domestic heat market will be under strong competition from oil and gas. Stricter environmental legislation, as already partly imposed by Member States and proposed by the Commission, may also turn out to reduce the prospects for solid fuels although this effect may be partially compensated by the ongoing R, D&D efforts to develop more efficient and environment-friendly technologies in the field of solid fuels utilisation. Furthermore too optimistic consumption projections, coupled with possible indigenous production capacity reductions, might result in substantial new needs for solid fuel imports of which the price impacts on the world coal market are difficult to assess at present.

51. All these elements of uncertainty make it indispensable to monitor closely future consumption trends in the various sectors, especially in electricity generation. Further national and/or Community measures may prove necessary to assure the achievement of this energy objective. In this context new approaches to encourage coal consumption and efforts to further reduce the environmental disadvantages of coal use could be of special importance.

Strong elements of uncertainty exist concerning the development of the future market share of solid fuels and at present it cannot be excluded that the Community will fail to meet its objective of increasing the share of solid fuels in energy consumption by 1995. New national and/or Community measures may become necessary to ensure the achievement of this objective.

#### 1995 Objective

To pursue efforts to promote consumption of solid fuels and improve the competitiveness of their production capacities in the Community.

52. As already mentioned the promotion of solid fuels consumption by Member States as far as industry, public buildings and district heating is concerned, will be the subject of a separate Communication to the Council. In the past Commission proposals have only been partly accepted by the Council. Apart from what is already done in the frame of the ECSC Treaty a specific proposal providing for Community financial aid in the form of interest rate subsidies for certain investments in the rational use of energy, that would have led to increased use of solid fuels, was not adopted by the Council.
53. With plentiful coal supplies on the world market and continuing downward pressure on coal prices, financial support for the Community's coal producing industry has increased, although annual production decreased between 1982 and 1986 by 17 Mtoe. The Community's lignite production is, in general, working under economic conditions. But at least for the near future it will be necessary to provide national aids to the coal industry to continue the current major restructuring programme. Commission Decision N° 2064/86/ECSC<sup>(1)</sup> sets out the Community rules for state aids and other measures to the coal industry up to the end of 1993.

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(1) OJ N° L 177, 1.7.1986

54. Sales revenues therefore continue to be lower than hard coal production costs in the Community resulting in losses that are being covered by national aids. State aids and other measures granted for current production in four Member States (B, D, F, UK) increased from 3 000 MECU in 1982 to about 4 433 MECU in 1986. The amount of aid per ton of production increased from 12 to 21 ECU. Furthermore aid not relating to current production increased from 5 500 MECU in 1982 to 7 300 MECU in 1986 (B, D, F, UK - Esp not yet included in the calculations).
55. Although productivity in coal mining has increased substantially since 1982 in the Community this sector remains extremely vulnerable to world energy market developments. With falling world oil and coal prices the total aid for current production to be paid by the four Member States rose by 41% between 1985 and 1986. The Community average aid per tonne rose by 34%. Despite further restructuring efforts and productivity gains the future competitive position will be, to a very large degree, depend on world energy price developments and on the development of the US\$ exchange rate vis-à-vis EEC currencies.

Despite the substantial restructuring efforts already undertaken by the Community's coal producing industries further improvements of their competitiveness will remain to a large degree influenced by world energy market developments.

#### Electricity

##### Objective 1995:

The proportion of electricity generated from hydrocarbons should be reduced to less than 15% in 1995

56. The electricity sector has been one of the key vectors of change in the European Community's energy economy since 1973. In line with the Community's past energy policy objectives solid fuels and nuclear power replaced hydrocarbons as input for electricity generation in the Community. In a spectacular fashion the share of hydrocarbons in electricity generation dropped from about 42% in 1973 to 24% in 1982 and to only 16% in 1986. The Community objective for 1995 has thus already nearly been met in 1986 and this despite falling oil prices giving some incentives to use oil and gas in electricity generation.

57. This trend of a falling hydrocarbons share in electricity generation is expected to continue due to the fact that both nuclear energy and solid fuels will still increase their respective shares of electricity production. The balance between nuclear energy and solid fuels for electricity production differs widely between Member States. However at Community level both energies play a key rôle. In 1986, 37% of fuel input for electricity generation was of nuclear origin and 42% was based on solid fuels. The degree of continuity in the falling hydrocarbons share will depend on the future growth of electricity demand having a closer relationship with economic growth than other fuels. The accident at Chernobyl, together with falling oil prices, may influence adversely these positive past trends. Furthermore, the environmental dimension of the use of fossil fuels constitutes an increasingly important element<sup>1</sup>. However, according to present information, no drastic changes of trends or supply difficulties are foreseen up to the year 1995. Because of the long lead times in the electricity sector decisions taken today or over the next few years will hardly affect the picture in the timescale of the existing objectives. For the period after 1995 and up to 2010 the Commission staff is at present working on a study on different electricity generation scenarios to identify future possible problems and developments for fuel use, electricity costs and for the environment. This analytical study, when finalized in 1988, will be discussed with Member States.
58. According to presently available projections the share of electricity generated from hydrocarbons in 1995 should be as follows:

Share of electricity generated from hydrocarbons (2)

Energy 2000 adjusted to EUR 12	Submissions from Member States	Latest Commission forecast
9%	14%	9-13.5%

These figures are in line with the electricity industry's own projections referring to a share of hydrocarbons in 1995 of about 10%.

59. This positive past and expected future development was to a certain extent influenced by the two 1975 Council Directives, limiting the use of petroleum products<sup>(3)</sup> and natural gas<sup>(4)</sup> in power stations. In the past these two Directives have proved effective, to the extent that no new, large, solely oil or gas burning power stations were authorised to be constructed after 1975.

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(1) Nuclear energy does not contribute to air pollution, which is linked to the combustion process.  
 (2) Excluding coke oven gas and blast furnace derived from coal.  
 (3) Directive 75/404/EEC (O.J. L 178/26 of 9.7.1975)  
 (4) Directive 75/405/EEC (O.J. L 178/24 of 9.7.1975)



60. On various occasions the Commission has been requested to reappraise Council Directive 75/405/EEC concerning the use of natural gas in power stations. At present the use of gas for electricity generation is only of limited importance for the Community as such (6% of fuel input). However this situation varies widely among Member States with percentages of electricity generation input of 59% in the Netherlands, 23% in Ireland and 15% in Italy. Already at the June Energy Council in 1987 the Commission has indicated its willingness to look into the usefulness of launching a study on the use of natural gas in power stations. Such a study, to be launched in 1988, will follow a rather broad approach covering not only supply aspects, technical developments, security and cost implications but also environmental benefits.

The proportion of electricity generated from hydrocarbons amounted to 16% in 1986 and should be reduced below 15% in 1995, thus achieving the 1995 electricity objective.

#### Renewable Energies

##### 1995 objective

The output from new and renewable energy sources in place of conventional fuels should be substantially increased, thereby enabling them to make a significant contribution to the energy balance.

61. In its Communication on the development of renewable energy sources (COM(86)12 final) the Commission has quantified the contribution from renewable energy sources in 1985 being in the order of 15 Mtoe. Some 85% of these renewables come from hydroelectric<sup>(1)</sup> installations. However, as the data available on present renewable energies use is neither complete nor uniform, some statistical errors concerning these data cannot be excluded. A meaningful measurement concerning the present and future contribution from renewables will only be possible with a coherent and harmonized statistical Community approach.
62. While the theoretical energy contribution potential of renewable energies is considerable, the realistic exploitable potential by the year 2000 was estimated to be in the range of 42-52 Mtoe, representing the equivalent of 5% of the Community's energy demand. However these first projections were made in 1985 before the dramatic fall of oil prices and since then the economic conditions and the competitiveness of renewables have deteriorated.

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(1) Hydroelectricity measured in electricity equivalent.

63. Concerning the short-term realizable contribution potential up to 1995, a more realistic attitude has developed in the meantime not focussing on certain quantified market shares but stressing the necessity of longranging R,D&D efforts and political commitments by the Community and its Member States to continue the development of renewables, irrespective of energy price fluctuations. It is in this perspective that the Council has adopted the Resolution on a Community orientation to develop renewable energy sources<sup>(1)</sup> and a common orientation concerning a Recommendation on the development and exploitation of renewable energies in the Community<sup>(2)</sup>.
64. Renewable energy development must therefore be continued with effective measures on a substantial scale. It is estimated that up to 1987 substantial public funds have been invested in renewable energy development within the Community and its Member States, amounting to more than one billion ECU. The Community's non-nuclear R&D and energy demonstration program have contributed substantially to these financial efforts. Up to 1995 it is of prime importance to ensure the continuity of efforts in research, development and marketing of renewable energies and the energy demonstration programme. It is also important in this context to promote specific measures to develop the exploitation of renewable energies.

Irrespective of the quantitative contribution of renewable energies by 1995 continued efforts should be maintained to develop these renewable energy sources.

### III Intersectoral Developments (Horizontal Energy Objectives)

#### Security of Supply

##### 1995 objective

More secure conditions of supply and reduced risks of sudden fluctuations in energy prices.

65. The adequate and secure availability of energy on a satisfactory economic basis remains a prerequisite for the achievement of the Community's economic and social goals and continues to be the central objective of the Community's energy policy. To improve security of supply conditions some essential elements have been highlighted, like improvements concerning diversification of external supply sources and fuel mix, development of indigenous energy resources under economic conditions, effective crisis measures, etc. The following paragraphs do not analyse each of these elements in detail but attempt to provide an overview of past developments and prospects up to 1995.

(1) Resolution of 26 November 1986 (O.J. C 316 of 9.11.86)

(2) Result of the Energy council on 13.11.87 (Press release 9597/87)

66. Diversification between the different forms of energy has been regularly improved since 1973 by reducing the overriding importance of oil in the Community's demand structure. Overall developments are shown in paragraph 5. The share of external supplies concerning each type of fuel has developed as follows:

Share of net imports in inland energy demand per fuel:

	1973	1982	1986
Oil	100%	78%	75%
Solid fuels	9%	22%	26%
Gas	4%	29%	34%
Uranium	na	80%	70%

67. This development shows that the Community continues to have a high oil and uranium import dependence. However in the case of uranium imports this is not a major cause for concern as the present uranium market is characterized by excess production capacities and depressed prices. Uranium stocks at nuclear power plants are relatively high representing several years of fuel consumption and external Community uranium supplies are sufficiently diversified to cope with foreseeable supply interruptions. Bearing all these elements in mind nuclear energy is often quoted as an indigenous source of energy supply and not as an imported energy being vulnerable to short-term supply disruptions. This assessment should not drastically change up to 1995.
68. The share of net oil imports in inland oil consumption of 75% in 1986 could according to submissions from Member States rise to more than 80% by 1995. Furthermore Community oil supplies will be increasingly dependent on Middle East supply sources where political instability is a continuing concern. These prospects up to 1995 show again how important in security of supply terms it is to follow a policy line guaranteeing the achievement of the Community's sectoral 1995 oil objectives.

69. The communication on Natural Gas (COM (86) 518 final) confirmed that the Community's supply needs are by and large covered to the period 1995/2000 and moreover supplies are sufficiently diversified. In addition existing and planned security measures are adequate to cope with foreseeable supply interruptions. The same judgement can be made with regard to solid fuels. Although the share of solid fuels imports in internal consumption has increased since 1973 quite substantially these imports are coming from non-OPEC countries and suffering at present from production overcapacities and depressed world market prices. In 1986 the Community's main solid fuels suppliers have been, by ranking of importance, the USA, South Africa, Australia, Poland, Canada and the USSR. In addition to these traditional coal suppliers new coal exporters, such as China, are fighting for Community market shares.
70. This overall assessment highlights that effective crisis measures, particularly in the oil sector, need to be in place. Present minimum compulsory oil stock levels reaching 90 days of the previous years consumption are based on Directive 68/1414/EEC as amended by Directive 72/425/EEC. Because a directive was the chosen form for putting this stocking obligation in place, national legislation differs from Member State to Member State.
71. In recent years there has been growing recognition of the importance of security oil stocks and the Commission has expressed concern about the quality of parts of these stocks. Earlier recommendations that all Member States should adopt a central government or entity stock to cover at least part of the compulsory stock obligation were not favourably received by Member States at that time (1977). Progressively, since then however, improvements have been made in some Member States. Whereas in the past security oil stocks were considered as a measure of last resort, it is now felt, in the light of the 1979/1980 oil crisis, that stocks could be used at an early stage in the development of a crisis to avoid unjustified price rises.

Although individual national procedures still differ, almost all Member States consider themselves to be capable of cooperating on early stock use on an international basis should such action be considered necessary in the light of the circumstances at the time.

Certain complications still exist regarding the holding of stocks in one country for the credit of another. The Commission is actively involved in working with Member States to find simple and effective solutions to problems in this area. The binding compulsory oil stock levels were maintained in the past by all Member States.

72. The geographical diversification of the Community's external sources of energy supply depends, except in cases of long-term supply contracts (eg. for gas), on world market developments and quite substantial changes can occur from year to year. At present all major external supply sources are used to cover the Community demand and no undue supply overdependence can be identified at present.
73. Inter-fuel flexibility of energy systems continue to be important for reducing vulnerability to supply interruptions and "price shocks" and facilitate genuine competition between fuels. In the past investments have been made in the Community to increase short-term flexibility in the choice of fuel to be used. Especially in industry and power stations multifiring boiler systems were installed improving the flexibility of energy demand. This development should be continued and, if possible, expanded up to 1995. The link up of supply networks contributing to the flexibility of energy systems will be a separate subject in the Commission's internal energy market analysis.

#### Energy Pricing

##### 1995 objective

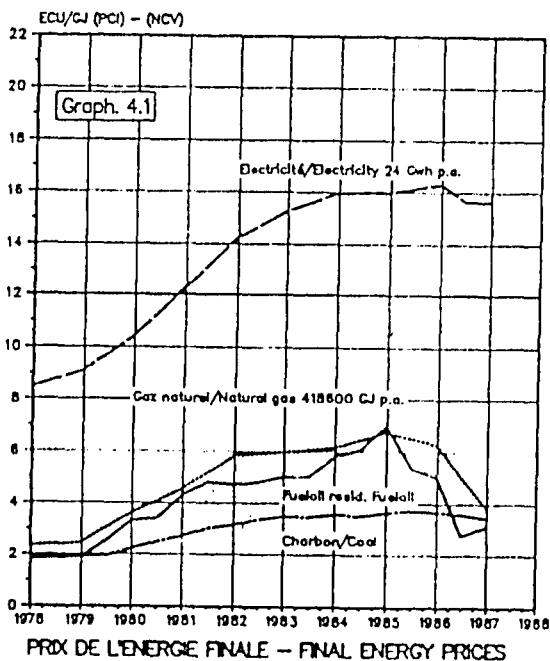
The application, in all consumption sectors and to all forms of energy, of Community energy price formation principles approved by the Council <sup>1</sup>.

74. The Commission had examined the application of the Community's energy pricing principles in Member States and had discussed this with the Council on the basis of COM(84)/490 final.
75. While in general terms one could conclude that there was still broad agreement in each Member State on the application of the general principles as set out in the various recommendations the practical implementation of these generally accepted principles was however such as to suggest some considerable divergencies in interpretation, particularly amongst the different utilities. Evidence of this was demonstrated by the number of formal and informal complaints the Commission services received in respect of large industrial users. Unfortunately, because of lack of transparency in the pricing or tariff arrangements for this category of users, the Commission services are not in a position to comment on the general application of the principles for this category. In the pricing paper currently being prepared for submission to the Council it will be seen that the level of transparency for small and medium enterprises for the different fuels across the Member States is adequate, but the situation is not so for the larger category of users particularly in the gas sector in certain Member States.

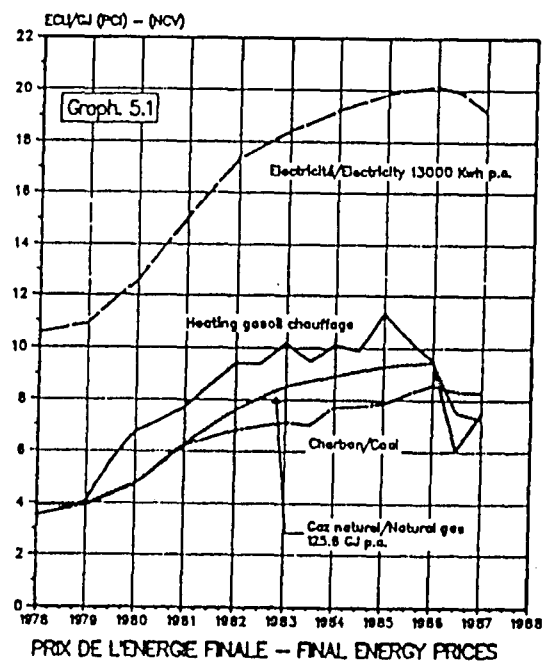
(1) Previous references: Council Recommendation of 27 October 1981 on electricity tariff structures in the Community (81/924/CEE, etc.).

76. In a trading community, it is, of course, important to remove any real or perceived barriers to trade in the interest of better overall economic performance. This requirement is particularly relevant in the context of the Community's actions on the internal market. As indicated in the earlier communication, to the extent that there are or are believed to be artificial factors offering competitive advantages, the environment within which trading occurs will be made more difficult by continual suspicion that competitors are benefitting from artificial pricing advantages.
77. Regrettably, the situation for price transparency has not improved in the intervening period and indeed there is some evidence of a deterioration in the level of transparency in certain cases.
78. The two graphs below show the trends in industrial (excluding large industrial users) and domestic fuel sectors over the period 1978-1987. In the earlier period, particularly between 1980-1982, the impact of the second oil shock may be observed. The upward pressure on prices in the subsequent period to 1986 is due largely to the influence of the exchange rate for the US dollar and to domestic cost increase factors. The decline since 1986 is due to two factors, the fall in the world price for oil and the devaluation of the US dollar; both of these factors working in the same direction and resulting in a substantial fall in the price of gas and oil products.

#### SECTEUR INDUSTRIEL (hors tva) (moyenne des prix communautaires)



#### SECTEUR DOMESTIQUE (taxes incl) (moyenne des prix communautaires)



79. Regrettably, this information is incomplete because of the lack of information on sales to large industrial users. Agreement to complete this information is an important element in achieving better transparency within the context of the internal market and improving the competitive position of European industry.

Energy and Environment

1995 objective

A search for balanced solutions as regards energy and the environment, by making use of the best available and economically justified technologies and by improving energy efficiency, as well as taking into account of the desire to limit distortions of competition in the energy markets by a more coordinated approach in environmental affairs in the Community.

80. Energy production is heavily dependent on the use of fossil fuels and thus energy policy is inevitably concerned by atmospheric pollution issues. There are also environmental issues relating to nuclear power, such as waste disposal. Environmental requirements in turn affect energy costs and the competitive position of various energy sources. To judge the precise extent of these effects on the various fields specific studies need to be undertaken. The balanced pursuit of environmental and energy policy objectives is therefore of special importance, as stated in the Community's 1995 energy objectives. The report Nordmann (Document AZ-0253/87) of the European Parliament on coal and environment emphasizes the need of a global approach which takes account of the technical, economic, environmental and social aspects of the problem.
81. Reductions in polluting emissions from all major sources at a reasonable cost is a central objective of the Community's environmental policy. Reductions of emissions - SO<sub>2</sub>, NO<sub>x</sub> and dust - from fossil fuel power stations are of special importance to combat acid deposition. Since 1980 total SO<sub>2</sub> emissions in the Community are decreasing although efforts undertaken in Member States vary widely. The rapid adoption of the draft directive on large combustion installations (COM (83) 704 final) would further improve this positive trend. Air pollution is a major concern in relation to fossil fuel burning but it is important to consider all the multi-media pollution aspects of the problem and try to avoid transfer of pollution that might arise from the adoption of partial measures.
82. NO<sub>x</sub> emissions are not following the same trend as in the case of SO<sub>2</sub> emissions mainly due to the ever growing energy consumption in the transport sector. However first substantial reductions should become apparent after the entering into force of the Community's new car emission standards.
83. Over the 1973-1986 period the following specific energy related environmental measures have been taken on a Community basis to reduce air pollution:
- Air quality limit values and guide values for sulphur dioxides and suspended particulates (Directive 80/779/EEC);
  - Air quality standards for nitrogen dioxide (Directive 85/203/EEC);
  - Standards relating to the sulphur content of certain liquid fuels - gas oils (Directive 75/716EEC as amended by Directive 87/219/EEC);

- Standards concerning the lead content of petrol (Directives 78/611/EEC, 85/210/EEC, 87/416/EEC);
  - Disposal of waste oils (Directives 75/439/EEC and 87/101/EEC);
  - Various directives relating to measures against air pollution by gases from positive ignition and diesel engines.
  - Combatting of air pollution from industrial plants (Directive 84/360/EEC).
84. The Community will continue to submit such specific environmental proposals having direct impacts on the energy sector as laid down in the Community's fourth environmental action programme. However energy policy measures can directly support the Community's agreed environmental policy objectives. Improvements in energy efficiency and the further development of non-fossil energy sources, including nuclear energy and renewable energies, will be of specific importance in this context. To give further support to the environment those measures to improve energy efficiency might be identified and promoted having the greatest positive effects for the environment.
85. Best available technologies to avoid air pollution not entailing excessive costs need to be used in the energy sector as laid down by Directive 84/360/EEC on the combatting of air pollution from industrial plants. Such emission reduction technologies are at present partly supported by the Community's energy R, D&D programmes. In 1988 a detailed evaluation of the Community's energy demonstration programme will take place showing to what extent the demonstration of such new technologies has been successful, including from the environmental point of view.
86. Although the Commission has already undertaken substantial efforts to implement coordinated and harmonized approaches concerning environmental policy national legislation still differs widely among Member States. A first study on the refining sector has been undertaken to evaluate how far this differing environmental legislation is affecting production costs of the energy industries. In this context, it is obvious that environmental costs are only one cost element in refining besides others. However, the Single Act foresees in its environmental regulations that Member States can adopt more stringent national legislation than the Community rules, if this turns out to be necessary. Different legislation in the Community Member States in the environmental sector can therefore not be excluded totally.

#### Energy and Regional Policy

##### 1995 objective

**33**

The implementation, in appropriate frameworks, for those regions which are less-favoured, including those less-favoured from the point of view of energy infrastructure, of measures designed to improve the Community's energy balance;

87. The realisation of this objectif fits into the actions destined to reinforce the economic and social cohesion of the Community as envisaged in the Single European Act.



88. The Valoren Programme which was agreed on by the Council in 1986 with a budget of 392.8 MECU from the Regional Fund is an important contribution to this objective.

The funds available under the Valoren Programme are destined for the priority regions whose structural development is not as advanced as in other Community regions. The Commission, in its overall proposals for the reform of the structural funds recommends that a large part of the overall amount available should be concentrated on the less developed regions with the aim of helping them to improve the development.

89. The Commission continues to believe that the regional framework is the optimal geographic dimension for an energy programme on a European scale as well as an important link in the energy chain. The regional energy planning efforts pursued by the Commission in the period 1982 - 1987 confirms that view. During the period in question around 6.6 MECUs were allocated to projects in 30 regions of the Community.

#### External Energy Relations

##### 1995 objective

The development of the Community's external relations in the energy sector by virtue of a coordinated approach in particular on the basis of regular consultations between Member States and the Commission.

90. The fact that the EC will increasingly become dependent on external sources of energy supply highlights the vital role that improved relations with third countries, i.e. both producers and consumers, will play. It has been recognised that a coordinated approach by the Community and its Member States maximises the effectiveness of EC actions in the international arena by bringing the influence of the Community to bear. On the few occasions where a properly coordinated approach has been pursued the results have been very encouraging (i.e. Oil Product Trade). However such occasions have been rare and much more needs to be done if there is to be a real improvement in the development of a coordinated Community approach.

91. A first step in developing a more coordinated approach would be for the regular exchange of information between the Commission and Member States on the outcome of energy contacts with third countries. It should be a regular feature of meetings of the Energy Working Group, High Level Energy Group and/or Council as appropriate that the Commission and/or Member States give a report on all energy contacts with third countries. A second step in the progress towards a more coordinated approach to external relations would be to increase the opportunities for developing a Community line. For example where important contacts with third countries are envisaged, either on a bilateral or multilateral basis, coordination meetings could be held beforehand to see what common issues of interest to the Member States and Community could be pursued.
  
92. As in the past the Commission will, for its part, continue to report on its energy contacts with third countries. Coordination meetings will where appropriate continue to hold, before important multilateral meetings. Insofar as relations with developing countries and oil producers are concerned the Commission will also continue to identify areas where joint actions with Member States are possible as well as ensuring that Member States are kept informed of ongoing developments.

## SUMMARIZED ENERGY BALANCE - EUR-12

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	1029.22	990.37	1056.29	1073.53	1121.4	1160.6
-BUNKERS	40.77	26.66	26.72	30.81	32.6	32.7
-INLAND CONSUMPTION	988.95	963.71	1029.57	1042.72	1088.8	1127.9
INLAND ENERGY CONSUMPTION	988.95	963.71	1029.57	1042.72	1088.6	1127.8
-SOLID FUELS	232.22	234.53	238.97	231.69	245.4	266.4
-OIL	606.55	482.43	462.81	474.26	473.3	468.0
-GAS	116.79	160.33	184.69	186.85	202.0	211.0
-PRIMARY ELECTRICITY ETC	33.39	86.42	143.10	149.92	168.0	182.4
INDIGENOUS PRODUCTION (1)	363.31	516.80	592.63	603.31	598.7	588.0
-HARD COAL	176.43	159.90	136.95	142.56	136.2	135.7
-LIGNITE & PEAT	28.50	36.24	35.64	33.87	41.0	41.8
-OIL	13.31	119.90	151.00	153.48	128.8	107.2
-NATURAL GAS	112.19	115.98	127.13	124.64	125.4	121.0
-NUCLEAR ENERGY	19.18	66.15	123.62	132.29	145.5	158.5
-HYDRO & GEOTHERMAL (2)	12.45	17.06	16.64	14.81	17.4	18.0
-OTHERS & RENEWABLES	1.25	1.57	1.65	1.66	4.5	5.7
NET IMPORTS (3)	669.50	476.38	456.75	479.88	522.0	572.7
-SOLID FUELS	21.45	51.22	62.36	60.52	68.3	89.0
-OIL	642.56	377.18	333.87	354.34	377.1	393.5
-NATURAL GAS	4.97	46.34	59.33	63.87	76.0	90.0
-ELECTRICITY (2)	0.52	1.64	1.19	1.15	0.6	0.2
STOCK CHANGES (4)	3.61	2.81	- 6.90	9.66	- 0.5	0.1
-SOLID FUELS	- 5.85	12.83	- 4.01	5.26	0.1	0.1
-OIL	9.08	- 12.01	- 4.66	2.74	- 0.6	
-GAS	0.38	1.99	1.77	1.66		
ELECTR. GENERATION INPUT	248.80	308.07	349.86	355.45	382.0	420.9
-SOLID FUELS (5)	111.67	147.81	145.82	148.96	160.0	185.9
-OIL	80.61	54.67	39.45	35.82	34.5	33.7
-NATURAL GAS	23.64	20.74	22.68	21.91	24.4	24.4
-NUCLEAR ENERGY	19.18	66.15	123.62	132.29	145.5	158.5
-HYDRO & GEOTHERMAL (2)	12.45	17.06	16.64	14.81	17.4	18.0
-OTHERS & RENEWABLES	1.25	1.64	1.65	1.66	0.2	0.3

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	4.8%	- 0.3%	2.0%	1.1%	0.7%	
GDP ANNUAL GROWTH RATE	4.9%	1.8%	2.2%	2.3%	2.4%	
IMPROVEMENT IN ENERGY INTENSITY		20.0%	2.4%	4%	9%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	62.8%	51.4%	46.3%	47.0%	45.1%	43.1%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	41.9%	24.5%	17.8%	16.2%	15.4%	13.8%
SUPPLY DEPENDANCE ON IMPORTS	65.0%	48.1%	43.2%	44.7%	46.5%	49.3%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES  
 FROM EXTERNAL SOURCES

- NOTES
1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
  2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
  3. THE (-) SIGN MEANS NET EXPORTS
  4. THE (-) SIGN MEANS A STOCK DECREASE
  5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

PART TWO- THE ENERGY POLICIES OF MEMBER STATES

1. The 1986 Resolution on new Community energy policy objectives for 1995 and convergence of the policies of Member States states that the commitment to Community objectives entails effective monitoring of national policies to verify the convergence of these policies in relation to Community objectives. Member States should continue efforts of comparable intensity, having regard to their own characteristics in the sphere of energy and in the light of their specific possibilities and constraints.
2. The specific reports on Member States energy policies that follow have been prepared with these points in mind. Especially account has been taken of the considerable variations between Member States.
3. The country reports draw heavily on quantitative and qualitative data submitted by Member States to the Commission during the period September 1987 to February 1988. The factual parts of the country reports have been checked with Member States and as far as possible comments offered have been taken into account. Because of the differing methodological approaches between EUROSTAT and national statistical offices some discrepancies remain in the presentation of data up to 1986. For 1990 and 1995 submission from Member States or other external estimates have been used. Where these future projections differ considerably from the Commission's own 1995 estimates this is highlighted. Statistical data transmitted by Member States have not reworked to conform to classifications of the Statistical office of the European Communities so that in some cases discrepancies can occur when directly comparing the 1995 and 1986 energy situation.
4. The policy conclusions of each country report have been prepared on the Commission's own responsibility and have not been subject to consultation with Member States.



9. The table shows that the share of coal has continued to decline, likewise the share of oil, despite the fall in oil prices. At the same time two new nuclear power stations (Doel 4 and Tihange 3) came on stream in 1986, so that the share of nuclear continues to rise.

Energy demand in 1986 was strongly influenced by events in the market. The sharp fall in oil prices in 1986 led to a fall off in demand for gas. This position was reversed in 1987 when gas prices had adjusted to that of oil. This temporary phenomenon accounted for part of the increased share of oil in total consumption.

#### Energy Policy Development

10. Since the fall in oil prices and the Chernobyl accident no important energy policy decisions have been taken and as a result the Belgian energy system continues to be influenced by the main policy actions of energy efficiency, the programme of redevelopment in the coal industry and the increased substitution of nuclear energy in the production of electricity.

Furthermore, on account of recent political developments no decision has yet been taken the construction of a new nuclear tranch at Doel, which had been postponed in the previous capital investment plan.

#### ENERGY FORECASTS TO 1995

11. The new projections for 1990 and 1995 take account of structural changes in two sectors:
- coal: domestic production will decline as the Limburg coalfield is restructured and imports rise;
  - oil: consumption in the transport sector is likely to increase by about 1 million toe by 1990 and 1.5 million toe by 1995.

As the percentages in the following table show, Belgian policy will continue in the medium term to follow the same broad directions as at present and will reflect the Community's new energy targets.

The forecasts for gross internal energy consumption (see table in the Annex) are as follows:

	%	
	<u>1990</u>	<u>1995</u>
Solid fuels	22.5	21.1
Oil	44.0	43.2
Gas	17.3	18.2
Primary electricity	16.0	17.3
New and renewable sources	0.2	0.2
	<u>100.0</u>	<u>100.0</u>

## HORIZONTAL DEVELOPMENTS

### Energy efficiency

12. Belgian energy efficiency efforts, which were already quite comprehensive, have been maintained since the last evaluation in 1984. Initiatives have been concentrated on the building and industrial sector, although some efforts have also been made to improve the energy efficiency of rail transport.

Energy intensity in Belgium improved by 29.5% during the period 1973-82 but increased by 2.1% during the period 1982-86.

13. The energy efficiency programme includes the following elements:
- tax reductions for retrofitting of buildings and energy efficiency investments in the residential sector,
  - a continuation of the European Energy Bus Programme for small and medium-sized enterprises,
  - investment in more energy-efficient rolling stock for Belgian railways,
  - improving the energy efficiency of public buildings,
  - information campaigns for both the public and for enterprises,
  - the imposition of energy efficiency standards through legislation.
14. The Belgian (energy efficiency) RD&D programme is aimed at supporting technologies which will be applicable in the short term. Spending has never been particularly high with a maximum allocation of 8.6 million ECU in 1984. RD&D spending for 1986 had dropped to 3.9 million ECU.
15. To sum up, Belgium had a comprehensive energy efficiency programme and made considerable improvements in energy efficiency during the period 1973-83.

In response to the new situation arising from lower energy prices and to the constraints of budget austerity, the Government has recently been moving towards an RUE policy in which, over and above a minimum of binding measures, emphasis is given to public information and education measures.

To inform and educate the public, special attention is given to the development of computerized and audiovisual media to supplement the written material already available (brochures, posters, videotext data bank, energy auditing).

Security of supply

16. In 1973 Belgium produced little energy and depended on imports for 94% of its needs. The dependency rate improved thereafter and in 1986 was down to 77.5%.
17. Belgium is entirely dependent on imports for its oil requirements, which it obtains from a range of sources (in 1986: 23% of imports were of Community origin and 77% from third countries of which 45% was from the Middle East, 23% from Eastern Europe and 29% from Africa). The use of oil in Belgium is increasingly restricted to specific uses and its share in power station generation was cut to 4.2% of all electricity generated in 1986.
18. Under Belgian law all compulsory oil stocks are held by the large and medium-sized oil companies operating on the Belgian market.
- A large proportion of stocks for Belgium is located in the Netherlands. In the absence of sufficiently extensive bilateral agreements, Belgium in the past was unable to enforce its claim to the entire amount of these stocks held abroad. Now that they are entirely accounted for as belonging to Belgium, the country's storage situation has substantially improved; and the Commission is working with the Member States to refine the bilateral agreements so that this improvement can be permanently maintained. The Belgian Government's attitude towards some degree of stock centralization is positive, but there are financial difficulties making it extremely difficult to achieve.
19. Belgium produces no natural gas itself. In 1986 its imports broke down as follows: 46% from the Netherlands, 34% from Algeria and 20% from the North Sea (Norway).
20. According to the long-term forecasts, the demand for natural gas in 1995 is likely to be around 8.8 million toe, which will be met by Belgium's three traditional suppliers, the Netherlands, Algeria and Norway. In the year 2000 their shares in natural gas imports are estimated at: Netherlands 34%, Algeria 44%, Norway 22%.

It should be noted that under the 1986 agreement on the long-term supply of Norwegian gas from the Sleipner and Troll fields to four Community countries, Belgium will receive from the mid-1990s onwards some 2 000 million m<sup>3</sup> per year, which will replace the supplies from Ekofisk and Statfjord and thus maintaining Norway's share in Belgium's gas supplies.



The new Zeepipe gas pipeline from the Sleipner and Troll gas fields to the Belgian port of Zeebrugge will further increase the security of gas supplies from Norway, which at present are delivered only to Emden in the Federal Republic of Germany.

21. In 1986 Belgium's coal production amounted to 3.85 million toe, 12% lower than in 1985 and marking a 6.7% average yearly fall since 1982. This output covers just under half of the country's coal requirements. Imports come from several sources, 20% from Community countries and 80% from third countries of which United States 55%, South Africa 31% and Poland 6%.

Under the restructuring plan, domestic coal output will in the medium term meet only 21% of forecast requirements, which will be slightly up on 1986. Imports will therefore substantially increase.

22. The increase in the share of nuclear energy has reduced Belgium's overall dependence on imported energy and improved the security of electricity generation.

#### Energy and Environment

23. The Belgian Government has enacted very strict environmental measures in the form of Royal Decrees. These include the fixing of emission limit values<sup>1</sup> for new combustion plant with a rated thermal output of 50 MW or more, fixing air quality standards for nitrogen dioxide,<sup>2</sup> reducing the lead content of fuels from 0.4 to 0.15 g/l<sup>3</sup> and the marketing of unleaded petrol from 1 October 1989.
24. From 1970 to 1980 the average reduction in sulphur emissions (from the use of diesel oil and residual fuel oils) was about 32%. A further Royal Decree on specifications for these products will soon be promulgated, reducing the number of different fuel types.
25. As regards the use of alternative fuels, a committee for adaptation to technical progress has been set up at the Institut belge du pétrole (Belgian oil institute) in order to maintain closer scrutiny of fuel additives.

<sup>1</sup>Royal Decree of 18 August 1986 (Moniteur belge, 3.12.86).

<sup>2</sup>Royal Decree of 1 July 1986 (Moniteur belge, 23.9.86).

<sup>3</sup>Royal Decree of 8 July 1985.

SECTORAL DEVELOPMENTSOil

26. Gross internal oil consumption in 1986 was around 22.2 million toe, about 10% up on 1985. The increase is due to the revived competitiveness of oil products against competing sources (especially natural gas), a colder winter and a rising consumption of motor fuels (up by 10% in 1986).
27. In 1986 the rate of utilization of refinery capacity, which had fallen steadily since 1973, improved to 79.5%, owing partly to the continued rationalization of primary distillation capacities and partly to an optimization of cracking and reforming units in a more advantageous supply situation.

Natural gas

28. Sales of natural gas in Belgium declined by about 7.9% in 1986 (down by 12.5% in industry, 3.9% in the residential sector and 13.1% for non-energy uses). This decline was due to the fall in oil prices during the year and to a shift from the use of gas in conventional power stations to coal and nuclear. This is something that merits particular attention so as to avoid harmful market consequences.

Solid fuels

29. Falling oil prices led to a reduction in the demand for coal in the residential sector of 23.5% and by industry of 37% in 1986.

There was a smaller drop in demand by coking plants and power stations.

Imports from other Community countries (down by 21.2%) and from non-Community countries (down by 13%) were affected for the same reason.

30. Restructuring of the Limburg coalfield.  
On 31 December 1986 the Belgian Government adopted the restructuring plan for 1987-96:

- (i) closure of all pits in the eastern part of the Campine area by 1990;
- (ii) merger of two pits in the western part of the Campine.

Implementation of the plan could be speeded up in view of the number of and redundancies that have been accepted (10,000).

Electricity

31. The programme for converting power stations to coal continued in 1986 with the completion of the 300 MW unit 5 at the Ruien station, to be followed in 1987 by the 280 MW unit 2 at Genk-Langerlo and approval in principle for the subsequent conversion of two other units (280 MW unit 4 at Rodenhuiize and 135 MW unit 2 at Amercoeur).
32. The electricity capital investment plan was recently updated at the request of the Government by the Management Committee of the Electricity Industry (CGEE). In this updating the assumption of an annual 2.5% per year growth in electricity demand over the period 1985-95 has been maintained, which was the rate already envisaged in the capital investment plan 1983-1993.

The CGEE updating exercise led to the following conclusions:

- 1990: probable entry into service of combined generation units totalling 35 MW,
- 1991: 25% participation (348 MW) in the Chooz B1 unit and probable 10 MW increase in combined generation,
- 1992: probable entry into service of a 105 MW fluidized bed unit and probable 10 MW increase in combined generation,
- 1993: 25% participation (348 MW) in Chooz B2 and probable 10 MW increase in combined production,
- 1994: entry into service of a 160 MW peak load unit using purified heavy fuel and probable 10 MW increase in combined generation,
- 1995: as early as possible, i.e. towards mid-1995, entry into service of the Doel 5 (or N8) 1390 MW unit with 100% power for the Belgian grid.

A study has been made of the consequences of replacing the Doel 5 unit by a denitrified and desulphurized 600 MW coal-fired station; entry into service by the beginning of 1995 could be planned.

33. The examination of the importance of the Chernobyl accident is completed but the conclusions have not yet been debated in plenary session in Parliament. This debate has not yet held or account of recent political events.

Renewable energy sources

34. Renewables are not yet making much contribution to the overall energy balance. However, the Government is supporting the development of these sources (e.g. biomass and mini hydro) and in June 1987 brought into service at the port of Zeebrugge 23 wind generators with a total capacity of 4.6 MW.

CONCLUSIONS

Belgium has continued to improve its energy situation over the review period by implementing its own policy goals being coherent with the 1995 Community energy objectives. Inland oil consumption reduced slightly between 1982 and 1986 and the share of oil in gross energy consumption fell from 50% to 47%. Gas consumption is stagnating and due to the dominant position of nuclear and solid fuels hydrocarbons are practically of no importance as fuel input for electricity generation.

However although energy efficiency policies have been strengthened substantially since the last review exercise and impressive improvements were recorded up to 1982 this progress has slowed down and even been turned into disimprovements up to end of 1986. Budgetary allocations for energy efficiency should not be cut in a way to allow a continuation of this negative trend.

Other areas where important issues arise are:

- (i) The restructuring of indigenous coal production where capacities are to be scaled down. In general inland consumption of solid fuels is decreasing and its market share fell substantially between 1982 and 1986.
- (ii) Natural gas supply. In periods of stagnating or even falling natural gas demand difficulties exist to valorize the possibilities of new attractive offers from gas exporters in the light of the Algerian contract restrictions.

## SUMMARIZED ENERGY BALANCE - BELGIQUE

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	48.81	43.82	45.80	47.62	47.5	48.4
-BUNKERS	3.03	2.49	2.31	2.85	2.7	2.8
-INLAND CONSUMPTION	45.78	41.33	43.49	44.77	44.8	45.6
INLAND ENERGY CONSUMPTION	45.78	41.33	43.49	44.77	44.8	45.6
-SOLID FUELS	11.31	10.98	9.85	8.84	10.7	10.2
-OIL	27.29	19.62	17.45	19.39	18.2	18.2
-GAS	7.19	6.79	7.33	6.53	8.2	8.8
-PRIMARY ELECTRICITY ETC	- 0.01	3.94	8.86	10.01	7.7	8.4
INDIGENOUS PRODUCTION (1)	5.89	9.05	13.27	13.90	10.2	10.2
-HARD COAL	5.79	5.11	4.37	3.85	2.3	2.3
-LIGNITE & PEAT						
-OIL						
-NATURAL GAS	0.04	0.03	0.04	0.02		
-NUCLEAR ENERGY	0.02	3.84	8.70	9.82	7.9	7.9
-HYDRO & GEOTHERMAL (2)	0.01	0.03	0.02	0.03		
-OTHERS & RENEWABLES	0.03	0.04	0.14	0.18		
NET IMPORTS (3)	42.92	35.42	32.04	34.72	37.3	38.2
-SOLID FUELS	5.31	6.59	5.53	5.02	8.4	7.9
-OIL	30.53	21.83	19.23	22.85	20.9	21.0
-NATURAL GAS	7.14	6.97	7.28	6.87	8.2	8.8
-ELECTRICITY (2)	- 0.06	0.03	-	0.02	- 0.2	0.5
STOCK CHANGES (4)		0.65	- 0.49	1.00		
-SOLID FUELS	- 0.21	0.72	0.05	0.03		
-OIL	0.22	- 0.28	- 0.53	0.61		
-GAS	- 0.01	0.21	- 0.01	0.36		
ELECTR. GENERATION INPUT	9.66	11.72	13.87	14.20	14.4	14.1
-SOLID FUELS (5)	2.24	4.37	3.49	3.23	5.3	5.0
-OIL	5.07	2.88	0.95	0.67	0.9	0.9
-NATURAL GAS	2.29	0.56	0.57	0.27	0.3	0.3
-NUCLEAR ENERGY	0.02	3.84	8.70	9.82	7.9	7.9
-HYDRO & GEOTHERMAL (2)	0.01	0.03	0.02	0.03		
-OTHERS & RENEWABLES	0.03	0.04	0.14	0.18		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	4.8%	- 1.1%	2.0%	0.0%	0.4%	
GDP ANNUAL GROWTH RATE	5.0%	2.0%	1.2%	2.6%	3.0%	
IMPROVEMENT IN ENERGY INTENSITY		29.5%	-2.1%	4%	12%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENLGRY CONSUMPTION	62.1%	50.5%	43.1%	46.7%	44.0%	43.4%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	76.2%	29.4%	11.0%	6.6%	8.3%	8.5%
SUPPLY DEPENDANCE ON IMPORTS	87.9%	80.8%	70.0%	72.9%	78.5%	78.9%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES

## NOTES

1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
3. THE (-) SIGN MEANS NET EXPORTS
4. THE (-) SIGN MEANS A STOCK DECREASE
5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

## GENERAL NOTES :

FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

## DENMARK

Introduction

35. Between 1973 and 1982 Danish energy policy produced some impressive achievements, notably in the field of energy saving.

While total energy consumption was cut by 14% over that period, the share of petroleum products fell from 89% in 1973 to 66% in 1982 and net imports of crude oil fell from 91% in 1973 to 55% in 1982.

The most remarkable progress was achieved in electricity production. In 1973, power stations were dependent on oil for 61% of their fuel supplies: in 1982 this figure was reduced to 8%.

The conclusions regarding Denmark's energy programme, contained in the Commission document of December 1984, raised two main issues:

- difficulties might arise in integrating the new natural gas resources into the Danish energy system;
- a firm decision would have to be taken on the role, to be played by nuclear power in electricity generation in the 1990s.

Energy trends since 1982

## Supply and demand

36. In recent years, Danish production of North Sea oil and natural gas has increased rapidly. Oil came on stream in 1972 and natural gas in 1984: in 1986, 3.6 million t of oil and 2 000 million m<sup>3</sup> of natural gas were produced. These resources covered nearly 30% of all internal consumption in 1986, against 10% in 1982. Denmark is currently in a position to export some of its natural gas output to Germany and Sweden.

37. Between 1982 and 1986, the GDP grew at an average annual rate of 3.1%. Energy consumption increased by only 2.6% per year during the same period. Demand for electricity grew by 4.5% annually between 1982 and 1986 - considerably faster than the Community average.

38. The structure of energy consumption changed appreciably between 1982 and 1986:

	1973	1982	% 1986
Solid fuels (including wood, straw)	11.5	33.3	37.5
Oil	88.5	65.7	56.8
Natural gas	-	-	5.6
Primary electricity (imported, wind, other)	-	1.0	0.1

39. Clearly, therefore, there has been increasing diversification in the energy supply. Even more significantly, this structural improvement has been achieved in parallel with a marked decrease in Denmark's dependence on imports: 75% of the energy consumed in 1986 was imported, as against 88% in 1982.

40. The reduced level of oil consumption is attributable, in virtually equal proportions, to an increase in coal imports and to the increased domestic production of natural gas.

41. In the heating sector, there has been a change from individual heating systems based on oil products to district heating and the use of natural gas. Moreover, there has been an important change in district heating, from power plants fuelled by oil and coal to combined heat and power production.

42. The contribution from alternative energy sources, while relatively greater than in other Member States, is nevertheless limited. It is, however, very varied: wood, straw, biogas, municipal waste and waste heat are all used to fuel heating units supplying district heating and combined heat and power generators. Denmark is a world leader in wind energy (some 1 800 units with a total capacity of 100 MW were installed by the end of 1986).

#### Energy policy

43. Important decisions were taken in 1984 and 1986 to develop onshore and continental shelf oil and natural gas resources. Two successive rounds of exploration and prospecting licences were granted to national and foreign companies.

44. On 29 March 1985 Parliament decided that Denmark's energy plans should not include nuclear energy as an option.

45. In 1985 the Heating Plan, which had been implemented in 1979, was adapted to the new situation on the internal energy market. Natural gas will be

supplied to an increasing number of households while at the same time greater use will be made of local resources for small-scale cogeneration.

46. In May 1986 Parliament decided to ban imports of coal from South Africa.

47. As from 1 January 1985, a "heating inspection" report must be made when any residential building is sold.

The "Law to reduce energy consumption in buildings", which laid down an acceptable level of thermal efficiency in public buildings, was extended until the end of 1989. A publicity and information campaign was launched to encourage industries and trade associations to conserve energy in production processes, and in the commercial sector.

48. The agreement on 6 June 1986 between the Government and the Social Democrat Party means that the development of electricity generation capacity to 1995 will be achieved partly by the installation of small cogenerating power plants and partly by new, large-scale power stations.

Generating companies, in conjunction with local authorities and distribution companies, must guarantee optimum exploitation of the possibilities offered by the installation of small, decentralised units with a fixed capacity of 450 MW. These power plants should use domestic sources of energy such as natural gas, wood, straw, municipal waste and biogas. A demonstration programme of between 80-100 MW will be put into operation as a first stage of the installation.

#### Energy forecasts to 1995

49. According to national forecasts, total internal energy consumption should grow at an average rate of 1.7% per year between 1986 and 1990. At the end of that period, consumption would be 20.1 million toe and should remain at that level until 1995.

Over this period, the shares of natural gas and solid fuels in covering demand are expected to increase slightly and the share of oil would continue to fall.

	1990	% 1995
Solid fuels (including wood, straw)	44.7	46.3
Oil	45.8	42.3
Natural gas	9.0	10.4
Primary electricity (imported, wind, other)	0.5	1.0
	100.0	100.0

50. Energy supply in Denmark over the next few years will be influenced in the first place by oil price levels on the world market and by changes in the requirements of neighbouring countries as a consequence of the fall in prices. Intense prospecting activity is already being carried out and should continue when the third round of licences is granted. The degree of success achieved by such exploration may have a crucial effect on Denmark's imports of hydrocarbons, particularly oil, and the volume of natural gas which it exports.



51. Coal imports should increase to reach more than 13 million t by 1995, but their breakdown by source will be altered as a result of Parliament's decision. The interruption of supplies from South Africa will be made up by additional imports from Australia, China, Colombia and the United States.

### Horizontal developments

#### Energy Efficiency Programme

52. Denmark has maintained one of the strongest energy efficiency programmes although many of the subsidy schemes existing in 1984 have come to an end. In the course of the Programme in the residential sector, which cost DKR 2 200 million (275 million ECU), 50% of buildings received subsidies and heating installations in 40% were inspected. Energy efficiency improved by 27.9% in the period 1973-1982 and by 5.6% from 1982-1986.

53. The principal elements of the present Danish energy efficiency programme are:

- the maintenance (through taxation) of consumer energy prices at a level sufficient to ensure the reasonable profitability for private energy consumers of conservation projects,
- financial and other support for the Energy Conservation Committee for campaigns concerning both general consumer attitudes and specific projects in all sectors, including energy management,
- building regulations and audits to ensure that the building stock - including new, existing and public buildings - is sufficiently energy efficient,
- schemes for inspection, adjustment and cleaning of space heating and ventilation equipment,
- planning and implementation schemes for promoting rational methods of heat supply, especially those leading to reduced oil dependence.
- information campaigns directed to industries and commerce.

54. The Danish commitment to energy efficiency R&D has always been very limited, ranging from 2.3 million ECU in 1977 to 4.6 million ECU in 1981. The 1986 level of 3.2 million ECU is about average.

#### Security of supply

55. The Danish oil security stock system is composed of two parts. The earlier "civil preparedness stocks" were established prior to EEC membership. The second part was added later to bring the total security stock obligation up to the required EEC level.

Basically the responsibility for holding stocks lies with refiners and product importers. In practice, however, the major part of this responsibility is handled by a specially set up stock entity, Foreningen Danske Olieberedskabslagre (FDO). The Government controls how much stock is held by the FDO and how much must therefore be held by the companies. The tendency is to keep FDO levels relatively constant. Under present circumstances stock law requires the holding of 125 days; it is intended to increase this to 127 days.

The tendency is to maintain the FDO stocks at their present level. Since the Danish oil consumption is expected to decline, the FDO coverage in terms of days of consumption will increase. Under present circumstances stock law requires the holding of 125 days.

56. Current reserves of oil (120 million m<sup>3</sup>) and natural gas (125 000 million m<sup>3</sup>) will enable production to continue at its present level for several years and thus contribute to security of supply.

57. Danish imports of steam coal are highly diversified: in 1986 supplies came from at least 7 different sources. Together with the legislation on power station stocks, this diversification ensures a high level of security.

58. Electricity generating companies are jointly obliged to maintain stocks equivalent to 30% of the previous year's fuel consumption. Under some circumstances, this figure may be raised to 50%.

#### Energy and the environment

59. In May 1984 the Danish Parliament adopted a Law on SO<sub>2</sub> emissions from power stations, aiming to reduce these to 125 000 t in 1995, i.e. about 40% less than in 1980. A firm schedule up to 1992 for installing desulphurization plants in power stations has already been adopted. In 1985 the generating companies, supported by the Ministry of Energy, launched a major programme of research into NO<sub>x</sub> emissions.

60. The Government has taken steps, in the form of tax concessions, to encourage the use of unleaded petrol.

61. The ban on burning straw in the open will encourage its use in generating units.

## Sectoral developments and prospects

### Oil

62. After the sharp fall recorded between 1973 and 1982/83, internal oil consumption in Denmark stabilized at about 10.5 million tonnes. This is a noteworthy achievement, in view of the fact that, since 1983, Danish production of crude oil has risen by two thirds to 3.6 million tonnes.

63. Oil substitution in power stations had already reached an advanced stage by 1982 and has made little progress since then. This partly accounts for the fairly stable structure of oil consumption by sector over the last few years.

64. In 1986, the share of imported crude oil and the consumption of petroleum products in relation to total energy consumption were 39% and 54% respectively. In 1982, these figures were 55% and 66%, and should fall to 26% and 43% respectively in 1995.

65. Internal oil production should remain stable at around 6 million toe between 1987 and 1990, but might subsequently fall to only 3.5 million toe in 1995.

### Natural Gas

66. The new factor in the Danish energy situation over the last few years is the use of natural gas. Production from the four off-shore gas fields was 1.75 million toe in 1986 but might be as much as 2.3 million toe in 1987. Production would then be at full capacity and, on the basis of current proven reserves, should ensure stable production for at least forty years. Given more favourable operating conditions, natural gas extraction would have a considerably greater chance of more rapid expansion. Any excess production would be disposed of initially on the Swedish market, which may be able to absorb up to 2 000 million m<sup>3</sup> in 1995.

67. Efficiently integrated into the revised Heating Plan, natural gas consumption is steadily growing in the most favourable market, household consumption, which accounted for nearly 50% of total final consumption in 1986. Over the next few years, natural gas will supply some of the primary

energy for new small co-generating power stations located throughout the country, which will consume between 70 and 80 million m<sup>3</sup>. In 1995, an estimated 500 million m<sup>3</sup> will be used for district heating and 800 million m<sup>3</sup> for industrial purposes. A further possible use for natural gas by the end of the century is to supply some of the fuel for power stations. The authorities would favour such use because of its obvious advantages in terms of environmental protection and lack of atmospheric pollution. Consequently, some 700 million m<sup>3</sup> of natural gas might be used for such purposes in 1995. This possibility clearly depends on the results of current prospecting activities, on the third round of exploration in the North Sea and on the updated estimates of exploitable reserves.

#### Solid fuels

68. The increasing use of coal for generating electricity and heat is the main reason why total solid fuel consumption in Denmark rose by 16% between 1982 and 1986.

69. The prospects for further growth depend on the use of coal in power stations for the production of electricity and heat: in this sector, it might meet with considerable competition from natural gas over the next few years. Increased consumption of coal in industry should not be as great

70. The 1984 government decisions on environmental protection will present an obstacle to any large-scale use of coal. Furthermore, the revised Heating Plan makes no provision for the use of coal in the new small power stations.

#### Electricity

71. In 1986, solid fuels used in State-owned power stations accounted for more than 95% of total fuel consumption for the production of electricity and heat.

72. Over the next few years, the conversion of power stations to coal will be virtually complete and exclusively oil-fired power stations will represent only a small fraction of total generating capacity.

73. The above-mentioned uncertainties surrounding the future prospects for the use of solid fuels in power stations make it difficult to estimate future supplies. The current potential for burning natural gas in multi-fuel

plants is about 730 MW (nearly 10% of total capacity) and, in view of the new availabilities of nationally produced natural gas, this capacity could be taken up.

According to national forecasts, the share of natural gas and of other hydrocarbons in power station fuel will rise from 2% and 7.5% respectively in 1986 to 4% and 8% respectively in 1995.

#### Heat

74. Over the next few years combined heat and power production will form the key element in the Heating Plan. The agreement of June 1986 between the Government and the Social Democrat Party, provides the basis for the creation of new small generating units (450 MW). Production from these units could cover around 15% of net heat demand. The share of combined production from large and small installations would then be the same as that from individual heating systems (oil, natural gas, electricity and renewable sources), the remainder being covered by district distribution networks.

75. As a result of the revised Heating Plan, great changes will take place by 1995 in the structure of supplies to meet the net demand for this type of energy, which is virtually static. In 1985 individual heating systems were largely oil-fired and accounted for 60% of the overall demand, they will account for only some 45% in 1995, of which 10% will be fixed by natural gas.

#### Renewable energy sources

76. There are two important bases for the development of new energy sources: the December 1985 agreement between the electricity companies and the Ministry of Energy to set up wind generator parks with a total capacity of 100 MW by the end of 1990, and the agreement of June 1986 on the use of primary energy to fuel small CHP generators.

77. These government initiatives will be backed up by direct subsidy schemes and tax concessions and by demonstration programmes for the small co-generation units.

78. As a result of this policy, new and renewable energy sources should make a significantly greater contribution to meeting total energy demand, which was nearly 4% in 1986.

## CONCLUSIONS

Since the Commission's last review, Denmark has continued and consolidated the remarkable improvement in its energy balance.

Denmark continues to figure amongst the Member States with the best performances in the rational use of energy. This is notably due to strong emphasis on collective heat supply systems and combined heat and power production, stringent energy efficiency standards in buildings, a vigorous information effort and a high level of taxation on some fuels.

The country's dependence on oil has been reduced from 66% in 1982 to 57% in 1986. Off-shore oil production has more than doubled in the same period bringing oil import dependence down from 55% in 1982 to 39% in 1986. Further important progress in reducing dependence on oil and oil imports can be envisaged.

Natural gas is now being introduced on a large scale and gas availability from the North Sea has even allowed for some exports. Natural gas is replacing oil both in the domestic sector as part of the heat planning process and in the industrial sector.

Coal use has developed substantially with the successful completion of the oil to coal conversion programme in the electricity sector. The environmental requirements to coal use could make the use of natural gas for power generation an increasingly interesting policy option. However, such a policy, if it should materialise, would not contribute to the achievement of the Community's objective as regards the use of hydrocarbons in electricity generation.

The Danish effort in developing new forms of energy has been innovative and wide-ranging. The decisions to integrate in the electricity sector an additional 100 MW of wind power by 1990 and by 1995, 450 MW of small decentralised combined heat and power plants based on indigenous fuels are important in this context.

The Commission is of the view that the Danish experience in such areas as energy planning, energy conservation, district heating schemes and the use of local renewable energy sources on a substantial scale could be of considerable value to others in the Community.

## SUMMARIZED ENERGY BALANCE - DANMARK

FEBRUARY 1988

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IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	20.21	17.42	19.06	19.24	20.5	20.5
-BUNKERS	0.68	0.48	0.41	0.45	0.4	0.4
-INLAND CONSUMPTION	19.53	16.94	18.65	18.79	20.1	20.1
INLAND ENERGY CONSUMPTION	19.53	16.94	18.65	18.79	20.1	20.1
-SOLID FUELS	2.32	5.80	7.38	7.21	9.0	9.3
-OIL	17.23	10.96	10.66	10.48	9.2	8.5
-GAS			0.57	1.08	1.8	2.1
-PRIMARY ELECTRICITY ETC	- 0.02	0.18	0.04	0.02	0.1	0.2
INDIGENOUS PRODUCTION (1)	0.07	1.70	3.90	5.43	8.9	6.7
-HARD COAL						
-LIGNITE & PEAT						
-OIL	0.07	1.70	2.92	3.66	6.1	3.5
-NATURAL GAS			0.98	1.75	2.7	3.0
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)				0.02		
-OTHERS & RENEWABLES					0.1	0.2
NET IMPORTS (3)	20.28	15.54	15.53	14.34	11.6	13.8
-SOLID FUELS	1.96	5.83	7.70	7.43	9.0	9.3
-OIL	18.34	9.53	8.19	7.47	3.5	5.4
-NATURAL GAS			- 0.40	- 0.56	- 0.9	- 0.9
-ELECTRICITY (2)	- 0.02	0.18	0.04			
STOCK CHANGES (4)	0.14	- 0.18	0.37	0.53		
-SOLID FUELS	- 0.36	0.03	0.32	0.22		
-OIL	0.50	- 0.21	0.04	0.20		
-GAS			0.01	0.11		
ELECTR. GENERATION INPUT	4.66	5.74	6.92	7.18	9.0	9.7
-SOLID FUELS (5)	1.82	5.27	6.49	6.66	8.2	8.7
-OIL	2.84	0.47	0.35	0.37	0.5	0.4
-NATURAL GAS			0.08	0.13	0.2	0.4
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)				0.02		
-OTHERS & RENEWABLES					0.1	0.2

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	5.5%	- 1.6%	2.6%	1.7%	0.0%	
GDP ANNUAL GROWTH RATE	4.9%	1.4%	3.1%	2.8%	2.9%	
IMPROVEMENT IN ENERGY INTENSITY		27.9%	5.6%	2%	12%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	88.6%	65.7%	58.1%	56.8%	46.8%	43.4%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	60.9%	8.2%	6.2%	7.0%	7.8%	8.2%
SUPPLY DEPENDANCE ON IMPORTS	0.3%	89.2%	81.5%	74.5%	56.6%	67.3%

- A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES
- NOTES  
 1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS  
 2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH  
 3. THE (-) SIGN MEANS NET EXPORTS  
 4. THE (-) SIGN MEANS A STOCK DECREASE  
 5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)
- GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS



GERMANYIntroduction

79. The Commission concluded in its 1984 review exercise the following important policy issues in the energy sector with which Germany might be faced in the future :
- i ) the balancing of supply and demand for natural gas in a smaller energy market.
  - ii ) the long-term role for coal, both in the energy economy as a whole and in electricity generation in particular (its largest sector of consumption);
  - iii) the future for the hard coal mining industry, where a process of adjustment is already underway and which could be further affected by a more depressed market outlook. An outstanding and difficult question against that background was the scope for increased imports of coal from third countries.

Furthermore the importance of environmental constraints concerning future energy use was highlighted.

Total energy consumption decreased in Germany by 14 Mtoe between 1973/1982 and the share of oil in gross energy consumption dropped over the same period from 56% to 44%. Supply dependence on imports fell to about 52% in 1982. However in 1986 the level of 1973 concerning reliance on imports was practically reached again.

Energy developments since 1982Market trends

80. Since 1982 GDP has increased regularly by an average of 2,3% p.a. In parallel total primary energy requirements grew as well, however at a lower percentage (on average 1.6% p.a.). Energy consumption remained quasi stagnant from 1985 to 1987, although GDP increased by 2.4% in 1986 and by 1.5% in 1987. Final electricity consumption increased over the review period at an average of 2.8% p.a..
81. With regard to the period 1982 (base year of last review) - 1986 it can be said that :
- oil consumption increased in 1985 as well as 1986
  - consumption of solid fuels decreased by about 4%

- consumption of natural gas increased by 7% and nuclear energy by almost 100%.

The fall in oil prices in 1986 which did not result in a substantial increase in energy demand changed the demand structure only slightly.

The German demand structure developed as follows :

in %	1973	1982	1986
oil	56,4	44,5	43,9
solid fuels	31,3	32,5	29,1
gas	10,2	15,2	15,2
primary elec- tricity	2,1	7,8	11,8

Energy supplies over the review period have been provided at international prices (except indigenous coal) and in adequate quantities. Although net energy imports increased by some 17 Mtoe from 1982 to 1986, the overall supply dependence on imports only rose from 52 to 55% (imports from other Member States included). Indigenous energy production remained nearly at its 1982 level. Falling coal production has been more than compensated for by rising electricity production from nuclear energy.

#### Policy Developments

In September 1986 the German Government has presented a comprehensive energy report expressing the German energy policy objectives, giving to industry the necessary frame data and confirming its general market-oriented approach in the energy sector. After the Chernobyl accident and the internal controversial nuclear discussions this report stresses the necessity to continue with the use of safe nuclear power. However after the Chernobyl accident the overall consensus between the Federal Government and the opposition parties and some Länder on the parallel use of coal and nuclear has broken down. The Federal Government is convinced that the use of nuclear power under the existing safety standards is justified and economically required. Furthermore the 1986 Energy Report stresses the objectives of continuing energy conservation policy, further reducing the share of oil in energy supplies and continuing efforts to improve security of supply by diversification and other means. The positive contribution of energy policy for the environment is highlighted in detail.

85. The German Government has constantly monitored developments in the coal sector and has contributed to the renewal of the Agreement between the coal mining and steel industry (Hüttenvertrag) in 1985 for subsidised supplies of coking coal to the steel industry up to the year 2000. The existing "Jahrhundertvertrag" ensuring indigenous coal sales to utilities will expire in 1995. In the recent "Kohlerunde" of December 1987 the Federal Government has agreed with the coal producing Länder Nordrhein - Westfalen and Saarland, with the coal producing industries as well as the responsible union for mining (JGBE) to reduce coal production capacities by 13-15 Mio t because of the falling demand in the steel industry and in the heat market. Production capacity shall be adapted as quickly as possible to finalize this restructuring process by 1995 at the latest. Regional and social measures are foreseen to realise this process of adaptation in a socially acceptable way.

#### Energy outlook to 1995

86. The German Government does not publish its own energy forecasts. However the scenarios given by economic research institutes and industry suggest that up to 1995/2000 total primary energy requirements could remain nearly constant compared with 1986. However up to 1995 the following changes in the demand structure are expected :
- quantitative and percentage fall of oil demand in the German energy balance; despite the stimulus of low oil prices the share of oil should fall below 40% in 1995;
  - moderate increases in coal demand and stagnation of lignite consumption;
  - stagnation or moderate increase in natural gas consumption, possibly, up to 18% of primary energy requirements;
  - increasing share of nuclear in electricity generation, but at a lower growth rate than in the past;
  - structural change in the economy, market penetration of new energy efficient technology and existing standards are expected to result in the long run in an auto-dynamic energy conservation process.
87. Expected energy demand up to 1995 should be covered by quasi stagnant indigenous overall energy production and slightly growing net energy imports. Production up to 1995 would be characterized according to most recent scenarios by an increasing nuclear contribution, more or less stable gas and solid fuels shares and falling indigenous oil output. These scenarios do not take into account the decisions of the last "Kohlerunde" as described under para 7.

Cross sectoral developmentsEnergy Efficiency  
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88. There have been some changes in the energy efficiency policy of the FRG since 1984. These changes reflect the general position of the Government that the free operation of the market with a minimum level of state involvement will lead to optimum results. During the period 1973/82 energy intensity (relation of final energy demand to GDP) in the Federal Republic improved by about 21%; this trend has been reversed in the period 1982/86 when energy intensity disimproved by 0.3%.
89. The principle energy efficiency initiatives have been:
- German energy conservation budgets have been regularly increased since 1982 amounting to about 1 billion ECU in 1987,
  - energy audits have been carried out to a large extent, especially by promotion of information and advice to private consumers,
  - information programmes involving the dissemination of energy efficiency experience and know-how have been targeted at those industrial sectors where important further energy savings are possible,
  - severe energy conservation standards have been laid down for the construction of new houses and heating plants, standards have also been developed for renovations and modifications to existing buildings,
  - consumption orientated billing of heating costs in buildings has been introduced improving energy efficiency in multi family buildings by more than 10%,
  - a scheme for financially assisting boiler replacement has been adopted,
  - allowances for certain investment projects in the field of energy production and distribution have been granted,
  - energy labelling has been enforced for household appliances,
  - the voluntary agreements entered into by the Federal Government and various industries have succeeded in improving the rational use of energy. For example the voluntary agreement with the motor car manufacturers has led to an average improvement in fuel consumption of 23% between 1978 and 1985.
90. The Federal Republic has substantially reduced it's committment to energy conservation R&D during the period 1981-1986. In 1981 the Federal Republic allocated 110 MECU to energy conservation R&D, but by 1986 this figure has dropped to less than 32 MECU.

## Security of Supply

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91. The overall supply dependence on imports increased slightly since 1982 and amounted in 1986 to about 55%. Up to 1995 it is expected that the German overall supply dependence will remain more or less at the same order of magnitude.
92. The share of oil in German gross energy consumption has dropped slightly since 1982 and markedly since 1973. The German oil supply structure is highly diversified concerning the source of origin. In 1986 the share of imports from OPEC countries amounted to about 56% (70% in 1982), imports from the North Sea to 35% (24% in 1982) and the share of imports from the USSR to about 6% (5% in 1982). Indigenous oil production is at present running at about 5.5 Mtoe and is expected to decline to below 1 Mtoe by 1995.
93. Oil stocks in Germany can be characterized by the following six categories:
1. Federal crude oil reserve
  2. EBV stocks (EBV = Erdölbevorratungsverband)
  3. Refinery obligatory stocks
  4. Refinery commercial stocks
  5. Power stations obligatory stocks for 30 days
  6. Final consumer stocks.

This combination has traditionally given Germany a satisfactory and healthy stock position. Germany therefore meets the EC and IEA stockholding obligations.

From the 1st April 1988 on the recently modified Erdölbevorratungsgesetz (oil stockpiling law) will lead to quantitative and qualitative improvements of Germany's emergency stocks. The new law increases the level of EBV stocks from 65 to 80 days of product imports and production and lowers the stock-obligation for refineries from 25 to 15 days of their production of products. As a result the obligatory stock-level according to the Erdölbevorratungsgesetz will be increased from around 80 to 90 consumption days. Qualitative improvements will be caused by limitation of stocks not owned by the EBV to at most 10% and separation from commercial stocks as well as by further concentration on the EBV as stock-holding organisation.

94. About 58% of natural gas supplies were met in 1986 from domestic and Community sources, the balance coming from Norway (13%) and the USSR (29%). The consumption share being covered by indigenous production (27% in 1986) has decreased since 1982 by 4 percentage points. After having concluded the Troll/Sleipner agreement existing contracts are expected to be sufficient to meet German natural gas requirements to 2000.

95. Inland solid fuels consumption is nearly exclusively covered by indigenous production of lignite and hard coal. Coal imports into Germany are limited under an import quota system defending indigenous production. Existing import quotas for the heat market are at present only partially used.
96. Energy and Environment
- In the field of environment the German Government pursues a strong policy concerning the reduction of air pollution. The increasing use of low sulphur fuels and nuclear energy as well as improvements in energy efficiency and strict environmental legislation will result up to 1995 in substantial reductions of air pollution.
97. After having adopted in 1983 a regulation concerning large combustion installations above 50 MW (thermal) a further "Clean Air Regulation (TA - Luft)" covering installations from 1 MW - 50 MW was adopted in 1986 and is being implemented. Both pieces of legislation contain stringent emission standards with regard to SO<sub>2</sub>, NO<sub>x</sub> and dust for existing and new installations. By 1995 it is expected that overall emissions from stationary sources will be reduced drastically (as compared with 1982 - SO<sub>2</sub> - 60%, NO<sub>x</sub> - 64%, dust-34%).
98. The German government strongly supports the rapid introduction of clean cars and lead-free petrol. Tax incentives up to 7 Pfg/l for lead-free versus leaded petrol have been granted in 1986. The consumption share of lead free petrol has been increased from practically zero in 1985 up to 11% in 1986 and 31% by the end of 1987.
99. All these efforts have resulted in substantial costs for the energy industries (costs to desulphurize German power plants will amount up to 7.26 bn ECU up to 1988). This may affect the competitive position of these industries vis-à-vis their counterparts in other countries having less stringent regulations.

#### Sectoral Developments and Outlook.

##### Oil

100. Oil continues to be the most important energy source for Germany covering 44% of primary energy consumption in 1986. The first significant demand increase after the second oil crisis in 1986 amounting to 6% was to a major extent due to an expansion of heating oil stocks in the residential sector taking advantage of lower prices. This has been confirmed by provisional 1987 figures when heating oil deliveries have been reduced by nearly 7%. No tax increases have been introduced in Germany to counterbalance the price decline.

101. Petrol and automotive diesel consumption has increased regularly since 1982 despite the successes in reducing the specific energy consumption per car (by 23% between 1978 and 1985). Fuel consumption in the transport sector is expected to continue to grow up to 1995 because of an increasing car fleet. For the first time since 1982 heavy fuel oil consumption increased in 1986. The 10% consumption increase in 1986 mainly occurred in the industrial and utility sector where a rather quick price reaction took place. However in 1987 heavy fuel oil demand decreased again by about 20%.
102. Refinery capacity was reduced to 86 Mio t in 1986, corresponding to a capacity reduction of about 46% compared with maximum distillation capacity of some 159 Mio t in 1978. Total inland oil product requirements can only be partly covered by own refineries.
- Net petroleum product imports increased substantially since 1982. The share of net product imports in total inland product deliveries grew from about 26% in 1973, over 30% in 1982 to 43% in 1986. Most of these product imports are coming from other Community Member States.
103. According to recent forecasts of the oil industry association the consumption of all major oil products with the exception of Diesel should decrease up to 1995. The share of oil in gross energy consumption should than be about 37% (34% in 2000) and the share of net oil imports in gross energy consumption that reached 43% in 1986 could decrease to 40%.
104. Natural gas
- The concerns raised in the last review exercise with regard to the balancing of supply and demand for natural gas have not materialized. The share of natural gas in gross energy consumption has remained at 15% since 1982, although because of falling oil prices consumption decreased in 1986 by about 2%. The German natural gas suppliers have however now adjusted gas prices to defend their market position.
105. In sectoral terms, final gas consumption has since 1982 increased substantially only in the tertiary sector, nearly stagnated in industry and decreased as input for electricity generation. In 1986 nearly 30% of all German dwellings were heated by natural gas. About 10% of all inland gas deliveries are going to the electricity sector. This order of magnitude is regarded as necessary by the gas industry to buffer seasonal demand fluctuations.
106. Various energy forecasts predict a more or less stagnant gas demand up to 1995. Further increases may be expected mainly in the household sector. The share of natural gas in gross energy consumption may increase under positive conditions from about 15% in 1986 to 16- 18% in 1995.

Solid fuels

107. Indigenous lignite and hardcoal cover nearly 30% of German primary energy requirements. Although restructuring in the coal mining industry continued over the review period this did not succeed in improving the competitive position of German coal. Furthermore it was impossible to adjust totally the indigenous coal production capacity to reduced market outlets for German coal. Coal remained the energy sector which was not being governed by market forces. According to the German government a special support system for indigenous coal is necessary because of security of supply and regional considerations.
108. To protect indigenous coal versus cheap imports a very sophisticated strategy has been developed over the past two decades. It consists mainly of the following elements :
- imports of coal from third countries under quantitative restrictions;
  - Coal supplies to the steel industry are supported by direct budget subsidies (Kokskohlenbeihilfe). Supplies to the electricity sector are secured up to 1995 by the "Jahrhundertvertrag". Higher costs resulting from the use of Community coal in electricity generation are compensated to a large extent through a public fund (Verstromungsfonds) being fed by a levy on electricity prices (Kohlepfennig) to be paid by consumers;
- adaptation of production capacities to long-term demand expectations. With regard to production capacities a reduction from about 150 Mio t in the fifties to 80 Mio t in 1988 will have taken place. However even this reduced capacity seems to be some 13 - 15 Mio t p.y. above expected medium term demand for German coal.
109. Falling energy prices in 1986 as well as a weakening US\$ have further deteriorated the competitive position of German coal and have resulted in higher subsidy requirements. In comparison with 1982 national aids and other financial measures to the current production have increased by 120% and amounted to 3141 Mio ECU in 1986. The major parts of these aids and other measures have been given to support the use of German coking coal in the steel industry and to guarantee that Community coal is used for electricity production. In the latter case the contribution to the "Verstromungsfond" had to be changed from 4.5% to 7.5% of electricity tariffs on 1. June 1987 and to 7.25% from 1 January 1988. In the long run it is the intention of the German government to decrease this levy gradually. The coking coal subsidy on the other hand increased from 260 MECU in 1982 to 1.274 MECU in 1986. In 1987 payments from public budgets for coking coal have amounted to about 1.690 MECU (provisional figure). Coking coal supplies to the German and Community steel industry were subsidised by 9.12 ECU/t in 1982 increasing to 71.91 ECU/t in 1987.



110. At present subsidies for the German hard coal sector have reached a critical level. In the Kohlerunde of 1987 it was decided to reduce up to 1995 at the latest production capacity by 13-15 Mio t because of falling supplies to the steel industry and the heat market.
111. In the longer term it can be expected that the costs of indigenous production will remain substantially higher than production costs in third countries. There is a large degree of uncertainty concerning long term coal demand. In the heating market, where coal consumption is not supported by financial aids, consumption increases can hardly be expected. Exports of German coal will cease to exist in the long run. In the steel sector consumption is not expected to rise. The Federal Government as well as industry suppose, that the "Jahrhundertvertrag" will be fulfilled with supplies to the electricity sector of about 42-43 Mio tons. For the period after 1995 the Federal Government is aiming at a solution being connected with the actual "Jahrhundertvertrag". Precise solutions of possible commitments to use German coal for electricity generation, especially concerning quantities, are not known at present.
112. Electricity
- Electricity consumption has increased since 1982 and amounted in 1986 to 413 TWh (increase of 0.6% in comparison with 1985). Natural gas and oil as fuels for electricity production have continued to loose importance although some consumption increases occurred in 1986. At present the combined share of hydrocarbons in electricity production is below 10%. Solid fuels and nuclear on the other hand represent about 88% of fuel input.
113. For the first time in several years the increase in electricity consumption in 1986 has been lower than the increase in GDP (+0,4% versus +2.4%). However it would be too early to see in this development a reversal of past trends.
114. Up to 1995 consumption increases are expected to be moderate and lower than in the past. Capacity bottlenecks are not likely up to 1995 and the production structure is likely to follow present paths with the confirmation of the German Government to continue with nuclear power. However the present opposition parties plea for a policy without nuclear energy and the NRW - Government continues to refuse the licensing of the Kalkar fast breeder. The public electricity industry expect present overcapacities (mainly oil and gas plants for peak shaving purposes) to be reduced till 1995 and total capacities to reach 104 GW in 1995. As lignite and hydro capacities are not likely to expand further the major increases in fuel input will be covered by coal and nuclear. At present three nuclear power plants with a capacity of 3900 MW are under construction. Further nuclear capacity increases in the medium term are not expected. According to the estimates made by the electricity industry the share of hydrocarbons as fuel input for electricity generation should remain substantially below 10% up to 1995.

115. However the danger exists that this outlook might be jeopardized if the consensus on energy policy between the Federal State and the Länder, especially with regard to nuclear but also concerning coal, cannot be re-established. Especially as nuclear is at present a valuable component to balance the costs of electricity production.

Cogeneration, District Heating

116. At present electricity from CHP-systems accounts for less than 4% of total electricity production. Although this decentralised form of energy production increases energy efficiency and has positive environmental effects the prospects for a further substantial expansion are limited in Germany, even with the further support of district heating. Since 1977 this form of heating has been supported by the Federal Government and the Länder and it will continue to be promoted through tax incentives and investment aids. In 1986 about 8% of total demand for space heating was covered up to district heating.

New and Renewables

117. Germany continues to support the research and development of new and renewable energies at present covering about 2% of energy demand. According to projections undertaken by independent research institutes this share might increase up to the year 2000 to 4 - 7%. To promote these new energy resources and to support the economic break-through of renewables a R, D & D programme has been adopted, mainly focussing on the further development of wind and solar energy. The total R, D & D budget for this purpose amounted to 40 Mio ECU in 1986 and 61 Mio ECU in 1987.
118. Furthermore investment grants and special tax allowances are granted to make such projects more economical and to facilitate market introduction. An investment subsidy of 7.5% has been granted in the industrial sector and special depreciation allowances of 10% for ten years can be realized in the private sector. Developments are under way on remuneration agreements with the electricity industry to facilitate the feeding in of electricity into the public grid produced from renewable energy sources.

CONCLUSIONS

Germany has achieved substantial progress in meeting its own policy goals and contributing to Community energy objectives, especially by further improving the diversification of its demand structure and its supply sources. The reduction of the oil consumption share and the increase of the nuclear contribution in the energy balance have been beneficial of this development having been mainly achieved by a market-oriented approach.

One of the cornerstones of German energy policy in the past has been the consensus between Federal Government, the major opposition party and all the Länder on the general direction of national energy policy, especially on the combined development of nuclear and indigenous coal. However this overall consensus no longer exists after the Chernobyl accident. Presently diverging policy views do not only jeopardize the achievement of national energy goals but have also implications for the realization of Community energy objectives. To restore this lost consensus in energy policy would improve the political and economic framework conditions.

Reliance on free market forces, with the exception of the solid fuels sector, has resulted up to 1982 in substantial energy efficiency improvements, being above the Community average of 20%. Even in periods of falling or low energy prices and decreasing financial state incentives the Government is continuing this policy approach believing in a more or less auto-dynamic energy conservation process. However since 1982 the rate of improvements in energy efficiency has slowed down and developments should be closely monitored and counterbalanced in case energy efficiency deteriorates further.

Difficult decisions have been taken in the coal sector by adjusting indigenous coal production capacities to depressed future demand expectations. A capacity cutback of 15 Mio tons needs to be realised by 1995. Legislation limiting the use of cheaper imported coal may have negative impacts on the future consumption potential in the domestic and industrial heat market not being supported by national subsidies.

Although renewable energies continue to be promoted by state financed research and development programmes further successes might be realized if the market introduction of renewable energies could be stimulated by additional separate tools.

## SUMMARIZED ENERGY BALANCE - DEUTSCHLAND

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	265.79	251.45	269.03	268.91	286.4	281.7
-BUNKERS	3.58	2.70	2.84	3.85	2.9	2.9
-INLAND CONSUMPTION	262.21	248.75	266.19	265.06	283.5	278.8
INLAND ENERGY CONSUMPTION	262.21	248.75	266.19	265.06	283.5	278.8
-SOLID FUELS	83.16	81.60	82.35	78.25	78.8	79.8
-OIL	146.21	109.32	108.85	114.11	121.5	116.0
-GAS	26.99	38.30	41.23	41.03	47.4	47.0
-PRIMARY ELECTRICITY ETC	5.85	19.53	33.76	31.67	35.8	36.0
INDIGENOUS PRODUCTION (1)	119.18	124.81	133.40	127.43	126.7	121.8
-HARD COAL	69.13	63.20	58.86	57.52	52.0	49.0
-LIGNITE & PEAT	22.92	25.77	24.12	22.15	24.0	24.0
-OIL	7.14	4.42	4.33	5.45	2.8	0.7
-NATURAL GAS	15.02	12.47	12.55	11.08	13.0	13.0
-NUCLEAR ENERGY	3.05	16.52	31.33	28.97	33.3	33.5
-HYDRO & GEOTHERMAL (2)	1.20	1.54	1.34	1.43	1.6	1.6
-OTHERS & RENEWABLES	0.72	0.89	0.87	0.83		
NET IMPORTS (3)	147.41	130.09	134.78	147.05	159.7	159.9
-SOLID FUELS	- 10.15	- 0.36	- 1.44	1.13	2.8	6.8
-OIL	144.65	104.05	106.39	115.51	121.6	118.2
-NATURAL GAS	12.03	25.82	29.61	29.97	34.4	34.0
-ELECTRICITY (2)	0.88	0.58	0.22	0.44	0.9	0.9
STOCK CHANGES (4)	0.81	3.45	- 0.85	5.57		
-SOLID FUELS	- 1.27	7.01	- 0.81	2.55		
-OIL	2.01	- 3.55	- 0.97	3.00		
-GAS	0.07	- 0.01	0.93	0.02		
ELECTR. GENERATION INPUT	69.50	85.15	95.25	93.31	98.6	105.1
-SOLID FUELS (5)	47.02	54.00	53.37	53.19	54.6	57.9
-OIL	9.75	3.94	2.62	3.26	3.2	5.2
-NATURAL GAS	7.76	8.26	5.72	5.63	5.9	6.9
-NUCLEAR ENERGY	3.05	16.52	31.33	28.97	33.3	33.5
-HYDRO & GEOTHERMAL (2)	1.20	1.54	1.34	1.43	1.6	1.6
-OTHERS & RENEWABLES	0.72	0.89	0.87	0.83		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	4.3%	- 0.6%	1.6%	1.7%	- 0.3%	
GDP ANNUAL GROWTH RATE	4.5%	1.6%	2.3%	2.4%	2.5%	
IMPROVEMENT IN ENERGY INTENSITY		21.0%	-0.3%	3%	15%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	56.4%	44.5%	41.5%	43.9%	43.4%	42.2%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	25.2%	14.3%	8.8%	9.5%	9.2%	11.5%
SUPPLY DEPENDANCE ON IMPORTS	55.5%	51.7%	50.1%	54.7%	55.8%	56.8%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES  
 FROM EXTERNAL SOURCES

- NOTES
1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
  2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
  3. THE (-) SIGN MEANS NET EXPORTS
  4. THE (-) SIGN MEANS A STOCK DECREASE
  5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

GREECEIntroduction

119. In its last review of Greek energy policy in 1984 the Commission highlighted the need for improvements in energy efficiency and the importance of the future development of indigenous lignite. The following policy preoccupations were also raised:

- i) the need to ensure the success of Greek efforts to promote exploration and development of hydrocarbon resources.
- ii) efforts to promote renewable energy sources in a country where there could be particularly good chances of success.
- iii) in the longer term, the possible introduction of natural gas into the Greek energy system. A number of options were then under review.

From 1973 up to 1982 total gross energy consumption increased by 3.5 Mtoe and the share of oil in the overall energy balance (bunkers included) decreased from 81% to 73%. The supply dependence on imports improved substantially from a 93% in 1973 to 67% in 1982 because of the expansion of indigenous lignite in the Greek energy system.

Energy Developments since 1982Market Trends

120. Since 1982 GDP has increased by an average of 1.6% p.a. However inland energy demand grew even faster over the same period at 2.9%. Electricity consumption in the period 1982-1986 increased by an average of 4.5% p.a.

Greece is one of those Community Member States where in the period 1982 to 1986 inland energy demand grew faster than GDP. Greece remains an industrializing country with substantial potential for improvements in energy efficiency.

121. Over the review period (1982-1986) gross energy consumption increased by about 17%. The long term trend of growing use of lignite for electricity generation in replacement for oil was confirmed. Since 1973 the share of oil in the overall energy balance has constantly decreased and even in 1986, when international oil prices fell drastically, inland oil consumption still fell by about 5%.

122. However despite all efforts to reduce oil demand Greece continues to remain to a large extent dependent on oil (64% of gross energy consumption in 1986). Final oil consumption has increased in the transport sector and decreased in industry.

123. Over the last 13 years the energy demand structure has developed as follows:

% of gross energy consumption	1973	1982	1986
solid fuels	18	24	33
oil	81	73	64
natural gas	-	-	-
primary electricity	1	3	3

This structural development shows a major increase in consumption in the solid fuels (lignite) sector.

The Public Power Corporation (PPC) has succeeded in increasing lignite production since 1982 by more than 10 Mio tons.

124. Policy Developments

Greek energy policy objectives as defined in the present five year economic and social development plan (1983-1987) have remained practically unchanged. The main goal is the reduction of Greece's oil dependence by the exploitation of indigenous energy sources (new and renewables included) and by the future introduction of natural gas. Improvements of energy efficiency continue to be a major element of the formulated energy policy.

125. In 1984 the state purchased the Exxon Group of companies in Greece (refinery, chemical plants and marketing assets) which became part of the Public Petroleum Company (DEP) which has been reorganized by Law 1571/85. DEP is now an integrated oil company covering all sectors of activity. In May 1987 legislation (Law 1701/87) was adopted enabling DEP to acquire up to 51% of the North Aegean Petroleum Company being responsible for the only indigenous oil production from the Prinos field. However on December 1987 the Ministry of Energy Research and Technology and the North Aegean Petroleum Company reached an agreement settling all pending issues. The agreement was the outcome of negotiations held in Athens between NAPC and DEP EKY on behalf of the Ministry. In principle the Government decided in 1987 to introduce natural gas imports from the USSR and Algeria to the Greek energy markets. Frame agreements have been signed and DEP is at present negotiating the final contractual conditions.

Energy Outlook to 1995

126. The Government has presented some forecasts up to 1995 being based on GDP growth rates of 1,8% (1985-1990) and 3% (1990-1995). According to these forecasts internal energy consumption will increase from 1986 by about 7 Mtoe or 41%. This consumption increase should be mainly covered by a further rising lignite production and increasing net energy imports. Especially the planned imports of natural gas will improve the diversification of energy supplies. According to the planning of DEP natural gas should by the year 1995 represent about 6% of inland energy requirements.
127. In the electricity sector the share of hydrocarbons as input for electricity production in the mainland system is forecasted to fall by 1995/96 substantially below 10%. Some natural gas might be used in the Keratsini power plant near Athens to facilitate the introduction of this energy source and reduce air pollution in the Athens area. In 1995 lignite will be by far the most important source of electricity generation reaching an input share of about 80%.
128. Oil demand measured as percentage of gross energy consumption should be about 52% by 1995. Net oil imports of about 13.5 Mtoe in 1995 should represent the same percentage of gross energy consumption as no indigenous oil production is presently foreseen for 1995 (exhaustion of the Prinos field).

Cross sectoral developmentsEnergy Efficiency

129. Energy efficiency has long been neglected in overall Greek energy policy. In fact energy intensity (the ratio of final energy consumption to GDP) has been increasing. During the nine year period 1973/82 energy intensity increased by 1.9%, and improved by 0.8% during the four year period 1982/86. In 1986 a long term national programme aimed at improving the rational use of energy in the residential, industrial and public sectors was proposed by the National Energy Council. The Government in the Five Year Economic and Social Development plan for the period 1988 to 1992 has recognized that energy efficiency should constitute one of the basic objectives of Greek energy policy. In this context, the Ministry of Industry, Energy and Technology will launch a comprehensive programme for Rational Use of Energy, with particular emphasis in the areas of information and publicity, training and technical assistance and the transfer and further development of local technologies and products in this area.

Greek conservation activity in the medium term will be financed to a large extent from EEC programmes, especially the VALOREN programme, through which a community assistance of Drs. 630 millions-representing 55% of total cost-is being made available to the Greek authorities over a period of five years for the finance of Rational Use of Energy Projects.

The Ministry has already commissioned four different energy conservation projects to ELKEPA, a government agency dealing with the improvement of productivity, and is in the process of commissioning another five. The first four, which are already underway, involve an advertising campaign on energy conservation, training of energy managers in industry, a survey and policy study on co-generation and a programme addressed to energy saving in public buildings.

130. There remains a large potential for future improvements in energy efficiency. A part of this potential will be exploited by actions undertaken in the frame of the VALOREN Programme.

There has been a very limited allocation for energy conservation related R&D with only about 0,44 MECU spent in 1986.

#### Security of Supply

131. The overall energy import dependence improved substantially since 1973. Whereas in 1973 about 93% of gross energy consumption was met by imports this figure reduced to 72% in 1986. Some Greek forecasts indicate that this import dependence could be further reduced up to 1995 to reach about 56%. However it has to be taken into account that Greece is in an island position with regard to other Community partners not having common borders with other Member States. Interconnections with other Member States for gas or electricity would therefore substantially improve security of supply.
132. Greece has only a smaller indigenous oil production from the offshore Prinos field running at present at about 1.3 Mtoe. All the remaining oil requirements need to be imported. By 1995 it is expected that the Prinos field will be exhausted and no indigenous oil production will then exist.

Crude oil imports being mainly based on State to State contracts are rather diversified and the following supply sources have been used in 1986: OPEC=48% of which Libya and Kuwait supplied important shares. A further important supply source are the USSR.

Traditionally the Greek Government has acted as the sole supply agency for oil destined for the Greek market. They have also been the holders of all significant stocks. Export refiners, who have not been allowed to deliver to the Greek market except through sales to the government, also hold stocks. These exports refinery stocks are included by the government in their reporting of Greek national totals.

Exact details on market liberalisation have not yet been finalised. It appears probable that security stock holding obligations will be placed upon companies wishing to operate in the Greek market and it is to be hoped that at least some part of the security stocks will be maintained in government hands and under government control, so as to provide the maximum degree of required flexibility.



133. The only marginal gas production of 90,000 toe is coming from the South Kavala gas field being associated to the Prinos oil field. The broader introduction of natural gas to the Greek energy system will only start in the nineties with imports from the USSR and Algeria. As Greece is not linked with the Community gas grid the diversification of gas supply sources will be of special importance.
134. In the period 1983-1987 the proved lignite reserves increased by 1,183 million tons (27%), reaching today a total of 5,630 million tons of which 60% are classified to be economically exploitable. With these reserves the even higher planned future lignite production can be maintained into the next century. In 1986 less than 20% of total solid fuel demand was imported and this share is expected to further drop to about 15% in 1995.

#### Energy and Environment

135. Up to 1995, if compared with 1980 figures, it is expected that dust emissions will be reduced by more than 50%, SO<sub>2</sub> emissions to remain more or less stable and NO<sub>x</sub> emissions to double. Particularly in the greater Athens area (GAA), where air pollution has already reached critical levels, this forecasted doubling of NO<sub>x</sub> emissions has forced the authorities to adopt a five-year air pollution abatement plan for the GAA.
136. The measures of this plan that have already started to be applied can be described as follows:
- Reduction of sulphur in fuels (maximum sulphur content in fuel oil = 0,7% and in gas oil = 0,3%);
  - Reduction of lead in premium gasoline (0.15 g/l);
  - Efficiency specifications and inspections of domestic space heating furnaces and industrial boilers;
  - Interventions on car circulation and technical inspection of automobiles;
  - Shut down of an oil-fired power plant and removal of the town gas production plant;

Further future measures in the frame of this five-year plan will be implemented. Among the already applied actions, those dealing with the control of smoke emissions have been particularly successful. With regard to large combustion installations outside Athens (industry and electricity generation) no investment in flue gas desulphurisation or catalytic denoxing is foreseen at the present stage.

Sectoral Developments and OutlookOil:

137. With a share of about 64% of gross energy consumption oil continues to be the most important energy source. However the growing share of indigenous lignite has resulted in a falling inland oil consumption since 1982. Even in 1986 when international oil prices were falling dramatically no consumption increase took place. On the contrary constant end consumer prices of oil products contributed to a decrease in internal oil consumption by about 0.5 Mtoe in 1986.
138. The share of oil products consumed in the transport sector and in agriculture increased substantially in the past. This development was accompanied by decreased consumption in the residential and industrial sector. The industrial consumption of fuel oil, in particular, dropped remarkably.
139. The State has a refinery monopoly which applies to refining for the domestic market. There are two state owned refineries (Hellenic Aspropyrgos with 5.5 mio t/y having undergone a \$450 million modernisation programme and Thessaloniki refining 3.5 mio t/y) and two private refineries of a capacity of 4.5 mio t/y each. The latter two refineries are not authorised to supply directly the internal domestic market.
140. When joining the Community Greece accepted the commitment to suppress progressively its exclusive right of oil product imports for the domestic market. On the basis of Law 1571/85 some 35% of the domestic oil market have been freed for imports at the end of 1987. As the Commission has considered this gradual dismantling of the oil monopoly not to be in line with Greece's responsibility and the Act of Accession an infraction procedure has been started. Despite the gradual opening of the market, no imports from other EEC Member States have been realized by private marketing companies because of the pricing system and because of lack of adequate storage capacity capable of receiving large shipments.
141. Up to 1995 oil consumption is forecasted to represent about 52% of gross energy consumption. All these oil requirements are expected to be imports as the production from the Prinos field should be exhausted in 1995 and no commercial oil finds have so far been made despite exploration efforts. In the 1984 review it was announced that the legislative framework concerning exploration might be changed. These changes did not happen over the review period and Act NO 568/76 on hydrocarbons is still in force. Hydrocarbon exploration is presently undertaken by DEP-EKY and a new concession round is not in sight.

Natural gas

142. Very small quantities of natural gas are produced and used in Greece at present. However in 1987 some principle agreements have been reached with the USSR and Algeria concerning gas imports. The commercial terms of corresponding detailed import contracts are at present being negotiated by DEP and the respective exporters.
143. With regard to the imports of gas from the USSR a new pipeline needs to be built from the Bulgarian border to Thessaloniki and Athens. Algerian gas should be landed at an LNG terminal near Athens that could start operations in 1991/1992. In the start up phase the oil-fired Keratsini power plant near Athens could be converted to gas use to serve as a buffer. According to present forecasts imports of natural gas in 1995 could amount to 1.5 Mtoe or 6% of gross energy consumption.

Solid fuels

144. Indigenous lignite production of about 5 Mtoe represented about 27% of gross energy consumption in 1986. Lignite is of special importance in the context of Greece's overall national economy and a vital employment factor. In the past PPC was quite successful in increasing its lignite production that is nearly exclusively used for electricity production. Lignite production nearly tripled since 1973 and according to the ten year Development Program of PPC (1987-1996) is expected to further increase substantially in the future.

The increase in lignite demand over the period up to 1995 shall be met by mines already in operation and under development.

Therefore, investment in lignite mining over the period 1987-1991 will increase till 1988 and then fall. Investments for new mines, which will be required to meet increase in electricity demand beyond 1996 are under consideration, and will affect (increase) investments of the last years (90-91) of the investment program. The recent creation of the Greek lignite center will help to expand the envisaged lignite production.

145. As there are no indigenous coal reserves in Greece the importance of this fuel in overall energy demand has always been limited. However imports of coal since 1982 nearly tripled and amounted to 1.1 Mtoe in 1986. The main consumer is the cement industry having now switched totally from oil to coal. However in future further increases of coal consumption seem to be marginal. Because of its limited size industry is not expected to increase coal conversion and PPC will stop using coal as a blending material to improve the calorific value of its lignite. For this purpose high quality lignite from smaller private producers will be used.

### Electricity

146. In 1986 total electricity consumption amounted to nearly 27 TWH. This total demand was covered by an electricity generation of about 24 TWH in the interconnected system, 1.5 TWH in island stations and imports of 1.3 TWH. The share of hydrocarbons in electricity generation in the mainland system amounted to about 15% in 1986 (21% of total fuel input for electricity generation); the share of lignite representing nearly 75%. Electricity generation on the islands is nearly exclusively dependent on fuel and diesel oil.
147. Utilisation of indigenous energy resources for electricity generation is planned to be intensified by the construction of new lignite fired and hydroelectric plants. For the time period 1987 to 1995 some further four lignite fired plants with a capacity of 1.2 GW and 17 hydroelectric stations with a total capacity of 1.5 GW will be commissioned in the interconnected system. These additions to existing capacity should result in a fuel input for the generation of electricity in the mainland system being more than 95% dependent on indigenous energy sources. The share of hydrocarbons is expected to fall below 5% of fuel input.
148. This positive development could be further strengthened if a direct interconnection with another Community Member State could be realised. At present PPC's mainland transmission network is interconnected with Albania, Yugoslavia and Bulgaria.

### New and Renewables

149. To increase the use of new and renewable energy sources is one of the main objectives of Greek energy policy as expressed in the ongoing five year economic plan. Although the Government and PPC promotes the exploitation and maximized use of renewable energies it is acknowledged that their share in the overall energy balance will remain modest for many years to come and will represent about 3-5% of total energy output in the year 2000. On the basis of Law 1559/85, which opens the possibility of electricity autoproduction from renewable energy sources, a ministerial decree is expected to be issued in the near future to set electricity tariffs for autoproduced electricity to be fed into PPC's system. Such tariffs should further stimulate the use of solar, wind and geothermal energies being prime targets for future developments. The Valoren programme, the Integrated Mediterranean Programmes, the Energy Demonstration Programme and the old non-quota programme of the European Regional Development Fund will to a very large extent assist Greece in the development of new and renewable energy sources. In 1987 the Greek Government has decided to establish a Center for new and renewable energies to further promote these energy sources.

CONCLUSIONS

The cornerstone of the Greek energy policy is the reduction of its oil dependence by the use of indigenous lignite or the introduction of other alternative energy sources. In the past Greece has been quite successful in pursuing this national policy goal being fully in line with the Community's energy objectives.

Especially the exploitation of indigenous lignite for electricity generation has reduced oil consumption in power plants. According to present forecasts this successful development should continue to reduce the share of hydrocarbons as fuel input for electricity generation to a marginal level.

To ensure that this envisaged lignite expansion programme in mining and power generation does not run into difficulties because of lacking financial means the already more healthy economic position of PPC should be further improved by a cost covering electricity tariff system.

Additional positive results concerning oil substitution will be undoubtedly achieved by the decided introduction of natural gas to the Greek energy system. The Government together with DEP should therefore ensure that all necessary means are made available for a successful realisation of these plans. Furthermore security of supply aspects concerning the imports of non-OECD natural gas should be monitored very closely.

Further substantial progress could have been realized if a comprehensive and coherent energy efficiency policy were implemented in the past. At present only some single tools are in existence to stimulate energy efficiency not always being fully applied. The definition and implementation of a coherent energy efficiency policy is therefore of prime importance and efforts undertaken at present to define such a policy should be finalized in due course.

Greece should in the context of dismantling its oil monopoly and opening the national oil market for product imports from other Member States respect its commitments from the Act of Accession and the EEC-Treaty.

## SUMMARIZED ENERGY BALANCE - HELLAS

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	12.51	16.02	18.57	18.75	22.3	25.8
-BUNKERS	0.83	0.82	1.10	1.71	1.8	1.8
-INLAND CONSUMPTION	11.68	15.20	17.47	17.04	20.5	24.0
INLAND ENERGY CONSUMPTION	11.68	15.20	17.47	17.04	20.5	24.0
-SOLID FUELS	2.19	3.81	6.08	6.19	9.3	10.4
-OIL	9.28	10.95	11.02	10.37	10.8	11.7
-GAS	0.21	0.07	0.07	0.10	0.1	1.5
-PRIMARY ELECTRICITY ETC	0.21	0.37	0.30	0.38	0.3	0.4
INDIGENOUS PRODUCTION (1)	1.97	4.82	6.47	6.75	8.9	9.3
-HARD COAL						
-LIGNITE & PEAT	1.77	3.42	4.84	5.06	8.0	8.9
-OIL		1.02	1.32	1.32	0.5	
-NATURAL GAS		0.07	0.07	0.10	0.1	
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.19	0.31	0.24	0.27	0.3	0.4
-OTHERS & RENEWABLES	0.01					
NET IMPORTS (3)	11.60	10.75	11.81	13.38	13.4	16.5
-SOLID FUELS	0.46	0.40	1.23	1.13	1.3	1.5
-OIL	11.13	10.29	10.52	12.14	12.1	13.5
-NATURAL GAS						1.5
-ELECTRICITY (2)	0.01	0.06	0.06	0.11		
STOCK CHANGES (4)	1.07	- 0.45	- 0.30	1.38		
-SOLID FUELS	0.04	0.01	0.02			
-OIL	1.03	- 0.46	- 0.28	1.38		
-GAS						
ELECTR. GENERATION INPUT	3.41	5.09	6.69	6.68	8.6	10.3
-SOLID FUELS (5)	1.47	3.22	4.81	5.01	7.6	8.6
-OIL	1.74	1.56	1.64	1.40	0.7	0.8
-NATURAL GAS						0.5
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.19	0.31	0.24	0.27	0.3	0.4
-OTHERS & RENEWABLES	0.01					

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	9.9%	3.0%	2.9%	4.7%	3.3%	
GDP ANNUAL GROWTH RATE	7.7%	2.6%	1.6%	1.8%	3.0%	
IMPROVEMENT IN ENERGY INTENSITY		-1.9%	0.8%	-8%	-1%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	80.8%	73.5%	65.3%	64.4%	56.5%	52.3%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	51.0%	30.6%	24.5%	21.0%	8.1%	12.6%
SUPPLY DEPENDANCE ON IMPORTS	92.7%	67.1%	63.6%	71.4%	60.1%	64.0%

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SPAINIntroduction

150. The Spanish energy sector underwent a major restructuring between 1982 and 1986 for the following two reasons.

The adoption of a new National Energy Plan in 1984 led to far-reaching changes in both Spain's national energy objectives and its institutions: new bodies were set up to enable the sector to respond quickly to the volatile nature of the energy markets and to make the structure more efficient and more competitive.

When Spain joined the European Community in 1986 further changes had to be made to bring national energy objectives into line with Community objectives and Community legislation.

Energy trends since 1982Supply and demand trends to 1986

151. Between 1982 and 1986 the annual average GNP growth rate was 2.2% compared with an average annual growth rate of 1.7% for gross internal energy consumption and 3.7% for final electricity consumption.

The pattern of gross energy demand moved as follows:

	%		
	1973	1982	1986
Oil	74.2	64.8	56.0
Solid fuels	16.8	25.8	24.5
Gas	1.8	3.0	3.4
Primary electricity	7.2	6.4	16.1
	<u>100</u>	<u>100</u>	<u>100</u>

The deliberate policy pursued by Spain to reduce its dependence on oil led to a decrease in consumption of nearly 10% between 1982 and 1986; this was mainly due to the contribution from nuclear and the use of solid fuel instead of oil for electricity generation. There was in consequence a slight increase of nearly 4% in solid fuel consumption during this period.

There was a significant rise in the consumption of natural gas (up by 22%), although its role in the overall energy balance is still marginal. The most marked increase was in primary electricity consumption, which virtually tripled during the period in question.

152. National energy production increased by 42% from 1982 to 1986. This increase was largely accounted for by the 300% rise in nuclear energy production. Solid fuel production increased slightly to over 13 million toe whereas oil production increased by 20%.

### Energy policy

153. The Spanish energy sector was for historical reasons subject to a degree of government control for many years (fixing of energy prices, monopoly control over the distribution of petroleum products, etc.). Public enterprises, in competition with those from the private sector, are active in all energy sectors.

154. Spain's present energy policy has been shaped by the National Energy Plan which was unanimously adopted by the Spanish Parliament in June 1984 on the basis of the proposals submitted by the Government in 1983.

The Plan has the following objectives:

- (i) to reduce energy dependence and vulnerability by increasing domestic production and diversifying external sources of supply;
- (ii) improving energy efficiency in the energy consuming and energy production sectors;
- (iii) making optimum use of energy infrastructures to satisfy national demand but reducing excess production capacity.

155. In the three years following the introduction of the Plan in 1983 there was far-reaching institutional restructuring in the energy sector. In 1985 REDESA (Red Eléctrica de España SA) was established in which the public sector has a majority shareholding. The role of REDESA is mainly to optimise the means of production and transport of electricity as well as guaranteeing its supply and to ensure security of distribution and development of the high tension network.

The shares which the state held in the oil monopoly have been transferred to CAMPSA, in which Spanish refiners now have a majority interest.



Insofar on the second part of the nuclear fuel cycle is concerned INI (National Institute of Energy) and JEN (Nuclear Energy Company) formed in 1984 ENRESA (Empresa Nacional de Residuos Radioactivos S.A.) to manage the treatment, stocking and care of radioactive waste.

In accordance with the National Energy Plan JEN in 1986 became the Centre for the Study of Energy Technology and Environment (CIEMAT) with was in restructured into five institutes whose principal activities encompass nuclear technology and new and renewable energies.

An office for Research and Development (OCIS) was established as well for each of the energy sectors.

The Institute for energy diversification and saving (IDAE), created in 1984 was charged with the promotion of new and renewable energies as well as the rational use of energy.

Finally there is the Council for Nuclear Safety (CSN) what is a state body set up in 1980 and responsible to parliament for the field of nuclear safety and radiation protection.

156. The changes that took place in world energy situation since 1983 led the Spanish Government to put in hand the drawing up of sectoral plans for the gas, oil electricity and renewable energies sector which would when taken together form a national energy plan.

#### Energy forecasts to 1995

157. The forecasts for 1995 set out below are based on the last report of the Ministry for Industry and Energy to the Spanish Parliament. These estimates arise from work already underway in the Spanish administration to realise the energy plan.

158. Final energy demand (excluding energy savings) is expected to grow at an average annual rate of 2.2% between 1986 and 1995, with final consumption rising from 50.2 million toe in 1986 to 60.7 million toe.

159. Final consumption forecasts for each sector are as follows:

Final gas demand in 1995 is expected to be 4.5 million toe compared with 2 million toe in 1986, giving an average annual growth rate of 9.1%.

Final demand for petroleum products in 1995 has been put at 37.7 million toe, an average annual growth rate of 1.2% over 1986, when it stood at 34.1 million toe. Account has been taken of petroleum products replaced by natural gas in calculating this growth rate, but not of those replaced by coal. The transport sector will account for virtually the entire increase. Consumption in the residential and tertiary sectors will remain level and will fall in the industrial sector.

Final electricity consumption (in the Spanish peninsula wich represents 95%of national consumption) will increase at an average annual rate of around 3.3% from 1986 to 1995. There is likely to be a 1% fall in consumption in the steel sector but an average annual increase of 5.2% in the non-industrial sectors (residential and tertiary).

There is expected to be a slight increase in final consumption of solid fuels. The average annual growth rate is put at 1.0% between 1986 and 1995. This increase will be largely accounted for by cement production.

### Horizontal developments

#### 160. Energy efficiency

In order to accomplish its energy efficiency objectives the Energy Administration set up in 1984 the Institute for Energy Diversification and Saving (IDAE).

Energy intensity in Spain increased by 7.3% during the period 1973/82 but has now begun to improve with a 6.7% improvement being recorded during the period 1982-86.

The energy efficiency measures adopted include:

- (i) sectoral agreements with energy-intensive industries which have set multiannual objectives for the improvement of efficiency. Conservation in industry is promoted by supporting energy audits and consultancy and by the provision of direct subsidies for energy efficiency investments,
- (ii) in the residential and service sector, systematic campaigns of technical support for the analysis and rationalization of consumption by local authorities and the domestic sector. These programmes concentrate on public buildings with subsequent extension to other buildings in the residential and service sectors,
  - (a) measures to rationalize traffic in major cities,
  - (b) publicity campaigns (including press, leaflets, seminars and conferences) aimed at creating public awareness of the need for energy efficiency,
  - (c) training of technicians at different levels by means of the publication of specialized documentation, and seminars and courses for operators and maintenance staff,
  - (d) an RD&D scheme aimed at developing and demonstrating energy-efficient technologies. Spending on energy conservation R&D was approximately 6 million ECU in 1986, which is equivalent to the 1977 level. The 1984 level was around 39 million ECU.

Since 1987 IDAE has not made indefinite loans for investments to improve the rational use of energy. From now on this body proposes to give integrated financial and technological aid which could cover the total cost of the project provided that the project in question was viable and that the finance made available would be reimbursed.

The Spanish National Energy Plan has made the improvement in the rational use of energy one of Spain's major energy objectives. The programme adopted to accomplish this aim draws from the successes of many of the other Member States' initiatives. Of particular interest is the series of voluntary agreements signed with those industries known to be the most energy-intensive e.g. iron, steel, chemicals, brick, etc. The Energy Administration has also been particularly active in promoting the use of novel financing techniques, e.g. third party financing, to accelerate energy efficiency investments.

#### 161. Security of supply

Despite the strenuous efforts made to replace petroleum products and to reduce consumption, the Spanish economy is still 56% dependent on oil, 95% of which is imported. In 1979, 75% of imports came from the Middle East. Imports in 1986 break down at present into 33% from the Middle East, 33% from Africa, 23% from America and 10% from Europe.

Prior to joining the Community the Spanish compulsory stock obligation totalled 120 days. This has now been reduced to 90. Prior to the entry of new marketers into the Spanish market this obligation was covered by the refiners, who were responsible for 60 days of stock, and by CAMPSA, which holds 30. New marketing companies (importing from other Community countries) are required to keep stocks of 90 days. The Commission has proposed and Spanish authorities have agreed in principle to reduce this stock obligation to 60 days as long as the new marketing companies are obliged to deliver the imported products to CAMPSA.

In an emergency situation and depending on its nature, intensity and possible duration, Spain will take measures which would involve the use of available stocks as well as measures aimed to reduce demand. In the framework of the monopoly that would imply in any event the use of stocks (which are owned by the State) and which would lead to a reduction in the 90 days obligatory levels. However, the Government is examining the possibility of a degree of central government stock which could be in excess of the 90 and therefore freely available for early use. This development will, however, be some way into the future.

162. For solid fuel, national production can satisfy some 70% of internal requirements. The need for imports has grown with the increasing substitution of solid fuel for oil in power stations. Spain's main suppliers are the United States, Australia, South Africa and Poland. Spain's external dependence for this energy source does not give cause for concern, given the situation on the world market and the diversity of supplier countries.

163. Natural gas imports cover 86% of national requirements and come solely from Libya and Algeria. From 1992 Spain will be dependent on one supplier, if the negotiations currently underway with Libya do not lead to a new supply contract to follow on from the existing one which is due to expire in 1991. Although natural gas accounts for only 3.4% of total energy consumption, this will put Spain in a very vulnerable position. To offset this situation Spain has entered into negotiations with a view to obtaining natural gas supplies from 1993-1994. These could come from Norway, USSR and other countries.

164. There has been an increase of over 300% in nuclear-based electricity production over the last four years. Concentrated uranium requirements are five times higher than national production which should however be sufficient up to 1991. However, present stocks, which are governed by a law adopted in 1985, are sufficient to keep power stations going for around another five years.

#### 165. Energy and the environment

In 1984 the Spanish Parliament adopted a resolution based on the National Energy Plan calling for further damage to the environment to be halted. In broad terms it advocates greater transparency in public information, special precautions in energy production in the vicinity of large urban conurbations and a general improvement in national solid fuel production (coal washing). In addition to these general guidelines several laws and decrees were adopted in 1986 which govern the recovery of the energy content of urban waste, the sulphur content of national coal used to produce electricity and the sulphur content of diesel oil.

#### Sectoral developments and outlook

##### 166. Oil

Oil plays a major role in primary energy consumption, accounting for 56% of energy requirements. Efforts to reduce consumption have already proved successful, with a 21% fall between 1980 and 1986. Final demand has fallen in the industrial sector and grown in the transport sector over the last three years. Oil's share of gross energy consumption could still be 51% by 1995 - much higher than the Community objective of 40%. Net oil imports are expected to account for 48% of gross energy consumption by 1995 compared with 52% in 1986.

There is a formula which is used to calculate ex-refinery prices. Consumer prices, however, are calculated according to national estimates. Ex-refinery prices are calculated each month, whereas consumer prices may remain unchanged for several months at a time. The difference between the price including tax and the final price paid by the consumer is made up of a variable tax (Renta) which is paid to the State.

The Spanish refining industry is plagued by three fundamental problems:

- (i) excess distillation capacity: topping capacity in the Community as a whole fell by 35% between January 1980 and December 1986 but by only 14% in Spain;
- (ii) mismatched supply: as demand has shifted towards lighter products the Spanish refining sector will also have to continue to switch to this type of production;
- (iii) improvement in products: for environmental reasons the quality of certain products will have to be adapted to the new legislation.

The laws governing the Spanish oil monopoly introduced in 1927 are being radically amended to bring them into line with the obligations stemming from Article 48 of the Treaty of Accession.

#### 167. Natural gas

Natural gas accounts for only 3% of gross energy consumption. Under the National Energy Plan this is to be doubled by 1990, but it will still be lower than the Community average, which is around 18%. Although national production increased by 26% in 1986 it covers only 14% of natural gas requirements. Domestic production will be expanded with the Gaviota field, which came on stream in 1986.

There is a political commitment to developing the use of natural gas. This can be seen in the "gas protocol" signed in July 1985 between the Ministry of Industry and Energy and a number of bodies such as the Instituto Nacional de Hidrocarburos and gas distribution companies. The protocol's aim is to provide a framework under which natural gas can be developed in Spain.

The gas pipeline network is being developed and seven further cities (including Madrid) were linked up to the network in 1987. Talks are being held with Gaz de France to connect up the two networks and to allow Spain to obtain supplies from 1993-1994 from Norwegian, Soviet or other suppliers.

Studies are being carried out into a link-up with the Portuguese network.

#### 168. (c) Solid fuels

Solid fuel consumption varied very little during the last four years, accounting for some 25% of gross energy consumption. As oil has been increasingly replaced by coal, power stations now account for 82% of total coal consumption. Consumption in the steel industry has continued to fall since 1981 and now accounts for only 9% of coal consumption. Solid fuel consumption is expected to make up 28.6% of gross energy consumption in 1995 compared with 24.5% in 1986. This trend is in line with the Community objective of promoting the consumption of solid fuels.

Solid fuel production has slightly increased during the last four years, although it was slightly down in 1986 (by 3.5%) over 1985. Production is heavily concentrated in four coalfields. Over 80% of coal produced comes from the Leon, Asturias and Teruel coalfields and some 78% of anthracite comes from the Leon and Asturias fields. Virtually all recent lignite (lignito pardo) comes from Corunna.

169. An important framework agreement was signed in December 1986 between the electricity generating sector (UNESA) and the National Federation of Coal Producers (CARBUNION). Its aim is to make the coal sector more competitive by providing a stable framework under which long-term contracts can be concluded. Since February 1987 such contracts have been concluded at prices fixed freely between the contracting parties (free or reference prices) and not according to authorized prices as was the case under the previous arrangements.

#### 170. Electricity

Electricity production is steadily increasing. Nuclear-based electricity generation exceeded hydro generation for the first time in 1986; this was partly due to the fact that this was a very dry year. Production breaks down as follows: 51% conventional thermal production, 29% nuclear and 20% hydro.

Oil-based electricity generation fell by over 75% from 1982 to 1986. It now accounts for less than 5% of total electricity production. The share of electricity produced from hydrocarbons is expected to be around 7% in 1995, in line with the Community objective of reducing this share to under 15%.

171. In terms of installed capacity, nuclear accounted for 5.8 GW, hydro for 15.2 GW and conventional thermal electricity for 21 GW, out of a total of 42 GW in 1986. Existing power stations and the new plants to be introduced are expected to satisfy demand up to 1994, assuming an annual demand growth rate of 3.3%.

With existing capacity and work currently underway (hydro), and the entry into service from 1988 of two nuclear power stations combined with autoproduction and cogeneration there should be no need for new capacity on the Spanish Peninsula (which accounts for 95% of national demand) until around 1995, assuming an annual growth rate in demand of 4%.

The Spanish Government decided in March 1984 to scale down its nuclear programme by stopping work on five new units.

Installed nuclear capacity planned for the early 1990s will now be reduced from 12.5 to 7.5 GW, which will be attained when the Vandellos II and Trillo I plants come into service in 1988.

#### Renewable energy sources

172. The National Energy Plan recognizes the need for renewable energy sources in order to diversify and reduce Spain's dependence on energy imports. The first Renewable Energy Plan (PER) was submitted in June 1986 in response to the resolutions adopted by the Spanish Parliament when the 1983 Energy Plan was approved. A revised Renewable Energy Plan is expected during 1988.

173. This Plan's general objective is to increase the share of renewables in total primary energy demand by 1% in 1988 and to raise it to 3% by 1992.

The main obstacles to the development of renewables in Spain are:

- (i) the lack of coordination between the many different bodies responsible for these energy sources;
- (ii) the lack of continuity in their use and the lack of an overall coherent strategy under which well-defined objectives can be pursued.

It was hence decided to set up a Coordinating Committee for the Renewable Energy Plan comprising the heads of the many bodies responsible for renewable energy sources and representatives of the authorities of the autonomous regions, which have a part to play because these resources are widely scattered.

174. The renewable energy sources covered by the Plan are solar, wind, biomass, small-scale hydro schemes and geothermal energy. The annual production targets for all these sources are 0.9 million toe in 1988 and 2.7 million toe by 1992 of which two thirds will be biomass and small hydro.

175. It should be noted that many regions of Spain may be eligible from 1987 for support, over a period of five years, under the Valoren programme adopted by the Council in October 1986. This will not only exploit the indigenous energy potential of these regions but also help achieve the Community's energy policy objectives.

Conclusions

Over the period 1982-1986 the energy sector in Spain equipped itself with new structures designed at once to strengthen it and make it better able to adapt to international competition.

Spain's energy policy, as set out in the National Energy Plan, has implemented a whole range of measures to increase the country's energy independence, notably through:

- a reduction in the consumption of oil by way of substitution of this source of energy;
- the diversification of the sources of energy used (sustained penetration of natural gas and greater production of electricity of nuclear origin);
- the establishment of the first Renewable Sources Energy Plan designed to give these sources of energy a greater say in the energy balance;
- more efficient use of energy.

Nonetheless, efforts to ensure that natural gas plays a more significant role in the Spanish energy balance should be continued and, if necessary, stepped up.

Spain should continue and increase its efforts to use energy more efficiently and hence reduce the leeway on the Community average.

As regards the production of electricity, a deficit in installed power could emerge as from 1995. Given the time needed to establish new power stations, decisions in this field, especially with regard to the nuclear moratorium, should be taken at the earliest.

The dismantling of the oil monopoly should, in accordance with the Act of Accession and the EEC Treaty, be achieved within the transition period.



## SUMMARIZED ENERGY BALANCE - ESPANA

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	53.63	68.60	72.92	74.93	81.5	90.7
-BUNKERS	2.05	1.60	2.63	3.38	3.3	3.3
-INLAND CONSUMPTION	51.58	67.00	70.29	71.55	78.2	87.4
INLAND ENERGY CONSUMPTION	51.58	67.00	70.29	71.55	78.2	87.4
-SOLID FUELS	9.03	17.69	19.68	18.37	19.8	22.7
-OIL	37.76	42.84	38.12	38.64	39.3	42.8
-GAS	0.96	2.09	2.35	2.55	3.8	6.3
-PRIMARY ELECTRICITY ETC	3.83	4.38	10.14	11.99	15.3	15.6
INDIGENOUS PRODUCTION (1)	11.13	19.49	26.85	27.73	30.7	31.1
-HARD COAL	4.48	8.14	8.95	8.73	8.7	9.1
-LIGNITE & PEAT	2.00	4.90	4.99	4.39	4.0	4.0
-OIL	0.65	1.81	2.45	2.18	1.5	0.5
-NATURAL GAS			0.23	0.33	1.2	1.9
-NUCLEAR ENERGY	1.46	2.27	7.38	9.72	12.3	12.3
-HYDRO & GEOTHERMAL (2)	2.44	2.27	2.69	2.26	3.0	3.3
-OTHERS & RENEWABLES	0.10	0.10	0.16	0.12		
NET IMPORTS (3)	43.11	48.13	45.94	45.94	50.8	59.6
-SOLID FUELS	2.15	4.69	5.22	5.35	7.1	9.6
-OIL	40.18	41.62	38.67	38.50	41.1	45.6
-NATURAL GAS	0.95	2.08	2.14	2.20	2.6	4.4
-ELECTRICITY (2)	- 0.17	- 0.26	- 0.09	- 0.11		
STOCK CHANGES (4)	0.61	- 0.98	- 0.12	- 1.26		
-SOLID FUELS	- 0.40	0.04	- 0.51	0.10		
-OIL	1.02	- 1.01	0.37	- 1.34		
-GAS	- 0.01	- 0.01	0.02	- 0.02		
ELECTR. GENERATION INPUT	12.38	23.10	25.96	26.67	30.9	35.9
-SOLID FUELS (5)	3.02	10.93	13.20	12.54	13.7	17.3
-OIL	5.23	6.70	1.98	1.56	1.5	2.7
-NATURAL GAS	0.13	0.83	0.55	0.47	0.4	0.3
-NUCLEAR ENERGY	1.46	2.27	7.38	9.72	12.3	12.3
-HYDRO & GEOTHERMAL (2)	2.44	2.27	2.69	2.26	3.0	3.3
-OTHERS & RENEWABLES	0.10	0.10	0.16	0.12		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	9.2%	2.9%	1.7%	2.2%	2.2%	
GDP ANNUAL GROWTH RATE	5.8%	1.9%	2.2%	3.0%	3.0%	
IMPROVEMENT IN ENERGY INTENSITY			6.7%	1%	4%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	74.2%	64.8%	55.9%	56.1%	52.3%	50.8%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	43.3%	32.6%	9.7%	7.6%	6.1%	8.4%
SUPPLY DEPENDANCE ON IMPORTS	80.4%	70.2%	63.0%	61.3%	62.3%	65.7%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES

- NOTES
1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
  2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
  3. THE (-) SIGN MEANS NET EXPORTS
  4. THE (-) SIGN MEANS A STOCK DECREASE
  5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

FRANCEIntroduction

176. The conclusions reached by the Commission highlighted the major overhaul of the French energy economy since 1973, with the clear emphasis on nuclear energy and the range of energy conservation measures. Between 1973 and 1982 gross energy consumption declined by more than 1%, mainly owing to the plunge in oil consumption, down by nearly 27%. The share of oil in the energy balance fell from 71.7% in 1973 to 53.0% in 1982, affecting imports of oil, which dropped by some 31%. There were plans to continue and even to speed up the oil substitution process during the 1980s by doubling available nuclear capacity.

However, there are still uncertainties about the coal industry and about the future role of natural gas.

Energy trends since 1982Supply and demand trends to 1986

177. From 1982 to 1986 average annual GNP growth was 1.4% while final energy consumption increased by an average of 1.3% a year, and final electricity consumption by 4.8% a year.

178. The pattern of gross energy demand moved as follows:

	1973	1982	% 1986
Oil	71.8	53.0	43.5
Solid fuels	15.9	15.8	10.3
Gas	7.5	11.8	12.2
Primary electricity	4.8	19.4	34.0
	<u>100</u>	<u>100</u>	<u>100</u>

179. These changes are explained principally by the large increase in primary electricity consumption; this doubled between 1982 and 1986, whereas the consumption of natural gas increased by only 15%. Consumption of solid fuels and oil declined over the same period, by 26% and 7% respectively.

National energy production increased by nearly 60% between 1982 and 1986, most of this being in the nuclear power sector with a production increase of 125%. The solid fuel sector continued to shrink, with production dropping by 14%, and production of natural gas following the depletion of the Lacq gasfield, fell by some 34% over the same period.

### Energy policy

180. The main features of French energy policy are dictated by constraints of geology and strategy.

France is dependent on imports and in 1986 it imported from the Community and non-Member states virtually all its oil, more than 80% of its gas and over half its coal.

181. After the first oil crisis the Government worked out an energy policy whose main features have been endorsed by successive Governments. There are three main objectives:

- (i) to encourage rational use of energy by saving energy and replacing oil by alternative energy sources;
- (ii) to step up national energy production, mainly by boosting the nuclear energy programme;
- (iii) to diversify imports, both by type of energy and by origin.

182. Since March 1986, the new Government has specified the main features of its energy programme. Its main emphasis is to encourage competition between the different energy forms.

The measures announced or now being implemented include:

- (i) deregulation in the energy sector, partly by making the 1928 oil monopoly law more flexible, discontinuing the 1944 coal importing monopoly and taking measures to privatize public oil corporations;
- (ii) allowing these corporations more freedom to manage their own affairs and increase competition;
- (iii) making energy taxation more neutral (lower taxes on heavy fuel oil and gas in industry).

### Energy forecasts to 1995

183. When preparing the Ninth Plan in 1982 and 1983, the Long-Term Energy Group examined supply and demand prospects for France in 1990 and 2000. Because of the recent drop in the price of oil, new supply and demand forecasts were drawn up for 2000.

The forecasts were based on contrasting scenarios of which two were studied in-depth. The first scenario was a combination of high prices for imported energy (crude at \$25 a barrel in 1990 and \$35 in 1986 value terms in 2000) and low economic growth (between 1.2 and 1.5% year), with energy saving remaining steady.

The second scenario assumed moderate imported energy prices (crude at \$15 a barrel in 1990 and \$20 in 1986 value terms in 2000), strong economic growth (between 3% and 3.3% year) and weaker energy savings.

184. The following conclusions can be drawn from this study (taking the average of the figures provided by the two scenarios):

- (i) by 1995 total primary energy consumption in France could be around 207 million toe (compared with 200 million toe in 1986); this difference would be due mainly to an increase in electricity consumption;
- (ii) the breakdown of energy consumption by source: coal consumption should continue to decline, down to only 16.6 million toe by 1995 compared with 20.6 million toe in 1986; by 1995 oil will have lost its first place in the energy balance to primary electricity (hydro and nuclear), consumption of which could reach 88 million toe compared with 68 million toe in 1986; oil consumption forecasts for 1995 average out at 75 million toe compared with 84.6 million toe in 1986; natural gas consumption levels are expected to fluctuate around 27 million toe in 1995 compared with 24.3 million toe in 1986;
- (iii) between 1986 and 1995 French energy production should increase by 17%.

## Horizontal developments

### Energy efficiency

185. France has had a substantial energy efficiency programme since the late 1970s. However, since the last evaluation in 1984 there has been a significant change in Government policy towards energy efficiency. All the grant and subsidy programmes (including tax credit programmes) have been terminated and there is greater emphasis on the provision of energy efficiency information, energy audits, building codes and inter energy competition.

Energy intensity improved by 26% between 1973 and 1982, however an improvement of only 0.1% was recorded for the period 1982-86.

There have been five separate allocations under the FSGT (Fonds Spécial des Grands Travaux) for energy efficiency investments, the last being a 263 million ECU allocation announced in February 1986. It is unlikely that any further State funds will be available for energy efficiency investments in industry.

186. The French Government is considering the establishment of a guarantee fund which would guarantee the price of energy for those making investments in energy efficiency, i.e. investors have a guarantee that payback periods calculated under prevailing price conditions will be maintained in the event of price falls.

Energy efficiency RD&D activities already under way will probably be maintained. Certain energy producers (EdF, GdF, ELF) have introduced a subsidy scheme to assist work or equipment which will result in energy efficiency improvements.

The French energy efficiency programme has entered a new phase in which direct State assistance will no longer be available and the State will try to convince energy users that profitable investment in energy efficiency is in their own interests. Energy audits, energy consultancy and technological development and demonstration will continue to be supported. The principal agency of State policy on energy efficiency, the Agence Française pour la Maitrise de l'Energie, has been reorganized.

#### Security of supply

187. In 1973 the level of energy independence stood at only 22.5%. It has improved since then and by 1986 had reached 46%. According to the scenarios described above it should be somewhere between 51 and 56% by 1995 and between 52 and 58% by 2000.

188. France depends on imports for 96% of its oil supplies. It has recently diversified its sources and now principally relies on North Sea oil and oil from Africa and the Middle East.

It is attempting to diversify still further. With the changing structure of the world market, it should be easier to do this by reducing the number of long-term supply contracts.

Compulsory oil stocks have been required in France since 1925. Until this year obligations were covered entirely by product importers and refiners. There is now a proposal to form a special stock holding company by the end of 1987. It will be a private company to which all market operators will be required to belong. It will be responsible for holding 45 days of stock, while the remaining 45 days will continue to be held by companies, as at present.

The legal arrangements for the formation of the company have now been completed but the financing arrangements remain to be concluded.

189. Natural gas is supplied on the basis of long-term contracts signed between producers and Gaz de France.

France imports more than 85% of its natural gas, mainly from Algeria, the USSR, the Netherlands and Norway. National production continues to decline. This will lead to an increase in the share of imports in natural gas requirements. Supplies from the Norwegian Troll and Sleipner gas fields should begin in 1993, which will make for a better balance in sources of supply.

Security oil stocks should by 1990 reach 7 million toe, which is about 28% of annual consumption in 1986. Existing security measures (a combination of underground storage and use of interruptible contracts) should make it possible to cope for at least one year if the largest source of supply dries up in 1990.

190. Forecasts of coal consumption for 1995 tend to be somewhere around the 18 million toe mark. Forecasts put national production for the same year at below 8 million toe. This means that imports should exceed 10 million toe.

The geopolitical position as it affects coal indicates that dependence on the world market presents no serious risks.

191. Currently, the nuclear industry is producing 70% of France's electricity. Conventional power stations (coal-, oil- and gas-fired) account for 12% and hydro for the other 18%. In view of this breakdown, uranium supplies are important.

French uranium reserves are estimated at 120 000 tonnes. Forecasts of annual consumption for 1990 are of the order of 9 000 tonnes, 6 000 of which would be imported.

192. Policy objectives in this area are to obtain large capital holdings in mining operations abroad and to build up large buffer stocks. By 1987 EDF was to have built up stocks equivalent to three years of normal consumption, which, given the scope for increased national uranium production and for technical changes to enrichment and reprocessing methods, should be sufficient to cope with a total interruption of imports for five years.

### 193. Energy and the environment

Combating atmospheric pollution is essentially the task of the Ministry of the Environment but it also involves the Ministries of Health, Industry and Transport as well as the Air Quality Agency.

Prevention is pursued through regulations imposed on polluters. These regulations are based chiefly on the Law of 19 July 1976 which is very general and covers pollution in all its various forms (air pollution, effluent, etc.). There are also specific rules on air pollution based on the Law of 1961 on atmospheric pollution.

194. The overall objective for oxides of sulphur (acid pollutants) is to reduce emissions by 50% between 1980 and 1990. By 1987 levels had been reduced by 47% by replacing conventional oil- and coal-fired power stations by nuclear power plants and by energy conservation as well as by specific measures taken in the installations using these fuels.

In the case of oil and gas (photo-oxidizing pollutants) the objective for 2000 is to reduce levels by 30%.

Efforts to reduce pollution are supported by monitoring and measuring networks covering the whole of the country (some 2 000 monitoring devices were operational in 1986).

#### Sectoral developments and prospects

##### 195. Oil

Total oil consumption in France (corrected for climatic variations) declined by nearly 10% overall between 1982 and 1985. However, this trend was reversed from 1985 to 1986 when consumption increased slightly by less than 1%. This was largely accounted for by increased stocks.

The share of oil in total gross energy consumption dropped from 53% in 1982 to 43% in 1986 and by 1995 should be around 36%, a level achieving and even exceeding the Community's target.

In the sectoral breakdown, the share of oil should decrease in power stations, the steel industry and manufacturing industry in general. It will decline, whenever scenario is chosen, in the residential and tertiary sector and increase by 7% between 1986 and 1995 in the transport sector (low price scenario).

196. In 1986, production (3.5 million toe) covered less than 5% of consumption, even though it had increased by 38% over four years.

Exploration and development activities have been intensified and recently - in spite of a less than attractive tax system - this has resulted in a number of encouraging discoveries in the Paris Basin, already the source of more than half of France's production.

Imports of crude oil and refined oil products alone account for nearly 80% of France's energy bill. This was cut by 50% in 1986 following the fall in world prices. By 1995, net oil imports should cover about 35% of gross energy consumption compared with 40.7% in 1986.

197. In the future, most of France's crude oil supplies will have to be imported at rates which will be determined by world market trends.

The French refining industry is confronted by two events. On the one hand it is faced by the very rapid fall off in heavy fuel oil consumption as a result of high oil prices up to 1985, high levels of tax (significantly reduced from 1988) and the development of nuclear generated electricity. On the other hand the industry has to face increased imports of refined products. France imports increasing quantities of middle and light products from Mediterranean and Gulf countries. This situation puts the refining industry in a difficult position: it must continue to convert and modernize at considerable cost or risk losing a substantial proportion of its production capacity in the financial context of unfavourable international prices.

#### 198. Natural gas

Consumption increased in 1982 and 1983 and stabilized in 1985 and 1986 at around 24 million toe. The share of natural gas in primary energy consumption could increase very slowly to reach between 12% and 14% by 1995. Market penetration by gas is hampered primarily because, in accordance with government policy, it has to compete with nationally generated electricity. Yet national production (from the Lacq field) has fallen slightly over the last two years and by 1986 was down to 3.6 million toe. As the Lacq field is exhausted and since there have been no new discoveries, national supplies will continue to decrease and by 1990 will account for only 10% of total supplies.

199. French gas requirements will have to be met almost totally by international suppliers. Gas is imported from Algeria, the USSR, the Netherlands and Norway, and Norway's share should increase as imports from the Netherlands decline. In the short to medium term, French gas supplies are likely to be adequate to cover probable consumption levels.

#### 200. Solid fuels

The production of solid fuels decreased from 11.7 million toe in 1982 to 10.2 million toe in 1986. Consumption followed the same trend with a sharp fall of 15.5% from 1985 to 1986 as the use of coal in power stations was cut. By 1995 the share of solid fuels in total primary energy consumption should stand at about 7-8%, down on the 1986 figure of 10%. The French Government is continuing its efforts to rationalise indigenous coal production.



201. There are many reasons for the general decline in the production and consumption of solid fuels. Production is falling principally because of the high production costs in France's coalfields, some of whose economically exploitable reserves are running out.

The importance of nuclear electricity in France also severely limits the need for coal to generate electricity.

Finally, the sharp falls in the prices of competing energy sources - fuel oil and imported coal - have increased the downward pressure on national production. The current trend seems to be continuing, so production should go on declining to levels of between 10 and 12 million tonnes by 1990.

## 202. Electricity

Electricity production figures in France for 1986 were double those for 1973, and 70% of this electricity was nuclear-generated.

A large proportion of production capacity is nuclear plant. In 1986 44.7 GWe of installed capacity was nuclear and represented 48.5% of the total. Conventional thermal power plants (24.6 GWe) accounted for only 26.7% and hydro (22.8 GWe) for 24.8%.

203. Internal electricity consumption in 1995 should be somewhere between 360 and 430 TWh (compared with 315 TWh in 1986), depending on economic growth and energy price trends. Use of electricity is increasing in all areas of final consumption, particularly heating (where it is expected to double in 15 years if there are no significant changes in conditions, especially tariffs).

204. Because of lead times, production capacity for 1995 is largely determined already. Despite smoothing the flow of work on nuclear plant construction, there is likely to be excess installed capacity before 1990 (compared with optimum levels) of between three and seven 1300 MW units. Total installed capacity is forecast at between 107.4 GWe and 109.7 GWe (according to EDF). Nuclear energy will represent about 58% of this total, hydro 23%, and conventional power stations the remaining 19%. The proportion of electricity generated by oil- and gas-fired capacity by 1995 should be about 3.0%, which is well within the Community's target of less than 15%. The balance for export, which today stands at 30 TWh, could be somewhere between 45 TWh and 50 TWh by 1995.

## 205. Renewable energy sources

The official estimate of consumption of renewable energy sources was approximately 4 million toe in 1986 (not including hydro). In France's energy objectives for 1990, it is planned to encourage the selective development of renewables on the basis of their competitiveness.

Potentially one of the most valuable energy sources will be wood, mainly from pruning and forest maintenance, providing an estimated 10 million toe a year. The other alternative sources (municipal and industrial waste, geothermal energy and solar energy) together represented only 1 million toe in 1986 and their future is uncertain because of the strong competition they are now facing from other forms of energy.

Conclusions

France is successfully pursuing its objective of strengthening its independence in energy, which has grown constantly since the first oil crisis.

The policy of developing the nuclear industry, which was given considerable backing during the 1970s, has made for an appreciable increase in the production of primary electricity, which now covers more than a third of the country's energy requirements and is bound to develop. The resultant potential for exporting electricity can be regarded as positive in that it allows Community countries buying this electricity to reduce their imports of certain fuels and to conclude firm, long-term supply contracts.

The oil substitution process is running its course, thus converging with the Community's energy objective in this matter. The penetration of natural gas, on the other hand, could doubtlessly be better, given the benefits offered by this source of energy both from the environmental viewpoint and from the diversity of supply.

The solid fuel sector has dipped appreciably in terms of both consumption and production. The latter has suffered from international competition and a contracting national market, which raises sticky problems as to the future of the coal industry in the medium term.

The efficient use of energy remains one of the priorities of the energy policy, but the means of strengthening this are changing (reduction in the role of the public authorities and budgetized aid) and results must be closely monitored.

## SUMMARIZED ENERGY BALANCE - FRANCE

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	180.04	178.08	196.10	200.01	198.7	207.5
-BUNKERS	5.32	2.87	2.38	2.39	2.2	2.1
-INLAND CONSUMPTION	174.72	175.21	193.72	197.62	196.5	205.4
INLAND ENERGY CONSUMPTION	174.72	175.21	193.72	197.62	196.5	205.4
-SOLID FUELS	28.73	28.13	24.41	20.62	17.8	16.6
-OIL	123.85	91.43	84.24	84.65	77.6	74.4
-GAS	13.59	21.10	24.27	24.33	24.4	26.4
-PRIMARY ELECTRICITY ETC	8.55	34.55	60.80	68.02	76.7	88.0
INDIGENOUS PRODUCTION (1)	34.31	54.77	81.31	87.49	93.6	102.6
-HARD COAL	16.35	10.90	9.83	9.38	7.1	5.2
-LIGNITE & PEAT	0.85	0.88	0.62	0.79	0.6	0.5
-OIL	1.98	2.59	3.51	3.57	3.4	3.2
-NATURAL GAS	6.32	5.52	4.54	3.54	2.8	1.8
-NUCLEAR ENERGY	4.54	28.64	57.27	64.59	69.3	81.3
-HYDRO & GEOTHERMAL (2)	4.14	6.14	5.38	5.44	6.2	6.2
-OTHERS & RENEWABLES	0.13	0.10	0.16	0.18	4.2	4.4
NET IMPORTS (3)	145.93	119.10	112.00	112.02	104.5	104.9
-SOLID FUELS	9.90	14.85	12.56	11.15	10.1	10.9
-OIL	128.73	88.33	81.27	81.54	76.4	73.3
-NATURAL GAS	7.56	16.25	20.18	21.52	21.0	24.6
-ELECTRICITY (2)	- 0.26	- 0.33	- 2.01	- 2.19	- 3.0	- 3.9
STOCK CHANGES (4)	0.20	- 4.21	- 2.79	- 0.50	- 0.6	
-SOLID FUELS	- 1.63	- 1.50	- 1.40	0.70		
-OIL	1.54	3.38	1.84	1.93		
-GAS	0.29	0.67	0.45	0.73	- 0.6	
ELECTR. GENERATION INPUT	34.87	56.75	75.12	80.13	81.5	93.5
-SOLID FUELS (5)	8.60	14.97	10.34	8.41	4.2	4.2
-OIL	15.37	5.90	1.46	1.03	0.8	0.8
-NATURAL GAS	2.09	1.00	0.51	0.48	0.9	0.9
-NUCLEAR ENERGY	4.54	28.64	57.27	64.59	69.3	81.3
-HYDRO & GEOTHERMAL (2)	4.14	6.14	5.38	5.44	6.2	6.2
-OTHERS & RENEWABLES	0.13	0.10	0.16	0.18	0.1	0.1

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
FINAL ENERGY ANNUAL GROWTH RATE	-	-1.0%	1.3%	0.5%	0.3%	
GDP ANNUAL GROWTH RATE	5.5%	2.4%	1.4%	2.2%	2.3%	
IMPROVEMENT IN ENERGY INTENSITY		26%	0.1%	9%	10%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	71.7%	53.0%	44.2%	43.5%	40.2%	36.9%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	50.1%	12.2%	2.6%	1.9%	2.1%	1.8%
SUPPLY DEPENDANCE ON IMPORTS	81.1%	66.9%	57.1%	56.0%	52.6%	50.6%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES

## NOTES

1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
3. THE (-) SIGN MEANS NET EXPORTS
4. THE (-) SIGN MEANS A STOCK DECREASE
5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

## GENERAL NOTES :

FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

IrelandIntroduction

206. There has been no fundamental change in the Irish Energy situation since the previous review. At the time of the last review Ireland's dependence on imported oil had been reduced from its 1973 level of 78% to 56% of energy consumption. This trend has continued.

Three issues were highlighted in the previous review:

- (i) The development of premium markets for natural gas;
- (ii) the potential for further energy conservation, and
- (iii) the structure of the electricity supply system.

These are addressed in the main body of the report.

Developments since 1982Market Trends

207. Gross energy consumption has risen strongly in Ireland. In 1986 consumption was almost 12% above 1982 levels while GDP grew at only 5% during the same period.

208. The main features of Irish energy consumption since 1982 are:

- oil consumption fell until 1984 but rose in 1985 and 1986 largely as a result of advantage being taken of low oil prices for electricity generation;
- solid fuel consumption almost doubled in the period as a result of the construction of the first large coal fired electricity station in the country;
- natural gas consumption declined as the results of a Court case limited the amount that the sole supplier, Marathon Petroleum, could be compelled to deliver.

209. The share (%) of fuels in gross energy consumption in Ireland is set out below.

	<u>1973</u>	<u>1982</u>	<u>1986</u>
Solid fuels	20	22	31
Oil	78	56	53
Natural gas	-	20	15
Primary electricity	1	1	1
Bunkers	1	1	-

210. Indigenous energy production (mostly peat and natural gas) accounts for nearly one third of energy consumption. Peat production is now at maximum levels and will start to slowly decline. Natural gas production will in the absence of further discoveries remain at its present level up to the end of the century.

#### Policy Developments

211. While there has not been any significant change in the main lines of Irish energy policy since the last review the energy sector has in line with other sectors of the Irish economy been subject to careful scrutiny so as to try to reduce the level of Government expenditure and make the Irish economy operate more efficiently.
212. As a peripheral region with no interconnections with other parts of the Community energy networks long-term diversification of energy supply and demand remains a key issue for Irish energy policy. Hopes about the likelihood of further commercial hydrocarbon discoveries in Irish continental waters have not materialised. To stimulate interest in exploration in Ireland and as a response to cutbacks in oil industry exploration budgets resulting from the fall in oil prices, the Irish Government announced new oil and gas licensing terms designed to maintain and expand the impetus of exploration in the Irish offshore area.

#### Energy outlook to 1995

213. Total energy demand in 1995 is expected to be close to 20% above 1986 levels. A large part of this increase is accounted by a growth in electricity consumption of almost 50% between 1986 and 1995. Although still an industrializing country such a growth rate might be difficult to achieve particularly when account is taken of the annual average 3.0% growth in GDP expected during the same period and the increased competition expected from natural gas.

214. The share of oil in total energy requirements is expected to continue to fall. Oil consumption in the industrial and tertiary sectors is expected to continue to lose out to gas and electricity whereas in the electricity sector any new generating capacity is likely to be coal fired. However there is the danger that because of existing spare capacity older oil fired power stations could be brought on stream again to meet future demand requirements.
215. The other sector where oil consumption is expected to continue to grow is in the Transport Sector. Unlike other EC countries oil consumption in this sector fell between 1979 and 1986. The main reasons for this were the improvements in the car fleet and the relatively high level of petrol taxation in Ireland. This downward trend is expected to be reversed over the coming years with oil consumption estimated to rise by more than one-third. This would be an exceptionally large increase and warrants further examination when new forecasts are being drawn up.
216. The share of solid fuels in energy requirements will continue to rise as a result of increased use of coal in the electricity sector. However indigenous peat production is expected to decline during this period as smaller, more uneconomic bogs go out of production.
217. Without further natural gas supplies the level of natural gas consumption will remain static up to 1995 with supplies for electricity generation decreasing further as premium markets for the fuel are developed.
218. The contribution from new and renewable energies is expected to remain marginal in the time ahead with a small increase in the contribution from small hydro envisaged.

#### Cross Sectoral Developments

##### Energy efficiency

219. The main directions of the Irish Energy Efficiency Programme have remained the same since 1984. Government financial support though has fallen substantially. The Government has depended on the relatively high fuel and electricity prices to promote energy efficiency in place of direct intervention. The majority of the Government programmes concentrate on the dissemination of energy efficiency information. Department of Energy spending on energy efficiency has fallen from around 900,000 ECU in 1983 to 350 000 ECU in 1986. Energy intensity improved by over 27% during the period 1973/82 but disimproved by 13% during the period 1982/86.
220. The main lines of action include:
- the promotion of the efficient use of electricity in the industrial sector by enabling free audits of electrical lighting and tariffs to be undertaken in large companies,

- energy audits of public lighting, water-pumping, sewage and transport in local authorities by Regional Energy Officers who also provide on-the-spot advice and guidance on energy-related matters and promote energy efficiency at local level throughout the country,
- the provision of advice to the public on energy conservation matters by telephone and by letter, and by issuing information packages where appropriate,
- support for the Energy Management Association's 'Travelling Seminar and Exhibition on Energy Efficiency',
- financial support to enable detailed energy audits to be carried out in specific public buildings in the Dublin area with a view to reducing the energy consumption of such buildings,
- provision of grants of up to 33% (of the cost) to manufacturing industries, hotels and third-level institutions towards the cost of engaging consultants to carry out fuel efficiency surveys, or grants in respect of feasibility studies for switching from oil to combined heat and power projects.

#### Security of supply

221. While oil consumption is expected to fall up to 1990 the rate of decrease will be much less than in the past. As a result of rising consumption in the transport and possibly the electricity sector oil consumption could rise again in the early 1990's. Ever so oil import dependence would fall to around 45% in 1995.
222. The Security Oil Stock situation is still prejudiced by the major changes that have taken place in the infrastructure of the distribution system. In the past Bantry Bay contained large volumes of oil which could be used to offset a significant part of the country's minimum stock requirement. It was against this background that product importers were required to hold, not 90 but 80 days of their preceding year's sales in the internal market. Now that Bantry Bay is no longer in use, existing legislation does not require companies to hold sufficient stocks to enable the government to meet its EEC obligation. A further complicating factor has been the arrival in the market of a large number of relatively small operators, most of whom fall below the lower limit of 15 thousand tons annual delivery and are consequently not required to hold stocks. Also, regardless of size new market entrants will have no stock holding obligation in their first year of activity, since they had no market sales in the preceding year.

The ability to offset this problem by building stocks at the Whitegate refinery is limited by the undertaking entered into after the nationalisation of this plant to hold 170 thousand tons of stocks credited pro rata to the original four owning companies.



Current Commission developments to improve the use of bilateral stocks should assist the Irish in meeting their future obligations, since a lot of their potential supply comes from overseas suppliers.

223. The development of premium markets for natural gas has increased the necessity to improve security of supply in this sector particularly given that Ireland lacks an interconnection with gas grids in other Member States. Without storage or other back-up facilities an interruption in supplies could have serious consequences for the industry. This issue is currently under consideration with the Department of Energy.

#### Energy and the Environment

224. With very little heavy industry and a relatively small population there has up to now been no major environmental problem resulting from energy consumption. However with the construction of Moneypoint Power Station which is the first large coal firing unit in the country that situation could change. There is no FGD or similar emission control in Moneypoint. The ESB are presently burning low sulphur (+- 1%) coal. Units for the monitoring of SO<sub>2</sub> NO<sub>x</sub> and smoke emissions have been set up.
225. With the coming into force of the Air Pollution Act 1987 all environmental regulations relating to air pollution have been encompassed in one Act. One of the provisions of this Act enables Local Authorities to make "special control area orders" to prevent or limit air pollution in specific areas. The enactment of any such orders in the major urban areas could have a significant effect on the high consumption of solid fuels in the residential sector in Ireland.

#### Sectoral Developments and Outlook

##### Oil

226. With a view to maintaining and expanding exploration offshore Ireland, new licensing terms were announced in 1987. The new terms provided for exemption from royalty payment for all oil and gas production, free depreciation on both development and exploration expenditure and no State Participation in profits except corporation tax which remains at 50% and a supplementary levy on profits on production on achievement of production of 100 million barrels of oil or 0.6 trillion cubic feet of gas. As well as acting as an incentive for increase offshore activity these measures will also cause oil companies to re-evaluate discoveries which up to now have not been considered commercial.

227. Largely as a result of the reduction in oil use by the electricity sector the pattern of oil consumption has changed in Ireland. The transport sector is now the largest oil consuming sector and together with the electricity sector is expected to account for nearly three quarters of Ireland's consumption in 1995. There should be scope for reducing the expected level of consumption in both these sectors. The expected 50% increase in demand in the transport sector is high. Furthermore as mentioned earlier there is the possibility that older oil fired electricity generating stations will be brought on stream again to meet demand in the 1990's. The ESB should be encouraged to invest in dual firing facilities in these plants.
228. Ireland's only refinery at Whitegate is run by Irish Refining Plc a subsidiary of the state owned Irish National Petroleum Corporation. Importers of motor gasoline and gas oil in Ireland are obliged to buy up to 35% of their requirements for these products from the refinery. Their price is set on a cost recovery basis. The hydroskimming refinery operates at around 50% capacity (i.e. approx. 28,000 bd). The European Court of Justice in Luxembourg ruled that the mandatory offtake regime under which the refinery operates is justifiable under the Treaty of Rome on grounds of public policy and public security. The continued operation of these refinery needs to be kept under review particularly in the context of the work underway in the achievement of an internal market by the end of 1992.

#### Natural Gas

229. Natural gas now accounts for 15% of gross energy consumption in 1986. Almost two-thirds of natural gas consumption was until 1985, in the electricity sector. With the building of the Moneypoint coal fired generating station natural gas supplies to this sector have been reduced. The electricity sector now accounts for 45% of total natural gas demand. This has taken place in parallel with the construction of a national gas grid which links most of the major urban centres in the south and east of Ireland. As a result premium markets for natural gas are now being built up. Sales to the industrial, commercial and residential sector now account for 24% of gas sales. (The remaining 31% is supplied for UREA manufacture.) The development of a national grid has not been without difficulties. The Irish Gas Board were obliged to take over the financially troubled Dublin Gas Company a privately owned town gas company and to take on the heavy financial liabilities of this company. As a result the Irish Gas Board will for some years have to trade themselves out of a difficult financial situation.

230. It had originally been intended to extend the national gas grid from Dublin up to the border with Northern Ireland and thereby bring natural gas supplies to the Northern Ireland Gas industry. However due to the failure of the UK and Irish governments to agree on a price for delivery of the gas the proposed interconnection fell through. Since then the UK Government has decided to close the town gas industry in Northern Ireland. This will be completed in 1988. Despite this setback the Irish Gas Board with FEDER assistance is going ahead with the extension of the natural gas grid to towns near the border with Northern Ireland.

#### Solid Fuels

231. Peat is the other major indigenous Irish energy source accounting for around 20% of energy consumption the bulk of which is used for electricity production. Until the construction of the Moneypoint power station peat accounted for most of the consumption of solid fuels in Ireland. The outlook for peat production is uncertain. On the one hand Bord na Mona have been relatively successful in diversifying into areas such as horticultural use of peat. This has reduced their financial reliance on sales to the ESB. On the other hand disastrous harvesting seasons in 1985 and 1986 coupled with the fall in world energy prices is compelling Bord na Mona to try harder to reduce their costs so as to make peat more competitive. Peat sales to the ESB still provide the bulk of Bord na Mona's revenues and to a large extent the price paid by the ESB determines the profitability or otherwise of Bord na Mona. The Government are undertaking a review of Bord na Mona's activities which should be completed in Autumn 1988. The results of this review will be critical for Bord na Mona and its future structure.
232. Peat production is expected to decline slowly up to 1995 as older and less economic bogs go out of production.
233. Coal consumption outside the electricity sector is not expected to increase although the Government decision to allow the ESB to sell coal from its Moneypoint terminal may help to develop new markets for coal in the region. Coal usage in the electricity sector will depend on the growth in electricity demand but with spare capacity available it is not expected that coal demand will rise further unless it is decided to convert some of the existing oil fired stations to coal.

### Electricity

234. The rate of growth in electricity demand since 1982 at 4.5% p.a. greatly exceeds the average rate of growth of GDP 1.2% p.a.. With the coming on stream of the 900 MW Moneypoint power station Ireland's base load electricity is now coal based. As a result hydrocarbon consumption in the electricity sector has fallen to around 65% in 1986. It is expected to decline to under 40% by 1995. The rates of growth i.e. 4.5% for electricity consumption incorporated in recent Irish forecasts now seem to be optimistic and lower growth rates in the region of 3% are now considered more likely. In 1987 demand is likely to rise by around 3%. In the years ahead electricity will face increased competition from natural gas in the domestic and industrial markets.
235. There is sufficient installed capacity to meet demand requirements well into the early part of the 1990's. As mentioned earlier the major uncertainty is in relation to whether the investment decisions to convert existing oil stations to dual firing will be taken. With oil prices relatively low there could be a reluctance to commit the necessary investment. In that event oil use in electricity could therefore rise again in the 1990's.
236. Because the ESB has so much excess capacity it is extremely difficult for autoproducers (apart from those producing from small hydro) to sell excess capacity to the national grid. This acts as a brake on the development of CHP and other forms of electricity generation.

### New and Renewables

237. The potential for further development of small hydro, wind and biomass would appear to be good. There has however been a brake on development programmes.

Apart from existing hydrostations which provide less than 10% of electricity requirements the contribution from new and renewable energies to Ireland's energy requirements is expected to remain fairly negligible over the period to 1995.

CONCLUSIONSIreland

The Irish energy situation has improved steadily since the time of the first oil shock. Through measures taken to stimulate development of indigenous energy resources and reduce oil consumption Irish dependency on oil imports has fallen steadily. Efforts need to continue though to ensure that oil import dependency does not increase again in the time ahead.

An important element in helping the Irish energy situation has been the improvement recorded in energy efficiency. The economic situation in Ireland has necessitated severe curtailments in Government expenditure. Financial assistance for energy conservation programmes have been radically reduced as a result of these cutbacks. The resulting curtailment in energy efficiency programmes could mean that the remaining large potential that exists for further improvements may not be realised. Strengthening awareness in energy efficiency in Ireland, particularly now that energy prices are relatively low, is a key issue to be addressed.

The development of the Kinsale Head Natural Gas Field has been another factor in reducing Ireland's oil dependency. Premium markets for this gas are now being built up with most major population centres having access to natural gas supplies. With the development of this premium market for natural gas the provision of back up facilities in the event of a disruption in supplies becomes very important. Attention should be paid to this issue urgently. Consideration needs also to be given to the eventual replacement of the supplies from the Kinsale Head Gas Field.

Security oil stocks have been a vital element in improving the Community's security of supply. Irish security oil stocks have in recent times tended to be below minimum legal requirements. This problem needs to be redressed.

As in most EC Member States there is an excess of electricity generating capacity at present. A lot of the idle plant is oil fired. If hydrocarbon consumption in the electricity sector is not to rise again in the 1990's as the older oil fired plants are brought back on stream, then the electricity utility, ESB, should be encouraged to invest in dual firing facilities in oil plants where this does not already exist.

Finally there appears to be a low priority assigned to new and renewable energies. To increase the possibility of these fuels making a greater contribution to energy balances in 1995 the Government will have to play a more active role in their promotion.

## SUMMARIZED ENERGY BALANCE - IRELAND

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	7.02	8.13	8.79	9.09	10.0	10.9
-BUNKERS	0.07	0.04	0.03	0.02		
-INLAND CONSUMPTION	6.95	8.09	8.76	9.07	10.0	10.9
INLAND ENERGY CONSUMPTION	6.95	8.09	8.76	9.07	10.0	10.9
-SOLID FUELS	1.39	1.78	2.59	2.84	3.8	4.2
-OIL	5.50	4.58	4.16	4.79	4.4	4.9
-GAS		1.66	1.94	1.36	1.7	1.7
-PRIMARY ELECTRICITY ETC	0.06	0.07	0.07	0.08	0.1	0.1
INDIGENOUS PRODUCTION (1)	0.74	2.71	2.78	2.70	3.3	3.2
-HARD COAL	0.03	0.03	0.03	0.03		
-LIGNITE & PEAT	0.65	0.95	0.74	1.23	1.5	1.4
-OIL						
-NATURAL GAS		1.66	1.94	1.36	1.7	1.7
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.06	0.07	0.07	0.08	0.1	0.1
-OTHERS & RENEWABLES						
NET IMPORTS (3)	6.02	5.29	5.33	6.74	6.7	7.7
-SOLID FUELS	0.49	0.85	1.26	1.74	2.3	2.8
-OIL	5.52	4.44	4.07	5.00	4.4	4.9
-NATURAL GAS						
-ELECTRICITY (2)	0.01					
STOCK CHANGES (4)	- 0.27	- 0.13	- 0.68	0.35		
-SOLID FUELS	- 0.22	- 0.05	- 0.56	0.16		
-OIL	- 0.05	- 0.18	- 0.12	0.19		
-GAS						
ELECTR. GENERATION INPUT	1.84	2.78	2.70	2.78	3.7	4.4
-SOLID FUELS (5)	0.63	0.62	0.82	0.87	2.1	2.6
-OIL	1.15	0.70	0.54	1.20	1.1	1.4
-NATURAL GAS		1.32	1.27	0.63	0.4	0.3
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.06	0.07	0.07	0.08	0.1	0.1
-OTHERS & RENEWABLES		0.07				

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	6.8%	1.7%	2.9%	2.4%	1.7%	
GDP ANNUAL GROWTH RATE	4.4%	4.2%	1.2%	3.0%	3.0%	
IMPROVEMENT IN ENERGY INTENSITY		27.6%	-13%	3%	8%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	79.3%	56.8%	47.7%	52.9%	44.2%	45.2%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	62.5%	72.7%	67.0%	65.8%	40.7%	38.7%
SUPPLY DEPENDANCE ON IMPORTS	85.8%	65.1%	60.6%	74.1%	67.1%	70.4%

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ITALYIntroduction

238. During the period 1973-82 total energy consumption in Italy rose only slightly, by 0.5% per year, but dependence on imported oil dropped from 80% to 66%, compared with an average level of 38% in 1982 in the Community as a whole.

In the conclusions of its survey of December 1984 the Commission expressed concern at the slow progress made in Italy in establishing an overall energy policy.

Its concern centred especially on the continuing excessive use of petroleum products for electricity generation and on dependence on oil for a substantial percentage of Italy's energy needs. The Commission also drew attention to the priority to be given to energy conservation and pricing policies and to the use of natural gas in power stations.

Trends since 1982Supply and demand

239. Italy's GDP grew by 2.4% a year over the period 1982-86. While internal energy consumption increased by 1.2% a year on average between 1982 and 1986, the demand for electricity grew at a faster rate of 2.8% per year over the same period.

240. Between 1982 and 1986 the structure of internal consumption in Italy changed, in particular in favour of natural gas, while the share of oil (61% in 1986) still remained high compared with other Member States and the Community average:

	1973	1982	1986
	%	%	%
Solid fuels	6.6	10.6	10.7
Oil	77.8	66.8	61.1
Natural gas	11.7	17.5	21.7
Primary electricity	3.9	5.1	6.5
	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

241. The upswing in the use of coal in the electricity sector witnessed in the years following the second oil crisis slackened off between 1982 and 1986. The reduction in the use of fuel oil for electricity generation has been made possible, to a large degree, by the development of natural gas use in power stations as well as a significant growth in the use of coal and nuclear energy.

242. With the obstacles facing the implementation of a large-scale nuclear programme, an additional contribution from internal energy production has remained very limited. The share of net oil imports in total gross energy consumption in 1986 was 60% (against 67% in 1982), compared with an average of 33% for the Community.

#### Energy policy

243. Following a resolution from the Industry Committee of the Chamber of Deputies of 1 August 1984, the Minister for Industry submitted to Parliament on 27 February 1985 a document entitled "1985-1987 update" of the National Energy Plan approved by Parliament in October 1981.

244. After scrutiny by the two parliamentary committees on industry, the resolution of the CIPE (Interdepartmental Committee for Economic Planning) of 20 March 1986 recognized some achievements in the implementation of the 1981 Energy Plan, in particular a reduction in oil dependence, growth in the consumption of coal and natural gas and the commissioning of a nuclear power plant.

245. The resolution of the CIPE drew attention to the serious delays in siting power stations and to the need for restructuring in the refining industry and the distribution of petroleum products. Proposals of an institutional nature to make the Italian energy system more operational were put forward.

246. After the Chernobyl accident a resolution of the Chamber of Deputies of 3 June 1986 and an agenda item of the Senate of 12 June 1986 of very similar content called for a national energy conference before October 1986 to assess how far the policy objectives of the Energy Plan were compatible with guaranteed plant safety. The two parliamentary acts enjoined the Government not to take any initiative regarding nuclear installations which might prejudice subsequent parliamentary debates.



247. The national energy conference was held on 24-27 February 1987. The conclusions of the conference, which were set out in a joint final declaration of the Chairmen of the three working parties of the Technical and Scientific Committee, were not followed by immediate action because of the political crisis and the early parliamentary elections on 14-15 June 1987. The new Government has included in its programme three referendums on nuclear matters.

248. The results of these referendums held on 8 and 9 November 1987 will have the effect, among others, of repealing the existing law which gave the CIPE the power to choose areas for siting nuclear and coal-fired power stations.

249. On 30 November 1987 the Minister for Industry set up a Standing Technical Committee with a mandate to prepare the revision of the National Energy Plan within three and a half months. This Committee will be chaired by the Minister for Industry and will comprise the Ministers for the Budget, State Holdings, the Environment and Scientific Research and the chairmen of the three national energy administrations (ENI, ENEL, ENEA), together with a number of experts.

#### Energy forecasts to 1995

250. National forecasts of the average structure by source of primary energy in 1990 and 1995 are as follows:

#### Total energy consumption

	1990	1995
	%	%
Solid fuels	12.4	18.8
Oil	57.3	51.7
Natural gas	23.3	22.5
Primary electricity	7.0	7.8
	<u>100.0</u>	<u>100.0</u>

#### Production of electricity

	1990	1995
Solid fuels	20.3	37.5
Oil	46.2	30.6
Natural gas	14.4	13.3
Hydro and geothermal	11.0	10.0
Nuclear	8.1	8.6
	<u>100.0</u>	<u>100.0</u>

251. Irrespective of new guidelines from the recently established Standing Technical Committee, it is already certain that most of these forecasts will not be realized, especially those concerning the production of nuclear energy and the use of solid fuels in power stations.

### Horizontal developments

#### Energy efficiency programme

252. The Italian initiatives in energy efficiency date from 1982 and are now well established. Energy intensity improved by about 12.6% during the period 1973/82. This trend has been maintained with an improvement of 6.11% being recorded in energy intensity during the period 1982/86.

253. The programme includes the following elements:

- schemes for the development and dissemination of knowledge by means of research projects and targeted and general information campaigns,
- informative literature aimed at the general public,
- training courses on energy saving for engineers,
- financial support for studies, projects and demonstration,
- energy auditing in the industrial and non-industrial sectors,
- technical and economic assistance to industry to encourage the development of low energy-consumption components and systems,
- the adoption of energy efficiency as an assessment criterion in sectoral legislation (regional policy, technological development, etc.),
- measures to promote the marketing of products whose energy efficiency and consumption have been tested: monitoring of the energy efficiency of installations through approval and labelling of appliances,
- tariff measures designed to prevent the fall in the international price of crude oil being automatically passed on to the consumer price of oil products,
- financial support for realizing projects for improving the energy efficiency of electrical plant and structures: elimination of peaks in demand, partly by the application of multiple tariffs,
- measures to improve the flexibility of the national electricity generating system: financial support for combined generation schemes, liberalization of private electricity generation up to 10 000 kW and incentives for special production up to 3 000 kW.

254. Italy is one of the few Member States which have been increasing the allocation of funds to energy efficiency R&D. The 1986 allocation of 35.8 million ECU represents a 10% increase over the previous high of 31.9 million ECU recorded in 1984.

Security of supply

255. Oil security stocks in Italy are held in three categories.

1. Government owned strategic stocks (800 000 t of crude oil)
2. All depots and refineries must hold 10% of their capacity full at all times.
3. All enterprises which sell on the market must hold an amount fixed by the Ministry. This amount is determined annually by deducting from the national obligation stocks in points 1 and 2 above and prorating the residual obligation on the basis of the preceding year's sales volumes.

256. Italy opposes any increase in stock beyond the current 90-day level, but agrees that the 90-day volumes must be fully available. This question is currently being examined and it is the intention that, if additional stocks are found to be necessary, they should be obtained through increasing the government-owned strategic stocks. Italy sees some benefit from central stock ownership, but feels that it has adequate flexibility, since AGIP, which holds the major part of all Italian stocks, is part of the State-owned ENI.

257. With a major oil field in the Mediterranean coming on stream in the summer of 1987 from which production will reach 3.3 million tonnes a year when in full operation, Italy will be able to double its oil output. It will be able to maintain this level of production of 7-8 million tonnes up to 1995 and even beyond. Dependence on imported oil will drop from 96% in 1986 to 90% in 1995, assuming that the oil demand trend bears out the forecasts.

258. Italy's energy policy is directed, through the intermediary of the ENI, to securing a greater diversification of supply as a counterweight to the high overall level of dependence and, in a crisis, as a guard against interruption of supplies.

259. In recent years there has been a significant growth in Italy's natural gas output. The level of 13 million toe reached in 1986 should be maintained and possibly even increased by the end of the century. This prospect is satisfactory and, taking account of proven reserves (300 000 million m<sup>3</sup>) in Italy, has a good chance of becoming a reality.

260. Imports, which covered 54% of gross internal consumption in 1986, will continue to come from the traditional sources - the Netherlands, Algeria and the USSR. An additional supply will come from the USSR through the completion of a new gas pipeline and the implementation of a contract signed in 1985 for the delivery of 6 000 million m<sup>3</sup> per year.

261. The gas supply structure is already sufficiently flexible, but new storage capacities are in the process of being established. Storage capacity will thus reach 9 500 million m<sup>3</sup>, which could cope with a sudden break in supplies equivalent to six months of the quantities provided for in the largest contract.

262. By a law issued in 1985, which allocated an appropriation of LIT 505 000 million (about 340 million ECU) to the ENI for the purpose, it was decided to reactivate the Sulcis coalfield. Production should come on stream in the next few years; once in full operation, it should reach 1.7 million tonnes, i.e. 0.7 million toe, which will go to ENEL power stations. These quantities, with what lignite resources there are, will cover a limited proportion of the demand for coal. Imports should increase appreciably so that coal can perform its assigned role in the supply of power stations.

263. For their part, the main operators on the Italian coal market (ENEL, Italsider and Agip Carbone) are all channelling considerable effort, through purchases and direct operating abroad, into strategic and economic diversification of supply, on a world market with relatively few producer countries. In this context, the already very small imports of Community origin, mainly coal for the metalworking industries, seem likely to dwindle still further.

264. Although net imports of electricity from France (almost 50%), Switzerland and Austria, which far exceeded the 10% of availabilities in 1985 and 1986, do not give cause for concern in the medium term, the heavy dependence on oil for power stations and the shortfall in installed capacity will be critical factors in Italy's energy policy by 1995.

265. The conclusions of the national energy conference held on 24-27 February 1987 indicated that any delay in commissioning new power stations would lead to a deficit in installed power as from 1995, which would amount to about 10 000 MW in the year 2000.

266. The growing difficulties in licensing procedures hamper any kind of new production plant, and they also affect the construction of transport and distribution infrastructure.

#### Energy and environment

267. The Ministry of the Environment was established by the Law of 8 July 1986. This law unites functions and responsibilities which were previously spread around several government departments.

A joint environment-industry committee is already active and is engaged primarily with incorporating into national law two Community Directives on environmental impact assessment and major industrial hazards.

268. For its part, the Board of Directors of the ENEL decided in July 1986 to implement "Project Environment" and to adopt for its installations, but with more stringent standards, the provisions of the proposed Council Directive limiting emissions of pollutants into the air from large combustion plants.

269. This "Project Environment" involves the adoption of new technologies which will considerably reduce the negative effects on the environment of the different types of fuels used. In particular, average emissions from new multi-fuel power stations will be reduced to below 400 mg/Nm<sup>3</sup> for SO<sub>2</sub>, below 650 mg/Nm<sup>3</sup> for NO<sub>x</sub> and below 50 mg/Nm<sup>3</sup> for dust.

### Sectoral developments and outlook

#### Oil

270. Consumption fell sharply immediately after the second oil crisis, but progress in reducing consumption has slowed appreciably since then. From 1982 to 1986 gross internal consumption of oil fell by less than 6%, as against 10% over the two-year period 1980-82. The reasons for this can be found in sectoral consumption trends. The increased consumption in the transport and residential sectors almost cancelled out the marked fall in consumption by power stations and the main branches of industry.

271. The share of oil in internal energy consumption, which was still 78% in 1973, nonetheless dropped from 67% in 1982 to 61% in 1986. In the medium term, one should note the more than doubled contribution, compared with 1986, of Italy's own output and the wider diversification of supply sources.

Although the drop in oil prices curbed prospecting in 1986, the prospects for new discoveries are by no means negligible. According to recent studies, reserves of around 180 million tonnes of liquid hydrocarbons could still be identified on the continental shelf and onshore.

#### Natural gas

272. As imports climbed (by almost 50% from 1982 to 1986) natural gas increased its share in the structure of Italy's internal consumption of energy from 17.5% in 1982 to 22% in 1986.

The share of natural gas consumption covered by imports from non-Community countries remained stable between 1984 and 1986 at about 43%, but this situation will not be maintained in the future. By 1995 the extra demand will be covered entirely, given stationary national production, by further imports from the USSR and Algeria.

### Solid fuels

273. Although the share of solid fuels in the overall energy balance is unchanged, the consumption of coal in Italy has again slightly increased in recent years. In 1986 ENEL power stations were supplied with 9 million tonnes of coal, as against 5 million tonnes in 1980 and 7 million tonnes in 1982.

274. After the swift conversion process in the cement factories in the years 1980-82 consumption in the industrial sector stabilized at around 2 million tonnes. Levels in the coking plants hardly changed between 1982 and 1986 (10 million tonnes).

275. It remains to be seen in future whether ENEL's "Project Environment" will clear some of the backlog accumulated over the years from the use of coal for electricity generation.

### Electricity

276. The net consumption of electricity reached 200 TWh in 1986, an increase of 11.3% over 1982.

277. Even though the conclusions of the national energy conference put back by five years, to the year 2000, the electricity consumption forecast of 290 TWh that the Energy Plan had set for 1995, the serious effects of delays in the capital investment programme were clearly underlined in the final text.

278. The December 1985 update of the Energy Plan provided for the construction of new nuclear (8000 MW), coal fired (5700 MW), hydroelectric (2100 MW) and geothermal (290 MW) power stations. At 31 December 1986 construction work was in progress in ENEL power stations to provide power of 10 524 MW, of which 4000 MW nuclear, 3560 MW coal-fired and 1944 MW hydroelectric.

279. As far as the nuclear side of this programme is concerned, the Government decided in late November 1987 to stop the work at Montalto di Castro (2000 MW) until the end of January 1988. The start of work on the Trino Vercellese power station (2000 MW), for which the licensing procedures had been completed, is currently suspended as a result of the parliamentary resolutions. The programme for coal-fired power stations is also running well behind schedule. At the end of 1986 progress on the four units (640 MW each) of the Brindisi Sud plant varied between 30% and 60% of completion, but solutions for the port infrastructure and the coal conveyor system had still not been found, nor had authorization for construction of the port been granted.

Work on the power stations at Fiume Santo and Tavezzano (totalling 1000 MW) was interrupted.

#### Renewable energy sources

280. The contribution of renewables other than hydro and geothermal was estimated at 0.1 million toe in 1986.

281. While the original 1981 Energy Plan set the 1990 target for solar energy at 2 million toe, the "1985-87 update" is far less optimistic. It now predicts that in 1995 the production of primary energy from renewable sources will be of the order of 1 million toe. The results of national and Community incentive schemes have so far been disappointing and have not had the effect of creating a market.

282. In contrast, Law No 308/82 gave rise to more activity on hydro projects: many were reactivated and several small power plants were expanded.

The ENEL is also undertaking major research into new possibilities in this field. The joint efforts of public undertakings and small producers should achieve the 1995 production target of about 50 TWh.

283. With production of geothermal origin at 5 TWh, the two energy sources will cover 3% of internal energy consumption and 10% of electricity generation in 1995. Despite these efforts the share of hydro and geothermal energy in the production of electricity, rather than rising, is likely to be 12% less than in 1986.

## CONCLUSIONS

In contrast to earlier years, Italy has produced some good results in the period 1982-1986 as far as its efforts to improve energy efficiency is concerned. In this respect, Italy is in one of the leading positions among Member States. Government interventions, agreed upon in 1982, have played a part in this success.

The reduction in oil consumption has only been achieved by the penetration of imported natural gas in all sectors. In contradiction to Community energy objectives, the share of natural gas in the generation of electricity has more than doubled between 1982 and 1986 and will only decrease slightly in the period to 1995.

With regard to the electricity sector, where progress in the use of coal and the siting of new nuclear power stations encounters serious difficulties, it is a subject of concern for the Commission that the substantial use of hydrocarbons in power stations may continue.

More than two years after the approval by the CIPE of the "Update 1985-1987" of the National Energy Plan, Italy still has the problem of high import dependence, in particular on oil, and as a consequence is very vulnerable to world supply crises.

Diversification by energy type and by origin only partly compensates for the weakness of the Italian economic system. It is therefore urgent and essential that definitive decisions are taken on the basis of guidelines supplied by the National Energy Conference and by the public in the shape of the referendum held on 8th and 9th November 1987.

The directions contained in the new Energy Plan and the choices made by Government and Parliament should, in the coming months, enable Italy to leave behind the inertia which currently characterises its energy policy and which would, if continued, isolate the country from its European partners, committed as they are to achieving the common energy objectives.



## SUMMARIZED ENERGY BALANCE - ITALIA

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	128.72	131.21	136.01	136.91	148.9	159.4
-BUNKERS	7.03	4.02	3.40	3.60	4.0	4.0
-INLAND CONSUMPTION	121.69	127.19	132.61	133.31	144.9	155.4
INLAND ENERGY CONSUMPTION	121.69	127.19	132.61	133.31	144.9	155.4
-SOLID FUELS	8.08	13.30	15.16	14.23	18.0	28.0
-OIL	94.67	83.57	80.48	81.58	83.0	80.3
-GAS	14.23	21.99	27.20	28.88	33.7	35.0
-PRIMARY ELECTRICITY ETC	4.71	8.33	9.77	8.62	10.2	12.1
INDIGENOUS PRODUCTION (1)	18.81	21.84	21.99	22.49	29.8	33.1
-HARD COAL				0.02		
-LIGNITE & PEAT	0.31	0.32	0.33	0.25	1.9	2.0
-OIL	1.25	1.79	2.39	2.57	7.0	8.0
-NATURAL GAS	12.62	12.01	11.54	12.93	12.7	13.0
-NUCLEAR ENERGY	0.93	1.86	1.98	2.44	3.4	4.2
-HYDRO & GEOTHERMAL (2)	3.44	5.70	5.62	4.14	4.6	4.9
-OTHERS & RENEWABLES	0.26	0.16	0.13	0.14	0.2	1.0
NET IMPORTS (3)	112.09	112.31	114.06	113.90	119.1	126.3
-SOLID FUELS	7.71	13.29	14.76	13.94	16.1	26.0
-OIL	102.65	87.30	81.22	81.65	80.0	76.3
-NATURAL GAS	1.65	11.11	16.04	16.41	21.0	22.0
-ELECTRICITY (2)	0.08	0.61	2.04	1.90	2.0	2.0
STOCK CHANGES (4)	2.18	2.94	0.05	0.52		
-SOLID FUELS	- 0.06	0.31	- 0.06	- 0.02		
-OIL	2.20	1.50	- 0.27	- 0.96		
-GAS	0.04	1.13	0.38	0.46		
ELECTR. GENERATION INPUT	26.07	36.13	35.71	35.59	41.8	49.0
-SOLID FUELS (5)	1.29	5.48	6.66	6.84	8.5	18.4
-OIL	19.13	20.29	16.14	16.53	19.3	15.0
-NATURAL GAS	1.02	2.64	5.18	5.50	6.0	6.5
-NUCLEAR ENERGY	0.93	1.86	1.98	2.44	3.4	4.2
-HYDRO & GEOTHERMAL (2)	3.44	5.70	5.62	4.14	4.6	4.9
-OTHERS & RENEWABLES	0.26	0.16	0.13	0.14		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	8.1%	0.5%	1.2%	2.1%	1.4%	
GDP ANNUAL GROWTH RATE	6.4%	2.3%	2.4%	2.5%	2.5%	
IMPROVEMENT IN ENERGY INTENSITY		12.6%	6.1%	1%	7%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	79.0%	66.8%	61.7%	62.2%	58.4%	52.9%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	77.3%	63.5%	59.7%	61.9%	60.5%	43.9%
SUPPLY DEPENDANCE ON IMPORTS	87.1%	85.6%	83.9%	83.2%	80.0%	79.2%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES  
 FROM EXTERNAL SOURCES

- NOTES
1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
  2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
  3. THE (-) SIGN MEANS NET EXPORTS
  4. THE (-) SIGN MEANS A STOCK DECREASE
  5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

L U X E M B O U R GINTRODUCTION

284. The conclusions of the last country review published in 1984 were as follows:

Luxembourg is virtually totally dependent on imports for its energy supply, and its energy consumption is very heavily influenced by trends in the steel industry. The main concerns for the coming years are as follows:

- (i) development of the energy conservation policy
- (ii) the conclusion with neighbouring countries of satisfactory new long-term contracts for electricity and gas supplies
- (iii) the possibility of extending the natural gas distribution network in order to promote the substitution of gas for oil in the domestic heating sector.

During the period 1973-1982, the Grand Duchy was able, thanks to energy efficiency measures, to reduce its overall energy consumption from 4.5 mtoe to 2.98 mtoe. The share of oil in energy requirements has stayed below 40% and consumption has fallen from 1.65 to 1.04 mtoe.

285. Over the period 1982-86, Luxembourg remained equally dependent on energy imports. The share of oil in final energy consumption was unchanged, or even higher in 1986 than in 1982. For more technical rather than political considerations electricity interconnections are still restricted to Germany and Belgium.

ENERGY TRENDS SINCE 1982

## Supply and demand

286. GNP increased by 3.5% per annum from 1982 to 1986, while the increase for the period 1973-82 was only 1.2% per annum. Between 1982 and 1986, gross energy consumption increased by 0.7% p.a. and electricity consumption by 2.7% per annum.

287. Luxembourg's primary energy demand is covered by coal, which is used in the steel industry, and by oil, the share of which is increasing owing to the recent trend in oil prices. Final consumption, which gained momentum in 1984 and 1985, seems to have stabilized in 1986 and 1987 as a result of the drop in demand from industry (- 6%).

288. The pattern of shares of energy sources in gross consumption moved as follows between 1973 and 1986:

	1973	1982	% 1986
Solid fuels	<u>54.4</u>	<u>46.0</u>	<u>42.0</u>
Oil	36.7	34.9	37.4
Gas	4.9	9.1	9.8
Primary electricity <sup>(1)</sup>	<u>4.0</u>	<u>10.0</u>	<u>10.8</u>
	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

#### Energy policy developments

289. The Chernobyl accident had no impact on energy consumption in Luxembourg. On the other hand falling oil product prices in 1986 resulted in lower prices to consumers <sup>(2)</sup> which had the following effects:

- to enable oil to maintain its market share in both the industrial and the domestic sector;
- to mitigate the results of the Government's efforts to reduce the share of oil in the energy balance and to lessen the improvement in energy efficiency. The Government has embarked on a new programme to strengthen its efforts in this regard.

290. In order to take stock of the energy situation, the Ministry of Energy launched a wide-ranging study in 1985 on energy requirements and consumption in Luxembourg. This study, conducted in close collaboration with the Commission of the European Communities, began in autumn 1985 and will cover:

- the domestic sector
- the tertiary sector, craft businesses, commerce and industry
- a global consumption balance covering all sectors of the economy.

The results of this study will make it possible to define the broad lines of future policy.

#### ENERGY FORECASTS TO 1995

291. Government forecasts indicate a slight drop in coal and oil consumption in favour of gas and electricity.

(1) Note: 98% of Luxembourgs electricity requirements are imported.

(2) The level of taxes on petroleum products is such that their price is below the level in other EC Member States.

As a result, gross energy consumption by sector would be as follows:

	1986	1990	% 1995
Solid fuels	42.0	38.6	37.6
Oil	37.4	36.2	34.6
Gas	9.8	12.9	14.4
Primary electricity	10.8	12.3	13.4
	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>

As the table shows, natural gas (imported mainly from Belgium) will expand its share while the share of oil will decline.

#### HORIZONTAL DEVELOPMENTS

##### Energy conservation and energy efficiency

Energy intensity in Luxembourg improved by 38.8% during the period 1973-82. This remarkable figure is due mainly to the restructuring of the steel industry. This trend has continued and energy intensity improved by 9.4% during the period 1982-86.

292. There are two elements in the energy efficiency programme: a direct grant to improve the thermal efficiency of houses, which will end on 31 December 1987; and the provision of a 50% tax deduction for the costs of commercial/industrial installations which conserve energy or make more rational use of energy.

293. New proposals were tabled on this subject at the beginning of 1987, and four topics were selected by a working party set up for the purpose:

- (i) information and awareness: creation of a public information service and use of energy bus
- (ii) regulations: introduction of a method for calculating and determining thermal coefficients
- (iii) State aids to investment in energy conservation
- (iv) RUE in public buildings.

##### Security of supply

294. As Luxembourg has to import 100% of its energy supplies and has no power stations, it depends on its neighbours for security of supply.

295. Oil stocks: as Luxembourg has no refineries, all its oil stocks are in the form of oil products and thus directly available. Improvements in bilateral stock-holding arrangements could be beneficial for Luxembourg. In addition, the Government is making provision for a small State reserve which, however, may only be regarded as an ultimate fall-back supply and thus should not be used from the outset.

296. All natural gas imports are conducted by SOTEG (Gas Transport Company) through the intermediary of Distrigaz. 80% come from Belgium and 20% from France. The Luxembourg Government is in the process of negotiating new supply contracts.

297. Luxembourg does not produce any coal and has to import to meet its requirements, Germany being its main source of supply (76% from the Ruhr and the Aachen coalfield).

In 1986 Luxembourg imported 1.29 million toe of coal, which represents almost 43% of total net energy imports.

298. In 1986 Luxembourg produced only 0.01 million toe of energy from hydropower and 0.03 million toe from renewable energy sources, covering less than 1% of total energy consumption. Thus most of its electricity is imported, mainly from Germany, which supplies 65.6% of the total on the basis of a contract with the German supply undertaking RWE; a contract with the Belgian company UNERG supplies a further 31.4%.

It must be noted that there is no link-up with the French network, which excludes France as a source of imports. The absence of such a link-up reduces market opportunities for economic trade in electricity.

These two contracts expired in 1985 and were extended for five and fifteen years respectively.

#### Energy and Environment

299. With regard to environmental protection, a number of developments will help to reduce pollution, such as the introduction of unleaded petrol, the lead content having been reduced from 0.4 to 0.15 g/l. In addition, light fuel oil is virtually disappearing from the Luxembourg market in favour of less polluting gas oil.

300. Furthermore, projects for a link-up to the German electricity network have been the subject of a preliminary environmental impact study.

## SECTORAL DEVELOPMENTS

### Oil

301. Internal consumption and hence imports of oil (90% of which come from Belgium, as Luxembourg does not have its own refineries) amounted to 1.16 million toe in 1986 compared with 1.04 million toe in 1982. This increase is due to the fall in oil prices. In the medium and longer term, oil consumption is likely to decline slightly and to stabilize in absolute figures during the next 10 years (at 1.1 million toe) in view of efforts to replace oil products, particularly in the steel industry.

302. It is worth pointing out that Luxembourg has the lowest taxation on fuels in Europe, which hardly encourages major energy savings.

### Natural gas

303. Natural gas has been used in Luxembourg only since 1972. By 1986 it accounted for 9.8% of gross primary energy consumption.

304. Of this amount 40% is used in the steel industry, so that the trend in demand for gas is closely linked to the outlook for this industry. Increased penetration of the residential sector (which currently represents 45% of overall demand) depends on extensions to the gas supply network currently underway but which at present only exists in the south and centre of the country. A new distribution company has been created for this purpose.

305. It is forecast that gas consumption and hence imports will double by the year 2000.

### Solid fuels

306. Coal consumption is closely bound up with the steel industry, which takes up 90% of total coal demand. According to the forecasts, its share of coal in gross internal consumption will decline slowly and will account for 38% of primary energy consumption in 1995.

### Electricity

307. Electricity consumption in Luxembourg amounts to 0.33 million toe, which in 1986 represented 10.7% of total energy consumption. The forecasts suggest that electricity consumption will increase slightly to 0.4 million toe by 1995, stabilizing at that level during the next decade.

308. A project to connect in a further 220 kV from the German RWE network which was the subject of an environmental impact study has been completed and was provisionally due to come into service at the end of 1987.

#### Renewable energy sources

309. The Government has studied the feasibility of introducing renewable energy technologies in Luxembourg, with the emphasis on solar and wind energy.

310. The Ministry of Energy also has an appropriation for granting financial support to demonstration projects in the field of energy conservation and utilization of alternative energy sources. Many of these projects are conducted in collaboration with the Commission of the European Communities. Several demonstration projects were proposed for support in 1986, but only one (biogas plant) was selected for support by the Ministry of Energy; this project is also receiving Community aid. Many other projects which have received assistance have been maintained since previous years.

CONCLUSIONSLuxembourg

The country's energy policy continues to be based on the following two factors, which form part of the new Community energy objectives for 1995:

- the continuation of measures already taken in the field of energy efficiency in all sectors of consumption;
- the diversification of energy supplies, backed by a better distribution infrastructure.

Marked by a lack of energy production in the country itself (except for a little hydroelectric power representing less than 1% of requirements), Luxembourg depends entirely on imports to cover its energy needs. This emphasizes the importance of security of supplies. The Government has diversified its supplies by switching from oil to coal and, to a lesser degree, to gas and electricity.

Over the period in question the country's dependence on oil has not decreased. However, structural changes in certain sectors, more rational use of energy and negotiations designed to improve the country's supply of natural gas with the establishment of two new link-up networks with Germany should modify this trend in future.

As regards the conservation of energy, Luxembourg undertook a detailed analysis at the end of 1987 of suggestions made at a meeting of energy experts held in March 1987.

What fields merit special attention from the Luxembourg Government?

1. The reduction of imports and hence domestic consumption of oil.
2. An extension of the gas and electricity link-up networks with all its neighbouring countries in order to ensure greater security of supply in these sectors.



## SUMMARIZED ENERGY BALANCE - LUXEMBOURG

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	4.50	2.98	3.11	3.07	3.2	3.3
-BUNKERS						
-INLAND CONSUMPTION	4.50	2.98	3.11	3.07	3.2	3.3
INLAND ENERGY CONSUMPTION	4.50	2.98	3.11	3.07	3.1	3.3
-SOLID FUELS	2.45	1.37	1.42	1.29	1.3	1.3
-OIL	1.65	1.04	1.05	1.15	1.1	1.1
-GAS	0.22	0.27	0.30	0.30	0.4	0.5
-PRIMARY ELECTRICITY ETC	0.18	0.30	0.34	0.33	0.4	0.4
INDIGENOUS PRODUCTION (1)	0.01	0.03	0.03	0.03		
-HARD COAL						
-LIGNITE & PEAT						
-OIL						
-NATURAL GAS						
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.01	0.01	0.01	0.01		
-OTHERS & RENEWABLES		0.02	0.02	0.02		
NET IMPORTS (3)	4.50	2.95	3.10	3.05	3.1	3.2
-SOLID FUELS	2.46	1.37	1.42	1.29	1.3	1.3
-OIL	1.65	1.04	1.07	1.16	1.1	1.1
-NATURAL GAS	0.22	0.27	0.30	0.30	0.4	0.5
-ELECTRICITY (2)	0.17	0.27	0.31	0.30	0.3	0.3
STOCK CHANGES (4)	0.01		0.02	0.01		
-SOLID FUELS	0.01					
-OIL			0.02	0.01		
-GAS						
ELECTR. GENERATION INPUT	0.45	0.16	0.16	0.16	0.2	0.2
-SOLID FUELS (5)	0.29	0.10	0.12	0.11	0.1	0.1
-OIL	0.11	0.03	0.01	0.02		
-NATURAL GAS	0.04					
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.01	0.01	0.01	0.01		
-OTHERS & RENEWABLES		0.02	0.02	0.02		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	2.9%	4.7%	0.7%	0.2%	0.9%	
GDP ANNUAL GROWTH RATE	4.5%	1.2%	3.5%	2.0%	1.5%	
IMPROVEMENT IN ENERGY INTENSITY		38.8%	9.4%	10%	3%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	36.7%	34.9%	33.8%	37.5%	32.8%	32.1%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	33.3%	18.8%	6.3%	12.5%	15.8%	10.5%
SUPPLY DEPENDANCE ON IMPORTS	0.0%	99.0%	99.7%	99.3%	95.9%	97.6%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES

- NOTES
1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
  2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
  3. THE (-) SIGN MEANS NET EXPORTS
  4. THE (-) SIGN MEANS A STOCK DECREASE
  5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

THE NETHERLANDS

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INTRODUCTION

311. The Commission's conclusions of the last review exercise, concentrating on the main questions for the future facing the Netherlands had been summarized as follows :

- i ) the scope and nature of future energy savings policy.
- ii ) the overall place of gas in the energy economy including the question of gas use in power stations.
- iii) the long-term power station ordering programme.

Between 1973 and 1982 overall gross energy consumption was reduced by about 7 Mtoe (inland energy consumption by 5 Mtoe) and the share of oil in the Dutch energy balance (bunkers excluded) decreased by about eight percentage points. The supply dependence on imports improved substantially from 22% to 14% because of the reduction of net oil imports.

ENERGY DEVELOPMENTS SINCE 1982Market trends

312. Despite conservation efforts inland energy demand since 1982 grew faster than GDP because of a shift to a more energy intensive production structure (especially in the chemical sector). The respective annual average growth rates are 2.9% for inland energy consumption and 1.9% for GDP growth. Final electricity consumption grew at the same rate as inland energy consumption (2.8% on average p.a.).

313. Both the Chernobyl accident and the fall in oil prices, to which gas prices are directly linked, had a severe impact on the Dutch energy scene. The first resulted in a postponement concerning the further expansion of nuclear power and the second have dragged down gas prices, reduced the gas industry's turnover and eroded government revenue.

314. From 1982 to 1986 indigenous energy production grew faster than inland energy consumption.  
The share of the various fuels in gross energy consumption and in inland energy consumption is as follows: 1)

	1973a)	1973b)	1982a)	1982b)	1986a)	1986b)
Solid fuels	4.3%	5.1%	8.0%	9.1%	8.9%	10.2%
Oil	56.3%	48.0%	48.0%	40.0%	44.9%	36.4%
Gas	39.1%	46.4%	41.9%	48.2%	44.4%	51.2%
Primary Electricity	0.3%	0.3%	2.2%	2.5%	1.8%	2.1%

315. These developments show that the Netherlands inland energy demand is nearly exclusively covered by hydrocarbons although efforts are undertaken to improve the diversification of the supply structure and especially to increase solid fuels consumption. However since 1982 the dependence of inland consumption on gas has further increased at the expense of oil and efforts to move away from gas, especially in the electricity sector, have only been successful to a limited extent. Nevertheless, in 1988 the coal conversion program will bring the percentage of electricity produced from coal to 45%, compared with 5% in 1973.

316. The substantial increase in energy production over the review period took place in the gas and especially in the oil sector, where production more than doubled. However, due to lower gas export sales present gas production is still far away from the record production level in 1979/1980.

317. Policy developments

Despite the sharp fall in energy prices the main energy policy objectives have remained unchanged. These objectives comprise the improvement of energy efficiency, the further diversification of energy sources, the increase of indigenous energy production and environmentally acceptable energy supply options.

318. The Government decision in 1985 to approve construction of at least two nuclear plants of 900 MW to 1300 MW each has been postponed after the Chernobyl accident. New safety studies have been initiated and in the beginning of 1989 a Government White Paper will be sent to Parliament. The government decision on new electricity generating capacity will be based on a set of studies most of them dealing with nuclear safety and on the reports from the advisory-boards.

1) Because of the high amount of bunkers in the Netherlands both figures are given; a = share in gross energy consumption, b = share in inland energy consumption.

319. Slight adaptations of the energy conservation policy have taken place and in July 1986 a bill has been brought before Parliament to restructure the electricity sector. This draft law intends to raise the efficiency and competitiveness of the production sector and to merge production utilities, to separate production and distribution of electricity and in order to encourage competition end consumers have the possibility of private generation or imports from other Member States.

Also the distribution sector will undergo a major merging process with the objective to reduce the number of distribution companies by two thirds.

Oil crisis measures have been improved by the adoption of a new oil stockpiling law in June 1986 enacting the Dutch 90 days stockpiling obligations.

Furthermore a multi-annual CHP stimulation programme and a new national RD&D programme on coal have been sent to Parliament in 1987.

#### ENERGY OUTLOOK TO 1995

320. According to the energy demand and supply scenarios prepared by the Dutch Energy Study Centre and other forecasts the growth of energy use up to 1995/2000 will be much less than economic growth, because of improvements in energy efficiency (20% between 1985/2000) and structural changes (9% efficiency improvement between 1985/2000). Even the growth of electricity demand is predicted to be in the order of only 1,0 - 1,3% up to 1996.
321. The potential for further diversification of energy sources is practically limited to the sectors of public power generation and industrial steam raising. The share of oil in inland energy consumption should remain more or less stagnant as the potential for substitutions away from oil in the transport sector or as feedstock for the chemical industry is already nearly exhausted. Domestic natural gas will continue to be used for small scale heating purposes. However the share of gas in total inland energy consumption is predicted to decrease due to diversification in electricity generation.
322. In the electricity sector the major developments will only happen after 1995. However the use of coal as fuel input for electricity generation will continue to grow to 45% in 1988. Consequently the share of gas in public electricity production could be reduced to about 40%. After 1996 substantial new generating capacity needs to be built and decisions on the future production structure need to be taken soon to avoid capacity shortages or an inadequate fuel mix.

323. Proven natural gas reserves amounted to 1815 x 10<sup>9</sup> m<sup>3</sup> on 1. January 1987. This reserve position allows the continuation of present production levels into the first decade of the next century. However a critical reserves - production ratio is forecasted to occur in the period 2005 - 2015 depending among other factors on the amount of gas used for electricity generation. Proven oil reserves stay at about 28 MToe and expected reserves at 70 MTOe allowing the 1986 production level of 4.6 MTOe to last well beyond 1995. Net imports of coal may double in the nineties depending on the progress made in the electricity and industry sector.

#### CROSS SECTORAL DEVELOPMENTS

##### Energy efficiency

324. The Netherlands has been very active in the area of energy efficiency and has created three special government agencies to implement it's programmes. PEO (Project Management Bureau for Energy Research) promotes energy efficiency and energy technology RD&D and NEOM (Netherlands Energy Development Company) introduces new technology to the market. SVEN (Netherlands Foundation for Information on Energy Saving) is responsible for the dissemination of energy efficiency information. In the beginning of 1988 PEO and NEOM will fuse. In the course of 1988 SVEN also will fuse into the new organisation.

Energy efficiency (ratio between final energy demand and GDP) improved by about 17% during the period 1973/82 but disimproved by about 4% during the period under review (1982/86).

325. The current Dutch energy efficiency programme includes the following elements;
- a comprehensive RD&D programme, a series of multi-annual programmes have been or are being developed.
  - several existing support schemes will be terminated in 1988. Among these are the National Insulation Programme and the 10% subsidy for conservation investments. Reduction in the market stimulation schemes will reduce the subsidy budget by two thirds to approximately 42.7mECU. This amount will be used to support decentralized electricity production, notably CHP, wind and solar and matured energy technologies on a temporarily base.
  - the state guarantee for loans for district heating projects was terminated in 1986 due to lack of interest in the district heating sector,
  - the government maintains a comprehensive energy efficiency information dissemination programme and an active replication programme.
326. The Dutch Government is one of the few Member States which has been increasing it's efforts in the area of energy efficiency RD&D. Funds allocated to this initiative have increased steadily from 13.3mECU in 1977 to 34.3mECU in 1986.

327. The Dutch Government has been active in the area of energy efficiency and the results to date have been encouraging. The main thrust of the current policy is the maintenance of informational and RD&D programmes with addition of the 42.7 MECU subsidy scheme.

Security of supply

328. Over the review period the Dutch supply dependence on imports increased by about four percent to about 18% in 1986. However if compared with the situation in 1973 the supply dependence improved quite considerably. Together with the UK the Netherlands are only to a limited extent dependent on external supply sources if compared with other Community Member States.

As shown above Dutch energy demand is highly dependent on oil and gas (about 90% of gross consumption) and a further diversification away from hydrocarbons would improve the security of supply situation.

329. Indigenous oil production today covers more than 20% of inland oil consumption. As the Netherlands continue to be a European centre of energy trade higher amounts of crude and solid fuels pass through the country than needed for own consumption purposes.

Traditionally the Netherlands stock holding obligation has been divided between an interim central stock entity (ICOVA) and operators in the market.

New legislation has confirmed the official adoption of COVA which now has increased its stock. The de facto obligations of refiners and traders have not been diminished by this increase. The increase of ICOVA-stocks is required for two reasons:

1. because of the impact of minor products not included in the EEC-obligation, the IEA stock obligation is substantially larger than the EEC obligation. This margin of difference will be covered by additional COVA stock.
2. A further 13% (approximately 9 days of 1986 net oil imports) is available in excess of IEA/EEC obligations. In the near future the target will be to hold approximately 15% or 10 days in excess of obligation. Some of this additional oil could be used for coordinated early stock drawdown.

Considerable volumes of transit stock are held in duty free facilities in the Netherlands and presumably only limited credit is taken for them by any country outside the Netherlands. The proposed clarification of bilateral stock agreements will possibly allow credit to be taken for these stocks where they are destined for delivery into a Community country.

330. The Netherlands are the only substantial net exporter of natural gas in the Community contributing significantly to the natural gas requirements of other Community partners.

The Netherlands have ample proven natural gas reserves which are sufficient to meet cumulative future home-market sales and export commitments, which are running until 2010.

331. Indigenous hard coal production that still existed in 1973 was considered to be uneconomic and has therefore been stopped. All solid fuel requirements are to be met by imports coming to a large extent from third countries.

#### Energy and environment

332. The Netherlands as a highly populated country in Middle Europe have continued to give high priority to environmental considerations in formulating energy policy. The environmental policy, aimed at achieving a desired "environmental renovation" is effect- and source-oriented. Refineries as well as electric power plants and road traffic have made and will in future make major contributions towards emissions reduction.
333. A General Administrative Order concerning emission standards for combustion installations has been adopted in 1987 which implements strict emission standards for SO<sub>2</sub>, NO<sub>x</sub> and dust. For refineries a special system has been introduced making no distinction between new and existing installations. In the transport sector the Government is supporting the rapid introduction of the clean car and unleaded gasoline. The countrywide introduction of unleaded Super (Euro-grade) will be achieved by new fiscal and dutylike incentives. Furthermore the Dutch Government has declared its intention to lower the sulphur content of gasoil to 0.2%. The sulphur content of heavy fuel oil has already been lowered to a maximum of 1%. SO<sub>2</sub> emissions in the Netherlands decreased from 475 000 tons in 1980 to 265 000 tons in 1985 (a reduction of 45%). A further reduction to 213 000 tons in 1995 is expected. Mainly because of the growth in road transport NO<sub>x</sub> - emissions will only be reduced from 534 000 tons in 1980 to 489 000 tons in 1995.

#### SECTORAL DEVELOPMENTS AND OUTLOOK

##### Oil

334. Worries as expressed in the last country report about possible substantive increases of inland oil demand and oil dependence have not materialized. Since 1979 Dutch inland oil consumption was continuously reduced by about one third reaching about 21 Mio toe in 1985. However this downward development has been halted in 1986 when low oil prices as well as strong production growth in the petrochemical sector and in refineries resulted in an inland consumption increase of more than 2 MTOE. In the long term it is not expected that oil demand will pick up again substantially.
335. The gradual shift in product demand away from fuel oil towards lighter products has mainly influenced the drop in consumption up to 1985. Inland deliveries of fuel oil have fallen from 7 Mio t in 1980 to 0.5 Mio t in 1985. In order to satisfy this demand shift refinery conversion is being done more deeply and, for this, construction of additional conversion installations in the order of 8.6 Mio tons of catalytic cracking equivalent per annum has been undertaken since 1980. Distillation capacities in the order of 33% of maximal capacity have been closed since 1979 (Community average :35%).

336. Oil product demand between 1982 and 1986 decreased in the transport and the industrial sector. However sales of international bunkers covering Diesel, fuel oil and jet fuel as well as exports increased over the same time period. With regard to Community oil imports the Netherlands and especially Rotterdam maintained its strategic position. 15% of the Community's crude imports are passing through Rotterdam for Dutch, Belgian and German Refineries.
337. Oil exploration flourished in an offshore concessionary system that compares quite favourably with others, because of its stability and long-term certainty on sales and prices. However falling crude prices have halted in 1986 a substantial number of exploration and development projects. The combined drilling activities relating to exploration for hydrocarbons and appraisal actions declined by almost 36% in 1986 in comparison with the preceding year. Nevertheless in 1986 as well as in 1987 natural gas reserves increased because of new findings by about 30 milliard m<sup>3</sup>.
338. In 1986 net oil imports represented 41% of gross energy consumption and 47% of inland energy demand. 1986 oil consumption (bunkers included) amounted to 45% of gross energy consumption and 36% of inland energy demand. Up to 1995 these percentages should remain more or less constant.

#### Natural Gas

339. After having re-evaluated the indigenous gas reserves in 1984 current export contracts have been extended by Gasunie up to the year 2010 and the inland marketing policy has been relaxed resulting in a growing natural gas production up to 1985. However falling oil prices in 1986 put natural gas at a competitive disadvantage due to the time lag whereby natural gas prices follow oil prices some months in arrears. The sales volume of Gasunie in 1986 was reduced by 8% compared with 1985. This decline in sales was very largely due to the cutback in export volumes. For the future the gas export policy is aimed at stabilizing the existing annual gas sales volume over the contract period.
340. In the home-market natural gas has already reached a very high level of penetration in all major consumption sectors. This is especially the case in the residential and commercial sector. Also for electricity generation the use of gas has been increased. Since 1982 gas sales to power stations rose at the expense of oil by nearly 50% from 6.5 billion m<sup>3</sup> to 9.7 billion m<sup>3</sup> in 1986. Gas sales to power stations at special low prices stopped in 1986.

Total home market sales increased in the same period only by about 4%. In the future sales to power stations might be reduced taking into account the governments policy of diversifying the fuel input for electricity generation. However as the future of electricity production capacity has not been decided, gas sales for electricity generation continue to have a high degree of uncertainty.



341. The Groningen field continues to be the most important element in the Netherlands gas supply. However total production from smaller on- and offshore fields have grown up to 1986 (38% of total production) to conserve as far as possible the Groningen field enabling it to perform a buffer function. In the next years some 4300 MECU will be invested to preserve this function. Imported natural gas from Norway, consisting of supplies under older contracts e.g. Ekofisk etc. and supplies from Troll due to come on stream from 1993 onwards will support this Groningen conservationist policy.

#### Solid Fuels

342. High gas penetration in all sectors and stringent environmental standards have so far limited increases in coal consumption. As a result the share of coal in inland energy consumption only showed a moderate growth from 9% in 1982 to about 10% in 1986. The major consumption sectors are electricity generation and coking plants.
343. As prospects for coal in industry are limited a further expansion of the coal share in the Dutch energy balance can only be realized in the electricity sector. The conversion programme of oil/gas fired power stations to coal, (1650 MWe) which will be finalized by mid 1988, as well as two authorized new 600 MW coal fired power stations should certainly result in a substantial consumption increase up to 1995. In 1995 about 50% of total electricity production could be based on coal.
344. The new 1987-1991 R,D & D programme for coal as proposed by PEO and NEOM (Management Office for Energy Research and Netherlands Energy Development Corporation) intends to overcome the environmental and technological obstacles for an increased coal use and focuses on new environmentally acceptable combustion technologies.

#### Electricity

345. In the Netherlands the Government and utilities have pursued a programme concerning the diversification of fuel inputs for electricity generation. One of the aims of this policy line is a decrease in oil and gas consumption. With regard to oil this policy has been very successful reducing the share of oil in electricity generation from 21% in 1982 to 2% in 1986. However since 1982 there has been no reduction concerning the share of gas for electricity generation. In contrast its share grew from 46% in 1982 to nearly 62% in 1986 because of the substitution of oil by gas. Because of this development the share of hydrocarbons in electricity generation was only reduced over the last five years by about 3% (for 1990 a reduction of 27% is expected).
346. However the authorisation of two new coal burning plants will produce a downward trend in the proportion of hydrocarbons for electricity production. After the finalisation of the retrofitprogram towards coal in 1988 (Buggenüm, Borssele, Maasvlakte) 45% of fuel input for electricity generation should be covered by coal.

347. One of the means to provide a more diversified fuel mix for electricity generation would have been the expansion of nuclear power. However the postponement of the Government decision to go nuclear makes it necessary that decisions on additional generating capacity will have to be taken soon to avoid any capacity shortfall in the period 1996 to 2000 and beyond, although new coal fire power stations have been authorised. Up to 1995 new, so far not decided upon nuclear or conventional thermal capacity can hardly influence the electricity supply situation taking into account total lead times for completion in the order of 7 to 10 years.
348. According to the 1987-1996 electricity plan new generation capacity of some 1800 MW is needed in addition to two new district heating units in the order of 200 MW each. In the period between 1996 and 1998 a further 3000 MW of new capacity is needed and during the period 1996-2006 capacity requirements amount to 10 000 MW. Those heavy capacity requirements show that decisions on the future production park are needed soon to avoid capacity gaps. If up to the next electricity plan in 1988 the nuclear question cannot be decided upon it cannot be excluded that even new investment in gas fired plants will be undertaken. In case of a nuclear moratorium it would be necessary, according to Commission estimates, to construct eight new coal fired power stations between 1996 and 2000.
349. In 2000 it is expected to expand decentralized electricity production to more than 3.500 MWe. Combined Heat and Power of 1700 MWe with a further 1000 MWe option, District heating (700 MWe) and wind power (1000 MWe) should provide the major contributions.

#### CHP

350. The Governmental support programme for CHP envisaging a further CHP potential of about 700-1000 MW in addition to the existing CHP capacity will very much depend on the final support programme that is planned to promote joint ventures between the private sector and public utilities. A special task-force - a cooperation of organisations involved in CHP - has been formed to promote the realisation of CHP projects, mainly by joint-ventures. As far as decentralised district heating is concerned no further growth is anticipated for the time being.

New and Renewables

351. The contribution of renewable energy is currently still insignificant (there are about 15 MWe of wind energy installed). However the Government supports the maximum utilization of economically feasible renewable energy, especially wind energy. In 1986 a new support programme for wind energy projects has been adopted running up to 1990. The objective of this programme is to install before 1990 a wind turbine capacity of 100 - 150 MWe. The total financial dotation of this programme amounts to about 47 Mio ECU. Plans have been put forward for 200 MWe of which about 75 MWe can be supported by the financial means of 1986/87. Up to the turn of the century the objective is to expand wind generation to 1000 MWe. However the contribution of new and renewable energy sources to the overall energy balance will remain marginal up to 1995 and small up to the end of the century, when 1%-2% of the energy requirements will be met by new and renewable energies, especially wind and biomass.

CONCLUSIONS

The Netherlands' energy demand is nearly exclusively covered by hydrocarbons, and especially by gas. The availability of large supplies of indigenous gas has caused this result and with the prolongation of existing gas contracts, the Netherlands remain a very important long-term gas supplier for other Member States.

To reduce this high dependence on gas and oil the Netherlands should intensify efforts to diversify its fuel sources.

The electricity sector is of prime importance to realize substantial diversifications away from gas and oil. Although major efforts have already been undertaken in the past to introduce solid fuels for electricity generation progress up to now to reduce the share of hydrocarbons in electricity has only been marginal. To a large extent, however, oil for electricity generation was substituted by gas.

Decisions on the structure of the future electricity production park continue to be delayed because of the postponement of the Government decision to further develop nuclear energy. Rapid decisions should be taken on the future role of nuclear and the quantitative dimension of coal capacity to avoid capacity shortages after 1995. Furthermore the danger cannot be excluded that future capacities will be based on natural gas to avoid political difficulties and to speed up construction.

Energy efficiency stimulation programmes have resulted up to 1982 in substantive improvements, however in the period 1982 to 1986 energy intensity disimproved and the future development in this sector should be closely monitored to take, if necessary, appropriate countermeasures.

## SUMMARIZED ENERGY BALANCE - NEDERLAND

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	72.89	65.38	69.93	73.13	75.3	75.4
-BUNKERS	11.53	8.66	8.67	9.64	12.2	12.3
-INLAND CONSUMPTION	61.36	56.72	61.26	63.49	63.1	63.1
INLAND ENERGY CONSUMPTION	61.36	56.72	61.26	63.49	63.1	63.1
-SOLID FUELS	3.16	5.20	6.60	6.50	7.6	8.6
-OIL	29.51	22.70	20.84	23.12	24.7	25.0
-GAS	28.50	27.39	32.32	32.52	29.5	26.9
-PRIMARY ELECTRICITY ETC	0.19	1.43	1.50	1.35	1.3	2.6
INDIGENOUS PRODUCTION (1)	56.78	55.55	64.76	62.17	59.5	51.8
-HARD COAL	1.19		0.07			
-LIGNITE & PEAT						
-OIL	1.54	1.92	4.11	5.04	7.5	5.8
-NATURAL GAS	53.75	52.45	59.52	55.97	51.2	43.6
-NUCLEAR ENERGY	0.30	0.98	0.98	1.06	0.8	2.3
-HYDRO & GEOTHERMAL (2)		0.20	0.08	0.10		0.1
-OTHERS & RENEWABLES						
NET IMPORTS (3)	16.28	9.03	4.44	12.78	15.7	23.6
-SOLID FUELS	1.69	6.00	6.60	6.35	7.6	8.6
-OIL	39.96	27.84	24.61	29.69	29.4	31.5
-NATURAL GAS	- 25.25	- 25.06	- 27.21	- 23.45	- 21.7	- 16.7
-ELECTRICITY (2)	- 0.12	0.25	0.44	0.19	0.4	0.2
STOCK CHANGES (4)	0.18	- 0.80	- 0.73	1.82		
-SOLID FUELS	- 0.28	0.80	0.07	- 0.15		
-OIL	0.46	- 1.60	- 0.79	1.97		
-GAS			- 0.01			
ELECTR. GENERATION INPUT	12.03	13.04	13.41	14.08	16.2	16.3
-SOLID FUELS (5)	0.81	3.13	3.70	4.01	5.0	5.7
-OIL	1.55	2.98	0.60	0.59	1.1	1.1
-NATURAL GAS	9.37	5.75	8.05	8.32	9.3	7.2
-NUCLEAR ENERGY	0.30	0.98	0.98	1.06	0.8	2.3
-HYDRO & GEOTHERMAL (2)						
-OTHERS & RENEWABLES		0.20	0.08	0.10		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	8.2%	- 0.9%	2.9%	- 0.2%	0.0%	
GDP ANNUAL GROWTH RATE	5.9%	1.6%	1.9%	2.4%	2.2%	
IMPROVEMENT IN ENERGY INTENSITY		17.3%	-4.3%	17%	9%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	56.3%	48.0%	42.2%	44.8%	49.0%	49.5%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	90.8%	66.9%	64.5%	63.3%	64.2%	50.9%
SUPPLY DEPENDANCE ON IMPORTS	22.3%	13.8%	6.3%	17.5%	20.8%	31.3%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES

B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES

## NOTES

1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS
2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH
3. THE (-) SIGN MEANS NET EXPORTS
4. THE (-) SIGN MEANS A STOCK DECREASE
5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)

## GENERAL NOTES :

FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS

PortugalIntroduction

352. The Portuguese energy situation is characterised by a high dependency on imports as well as an extremely high share of oil in total consumption. Hydro is an important energy source in Portugal. So is biomass. Apart from these other indigenous resources are limited. At the time of the first oil crisis in 1973 oil accounted for almost three quarters of energy consumption in Portugal and until fairly recently little had been done to try to alter this high dependency on oil imports. In 1986 oil accounted for nearly 80% of energy consumption although projects coming on stream especially in the gas and electricity sector will help to reduce this level of oil consumption in the years ahead.
353. There were a variety of reasons why the Portuguese energy economy was so slow to respond to the two oil shocks. The high level of subsidisation of oil products and other energy prices was certainly a major factor. In the 1980's as the high oil import dependency led to balance of payments constraints, which in turn hindered investment in other sectors of the economy it was realised that major changes needed to be made in the energy area. The accession to the EC in 1986 provided an added incentive to rationalise the energy situation in Portugal.
354. This is the first time that Portuguese energy policy has been reviewed by the EC. There are accordingly no previous recommendations to draw on. An important issue worth drawing attention to is the statistical difficulty encountered in calculating the contribution from biomass. Because of problems of inadequate data the Statistical Office of the EC has not included this energy source in the historical energy balances of EC member countries. These problems of data collection are now being resolved and appropriate adjustments will be made in energy balances later in 1988. The figures for energy consumption in Portugal for 1982-1986 do not include the important contribution from biomass. This omission increases the share of other fuels in Portugal's energy balance.

Energy developments since 1982Market Trends

355. Energy consumption rose by over 8% in Portugal in 1986 following three years of relatively flat demand. GDP varied considerably with average growth rate of around (1.4%) during this period. The main aspects of Portuguese energy consumption since 1982 are:
- oil consumption fell by 8% between 1982 and 1985 but rose again by 7% in 1986 largely as a result of the relatively low contribution from hydro in that year and lower oil prices;

- as new coal fired electricity generation capacity started to come on stream solid fuel consumption has risen.

Share % of fuels in energy consumption

	<u>1973</u>	<u>1982</u>	<u>1986</u>
Solid fuels	15	3	10
Oil	67	85	78
Gas	-	-	-
Primary electricity etc.	8	8	9
Bunkers	10	4	4

(Note: Because of rounding figures may not add up to 100)

Policy Developments

356. Although a National Energy Plan has existed since 1982 (and revised in 1984) the Government of the day decided to present the Plan to Parliament but it was never adopted by the Parliament. Many of its targets (i.e. in respect of nuclear and natural gas) are now out-of-date. The Government have announced their intention to draw up a new plan which is expected to be published late 1988 or early 1989.

Because of the high volume of oil imports the fall in oil prices has had a beneficial effect on the Portuguese balance of payments. It has also allowed the Portuguese Government to suspend many of the subsidies that were being paid (particularly in the electricity sector).

357. Following accession to the EC Portugal has had to commence the liberalisation of its oil market. A seven year transitory period has been provided for in the accession treaty and the first stage of the liberalisation process began in 1986.

Energy outlook to 1995

358. Energy consumption is projected to increase at a slightly slower rate than economic growth. Energy consumption will grow by an estimated 38% between 1986 and 1995 (biomass excluded). This is higher than the EC average. Portugal's ability to substantially reduce oil dependency depends on being able to diversify its fuel use.

359. At present it is envisaged that in 1995 solid fuels and natural gas would be accounting for 21% and 5% respectively of gross energy consumption (biomass excluded). At present there is very little solid fuel consumption outside the electricity sector. It may be difficult to change this significantly in the period up to 1995 because of the small and diversified nature of industry in Portugal but studies are being carried out by the Portuguese Government to assess the potential for solid fuel usage in industry. Furthermore due to the lack of infrastructure a large proportion of industry will not be able to avail of the only large scale coal handling facilities that are being constructed for the electricity stations at Sines. With the decision taken to construct an LNG terminal at Setubal and to bring gas to Lisbon and further northwards it should be possible to have natural gas playing a role in Portuguese energy requirements by 1995.

### Cross Sectoral developments

#### Energy efficiency

360. Portugal has the lowest per capita energy consumption in the European Community although this situation is certain to change as the country industrialises. The Portuguese energy efficiency programme has been underway since 1978 but has experienced some elements of a stop-go situation on many of the initiatives. Energy intensity increased by 8.9% during the period 1973/82 and over the period 1982/86 energy intensity increased by 3.6%.

361. The energy efficiency programme comprises the following elements:

- a series of five 'Assistance Schemes to Industrial Consumers of Imported Fuels' have been implemented up to 1986. The aim of these schemes was to disseminate energy efficiency information and to provide grants of up to 30% of costs for energy conservation or fuel substitution projects. The total energy savings attributed to these schemes has been estimated at ± 400 000 toe per year. A new scheme came into operation in Autumn 1986 under which up to the end of 1986 over sixty projects were approved in the domain of energy conservation, promotion of indigenous resources and energy substitution. A revision of the scheme and its application to the Valoren Programme is currently under examination.

- all plants consuming over 1 000 toe/year must undertake comprehensive energy audits every five years and must submit a five year energy saving plan to the Department of Energy. This plan must then be adhered to.

- a World Bank loan has financed a 'Multi-Industry Energy Savings Survey' to carry out full energy audits on 55 plants to improve the rational use of energy. Five year energy saving plans will be developed for each of the plants and the execution of the plans will be monitored. Sectoral energy audits will be carried out in these plants which embrace the food, textile, wood and cork, paper and ceramics and glass industries.



- a programme of compulsory building energy audits is under consideration.

362. Portugal has been increasing its spending on energy efficiency R&D. Allocations have risen from under 200,000 ECU in 1980 to almost 1.8 mECU in 1985.

Security of supply

Portugal's dependence on imported energy is the highest in the Community. Over 85% of energy requirements come from third countries. Oil accounts for nearly 90% of energy imports.

363. The high dependence of Portugal on oil imports means that Portugal does not enjoy the relatively more diversified energy economies that exist in other Member States. The problems that this high dependency can bring have been recognised for some time but it is only relatively recently that concrete measures have been taken that will lead to a more diversified pattern of energy usage.
364. In the past the national obligation to hold security oil stocks has been divided between Petrogal, the state refining and supply company which has been responsible for holding the required 90 days of stock and the marketing companies each of which has been required to hold 30 days of their deliveries into consumption in the preceding calendar year. The final results of market liberalisation cannot yet be totally predicted but it is understood to be the intention to maintain the 90 days of stock relative to the market as a whole, in the hands of Petrogal. New suppliers entering the market also have to take on stock obligation but their final form will not be established prior to liberalization.

This gives Portugal a healthy stock position and it is understood that the Government is sympathetic to the concept of early use of stock and clearly have enough stock within the national system to allow this to be done without prejudice to the holding of the 90 day Community obligation minimum.

365. The Government have recently announced plans to construct an LNG terminal at Setubal. This gas would be used initially to replace the existing supply of town gas in Lisbon and from there further northwards towards Oporto. The terminal will have an initial throughput of 1 milliard m<sup>3</sup>. Algeria and Nigeria are among the potential suppliers. Discussions are still in progress with the Spanish authorities on the possibility of extending the Spanish gas network towards the North of Portugal.

366. Hydro and biomass are the only large indigenous sources of energy. As a peripheral region of the Community Portugal faces additional difficulties in connecting to other sources of Community energy supplies. Thanks to electricity interconnections with Spain Portugal has been able to purchase French and Spanish electricity to cut down on domestic electricity production from fuel oil. Hydro electricity is the largest indigenous energy source accounting for 50% of electricity production, on average. Because of climatic conditions the contribution from hydro can vary significantly from year to year. The share of oil in electricity generation will continue to fall as new coal and hydro plants are brought on-stream.
367. The increased use of coal for electricity generation is the most significant change that is presently taking place in Portugal's energy economy. The lack of inland infrastructure though limits the prospects for coal use in areas outside the electricity sector.

#### Energy and the Environment

368. With a comparatively low level of industrialization environmental problems from energy usage are not as yet a serious problem in Portugal although with the construction of new coal fired electricity plants, that do not have FGD or similar equipment, this situation may change. It is expected that new coal fired plants, for which orders have yet to be placed, will be equipped with FGD.

#### Sectoral Developments and outlook

##### Oil

369. With the construction of new coal fired electricity stations the share of oil in total energy consumption has started to decrease in Portugal. There is though a large level of oil consumption in the industrial sector (over 40% of oil consumption) and unless some further diversification of fuel use takes place in this sector the share of oil in total energy consumption will remain relatively high (close to 60%) in Portugal in 1995.
370. The state owned company Petrogal operates the country's two refineries at Sines (10 mt/y) and Oporto (4.5 mt/y). Both these refineries are operating well below distillation capacity. The newer of the two, Sines, which came on stream in 1978 was originally intended to be an export refinery as well as feeding an intended downstream petrochemical industry. This industry never fully materialized and with the downturn in demand for oil that occurred after 1979 the Sines refinery has been only able to maintain its level of operation with considerable Government assistance.

371. Under the terms of the Accession Treaty a seven year transition period up to 31 December 1992 has been granted for the liberalisation of the oil market in Portugal. Prior to accession the three foreign companies operating in Portugal were allocated quotas of approximately 41% (of market) for gasoline, 32% for gas oil, 21% for fuel oil and 48% Kerosene. Petrogal supplies the remainder. These shares have now changed. The first stage of the liberalisation process began in 1986. The Accession Treaty envisages an annual increase in the quotas. The Portuguese Government has decided that this annual increase should be 5% (in volume) from 1987.
372. A new formula for calculating the ex refinery price of oil products came into effect in October 1987. The selling price to consumers is made up of ex refinery costs, distribution costs plus taxation plus a variable tax which is designed to keep consumer prices at an even level.

#### Natural Gas

373. There are no supplies of natural gas currently available in Portugal. There is one town gas industry in Lisbon, which manufactures gas from naphta. (Until recently) the price of gas to consumers has been subsidised. However one of the main difficulties in increasing gas penetration appears to have been the fact that EDP the electricity generation and distribution company was also responsible for distribution and marketing of town gas and little effort has been made to extend the gas network in Lisbon. The Government is currently actively considering the reorganisation of the town gas industry. The National Energy Plan originally envisaged that natural gas could be making a contribution to Portugal's energy requirements by 1990. The decision to construct a LNG terminal south of Lisbon could mean that natural gas could be available in the Lisbon area and further north by early 1990's. Talks between the Portuguese and Spanish authorities are proceeding on a possible link up between Portugal and the Spanish gas network.

#### Solid fuels

374. Indigenous sources of coal are small and are of poor quality. Most is used at a minemouth power station. Lignite reserves are more extensive but also of poor quality. There are no definitive plans for exploitation of these reserves.

375. Until the construction of the Sines electricity stations coal consumption was low in Portugal. A further 1 200 MW of coal fired capacity is expected to be in place by 1997. Because of the high degree of protection afforded to domestic Portuguese industries and the subsidies paid to reduce energy prices many of the industries there were slow to adjust to the rise in oil prices. In other countries similar industries quickly changed their fuel use from oil to solid fuels in the early 1970's. It was almost a decade later before comparable industries in Portugal switched away from oil. Another factor hindering the development of a market for solid fuels is the absence of internal infrastructure for large scale handling of coal. There are many small coal importers but there is no overall body who could undertake a central purchasing or marketing role. These factors will act against the development of a market for solid fuels outside the electricity sector.

#### Electricity

376. The 4.8% p.a. growth in electricity demand in Portugal between 1982 and 1986 was one of the highest in the Community. GDP growth was over 1% p.a. on average during the same period. Electricity growth is expected to continue strongly up to 1995. The electricity sector has for a number of years been beset by many difficulties which are only now being addressed. The financial situation of EdP (Electricidade de Portugal), the state owned electricity and distribution company, is very weak. A number of factors have prevented the company from raising sufficient revenues to cover its operating costs and eliminate its accumulated deficit. Legislation executed in 1986 will integrate the distribution of electricity still in the hands of some municipalities into the EdP network. This will remove the difficulty EdP had in collecting sufficient revenues from some municipalities for electricity supplied. However it is expected that further decisions will need to be taken by the Government to resolve the problem of low electricity prices in Oporto.
377. The subsidisation of fuel oil prices in electricity generation meant that conversion to other energy sources occurred later in the electricity sector in Portugal than in most other countries. That position is now changing and for the future all new electricity capacity will be either coal or hydro. Of the 9GW of installed capacity expected to be in place by 1995 47% will be hydro, approximately 28% oil and 25% coal. Plans to have a nuclear power plant in operation by the end of the century have been shelved. The share of hydrocarbons in electricity generation will have declined from 53% in 1986 to under 30% in 1995.
378. Hydroelectricity plays a very important part in electricity generation in Portugal. Almost half of installed capacity is hydro which on an average year contributes around one half of electricity requirements. New plants currently under construction will increase hydro capacity by over one third by 1995. Considerable potential for further hydro developments still exist in Portugal.

New and Renewable Energies

379. Hydro is clearly the most important of these fuels in Portugal and as mentioned earlier there is still considerable potential particularly for small hydro developments. While legislation exists which permits the private production of electricity (and its sale to the national grid) delays in receiving the necessary approval have hindered developments. A draft law is in preparation to facilitate the production of electricity from new and renewable sources. If enacted this law would allow private production of electricity of up to 10MW from these sources as well as speeding up the current authorisation process. An important element in this law is that producers of electricity from these sources do not also have to be consumers of the electricity from the grid.
380. Because of its geographical position Portugal is well situated to exploit solar energy. Biomass, which currently contributes  $\pm$  1mtoe to energy requirements has potential for further development. There is considerable potential for wind and geothermal as well. Renewable energies could be accounting for up to 12% of Portuguese requirements in 1995.

## CONCLUSIONS

At the time of the first oil crisis Portugal had an extremely high oil import dependence. In comparison to other Member States oil consumption remained at very high levels in Portugal until relatively recently. It is only in the past few years that the decisions have been taken that will lead to a substantial reduction in oil consumption in Portugal. The eventual adoption by the Parliament of the National Energy Plan currently in preparation would help to ensure that sufficient political backing is given to restructuring the Portuguese Energy Economy.

The Portuguese have taken steps to harness the contribution from their main indigenous energy resources i.e. hydro and biomass. Potential exists for further exploitation of these resources particularly small hydro. The Government should do all that it can to ensure the maximisation of these resources so as to minimise oil import dependency.

Considerable effort has been made to improve energy efficiency in Portugal. Monitoring the effectiveness of these schemes and devoting resources to the areas that have the greatest potential for further improvements should be a key element where resources are limited. An effective energy pricing policy has an important role to play in this area also.

One of the reasons why oil consumption has stayed at relatively high levels in Portugal was on account of the many subsidies to reduce the cost of oil, paid in the energy area. However energy prices have provided an opportunity for the Government to remove many of the existing subsidies. More needs to be done particularly in the field of electricity pricing so as to bring consumer prices more in line with real costs of production. The problem is particularly acute in certain municipalities such as Oporto.

The dismantling of the oil monopoly in Portugal should, in accordance with the act of accession and EEC Treaty, be achieved within the transition period.

The development of alternatives to oil such as coal and natural gas have also been hampered by the absence of infrastructural requirements. Plans are underway to remedy these difficulties. For example the Government have announced plans to introduce natural gas by the end of 1991. In the case of the coal handling facilities at Sines the completion of all the necessary facilities is particularly urgent so as to permit the economic utilisation of imported coal.

## SUMMARIZED ENERGY BALANCE - PORTUGAL

FEBRUARY 1988

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IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	8.06	10.76	10.76	11.63	14.8	17.0
-BUNKERS	0.84	0.39	0.47	0.50	0.6	0.6
-INLAND CONSUMPTION	7.22	10.37	10.29	11.13	14.2	16.4
INLAND ENERGY CONSUMPTION	7.22	10.37	10.29	11.13	14.2	16.4
-SOLID FUELS	1.23	0.32	0.68	1.11	3.3	4.3
-OIL	5.36	9.14	8.42	9.03	9.7	10.1
-GAS						0.8
-PRIMARY ELECTRICITY ETC	0.63	0.91	1.19	0.99	1.2	1.2
INDIGENOUS PRODUCTION (1)	1.42	0.73	1.11	0.91	2.1	2.1
-HARD COAL	0.79	0.07	0.10	0.09	0.1	0.1
-LIGNITE & PEAT					1.0	1.0
-OIL						
-NATURAL GAS						
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.63	0.60	0.92	0.73	1.0	1.0
-OTHERS & RENEWABLES		0.06	0.09	0.09		
NET IMPORTS (3)	6.48	9.89	9.64	10.77	12.8	15.0
-SOLID FUELS	0.32	0.27	0.94	1.07	2.3	3.3
-OIL	6.16	9.37	8.52	9.54	10.3	10.7
-NATURAL GAS						0.8
-ELECTRICITY (2)		0.25	0.18	0.16	0.2	0.2
STOCK CHANGES (4)	- 0.16	- 0.14	- 0.01	0.05	0.1	0.1
-SOLID FUELS	- 0.12	0.02	0.36	0.05	0.1	0.1
-OIL	- 0.04	- 0.16	- 0.37			
-GAS						
ELECTR. GENERATION INPUT	1.27	2.54	2.74	3.34	4.1	4.9
-SOLID FUELS (5)	0.31	0.08	0.22	0.76	1.7	2.4
-OIL	0.33	1.80	1.51	1.76	1.4	1.4
-NATURAL GAS						0.1
-NUCLEAR ENERGY						
-HYDRO & GEOTHERMAL (2)	0.63	0.60	0.92	0.73	1.0	1.0
-OTHERS & RENEWABLES		0.06	0.09	0.09		

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990
INLAND ENERGY ANNUAL GROWTH RATE	7.4%	4.1%	1.8%	6.3%	2.9%
GDP ANNUAL GROWTH RATE	7.1%	3.3%	1.0%	3.7%	4.3%
IMPROVEMENT IN ENERGY INTENSITY			3.6%	-17%	7%

	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	76.9%	88.6%	82.6%	81.9%	69.6%	62.9%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	26.0%	70.9%	55.1%	52.7%	34.1%	30.8%
SUPPLY DEPENDANCE ON IMPORTS	80.4%	91.9%	89.6%	92.6%	86.5%	88.2%

A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES  
 FROM EXTERNAL SOURCES

- NOTES
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UNITED KINGDOMIntroduction

381. The U.K.'s position as a large net exporter of oil and a major producer of gas and coal for her own use places her in a unique position in the Community, although the volume of indigenous energy production has probably now reached its peak. At the time of the last review UK energy consumption had been reduced to 13% below its level in 1973, and a reliance on imported oil for nearly 50% of its energy needs in the latter year had been transformed into a substantive oil export surplus.
382. In the Commission's last review four policy issues were highlighted as meriting particular consideration:-
- the exploitation of energy efficiency potential
  - future role of nuclear.
  - outlook for the coal industry
  - maintenance of satisfactory conditions for exploitation and development of hydrocarbons
383. Progress on these issues is recounted in the relevant sections of this report.

Energy DevelopmentsMarket Trends

384. Although the pattern of energy consumption in the UK was distorted by the coal miners dispute in 1984/85, the underlying trend is now towards increasing consumption. Gross energy consumption continued to fall until 1984 but then rose strongly. Over the period 1982-1986 energy consumption rose by nearly 7%, compared to a GDP growth of 12% during the same period.
- 385.\* The main features of the consumption pattern in the last four years were:-
- natural gas consumption increased by 18%
  - primary electricity, almost all nuclear, grew by over 30%

Share (%) of Fuels in Gross Inland Energy Consumption

	1973	1982	1986
Solid Fuels	35	33	32
Oil	48	39	37
Gas	11	21	23
Primary Electricity	4	6	8
Bunkers	2	1	1



386. On the supply side, the rationalisation of the domestic coal industry continued with coal production 13% lower in 1986 than in 1982. The coal miners dispute in 1984/85 was in many ways a watershed for the industry. In the period since the end of the dispute there has been a radical transformation with over 85 000 employees out of a total of 220 000 leaving the industry.
387. North Sea oil production peaked in 1985 and is expected to decline slowly in the years ahead. Around 35% net of production is currently exported. The fall in oil prices has had no noticeable effect on UK oil production levels. Natural gas imports fell in volume terms in 1986 and their share of natural gas consumption was around 22% in 1986.

#### Policy Developments

388. The present Government's policy that market forces should be allowed to operate was demonstrated not only in the coal sector but also during the sharp fall in oil prices in 1986. Although Government revenues from offshore oil and gas production were reduced by  $\pm$  £10 bn ECU in the fiscal year 1986/87 the Government decided that it would not join many other oil producers in trying to maintain or restore world oil price levels.
389. A major part of the Governments programme has been to sell off state owned industries to the private sector. Companies in the energy sector that have been privatised include : Britoil (1982), Enterprise Oil (1983), British Gas Corporation (1986) and BP, (sale of remaining Government share) 1987. The privatisation of the electricity industry, which will probably be the most complex exercise of all, is scheduled to take place in the next few years.

#### Energy Outlook to 1995

390. The Governments policy of reliance on market forces is well known by the absence of an overall policy statement on energy and in particular the lack of published Government projections complicates the task of looking at the medium to longer-term energy outlook in the UK.
391. Estimates by the Commission services on the basis of recent trends and data from UK sources suggest however that, assuming fairly steady economic growth, the UK might expect a slow but steady rise in overall energy consumption of around 7% over 1985 levels by the end of the ten years. Oil consumption should fall slightly up to 1990 but due to increasing demand in the transport sector could rise again after 1990, maintaining its market share of about 35%. Oil production will continue to fall but the level of UK oil production could be about 85 mt in 1995.
392. As discussed below the outlook for coal consumption and production is closely linked to the electricity sector and the privatisation of that industry. Electricity and natural gas demand are expected to show the strongest increase in demand in the period up to 1995 with an expected increase of 10-15% up to 1995 in both cases..

## Cross Sectoral Developments

### Energy efficiency

393. The United Kingdom has completed an assessment of the Energy Efficiency Office (EEO). The EEO's programmes are to be targeted on what are considered the most economically attractive areas. Studies are under way to examine how the contribution from those who benefit from the Office's industrial and commercial programmes can be increased. There has been an emphasis in the past on the adoption of initiatives which do not require government funding and which could effectively be driven by the market. Energy intensity improved by 18.8% during the period 1973/82 and by 5.3% during the period 1982/86.
394. The energy efficiency initiatives taken by or at the instance of the UK Department of Energy include the following:
- provision of a wide range of practical help and advice on all aspects of energy efficiency in industry, commerce and the public and domestic sectors
  - a comprehensive range of free information booklets and publicity material
  - targeted publicity through leaflets, maildrops, and advertisements in the trade and specialised press,
  - schemes in the non-domestic sector for helping with consultancy costs for energy audits, and for the development of energy management disciplines,
  - independent and specific advice, mainly outside the domestic sector, from the EEO's 12 regional energy efficiency officers
  - schemes in the domestic sector for contributing to the costs of the insulation of roof spaces and of hot water cylinders, with additional assistance (including labour) for older consumers and others on low incomes,
  - assistance to local authorities on development of strategies and techniques suitable for controlling their own energy use, together with advice on external methods of funding improvements; support to chosen lead authorities for consultancy work for developing new schemes for combined heat and power programmes,
  - provision of educational materials to schools; touring displays; support for promotional events designed to bring consumers to a closer awareness of the precise opportunities available for energy efficiency and the methods for achieving those opportunities,
  - demonstration schemes for new technologies, or novel uses of existing technologies, with an ongoing programme of related seminars,
  - support for energy management groups at local level and training in energy management,

- production of performance indicators for all major types of non-domestic buildings
- direct ministerial contacts, through meetings, visits, and letters, to encourage the involvement of new decision makers in energy efficiency.
- collaboration with other Government Departments to improve their energy efficiency

395. The United Kingdom has a very active energy efficiency research, development and demonstration programme. The emphasis of the demonstration programme has been the replication of successful technologies. Expenditure on energy efficiency R,D and D programmes was almost 12 MECU in 1986/7.

#### Security of Supply

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396. Being a net energy exporter the UK is in a relatively favourable position as regards security of supply.

Domestic oil production should be more than sufficient to meet all UK domestic demand until early next century, and oil exports are expected to continue (although at much lower levels) for the rest of the century, thus helping the security of supply of other EC member states. Investments in North sea developments to come on stream in the 1990's are of course sensitive to actual and anticipated oil prices. The results from the 1987 season are however more encouraging than had previously been foreseen.

397. Because of the level of indigenous crude oil production, the United Kingdom has a lower EC oil stock obligation (76.5 days). These stocks are held entirely by the oil companies which operate in the market under annual directions issued by the Government.

On occasion UK stock levels for certain products have been marginally below obligation, a situation largely attributable to the fact that full credit cannot be taken for the large UK crude oil stocks, because of the technical restrictions which the EC directive places on the quantity of crude that may be taken into account against product stock obligations.

The UK considers that early stock release could be an appropriate response in certain crisis situations.

398. The implications of on-going restructuring and rationalisation in the coal industry for future output levels are difficult to assess. The prospects of maintaining or even increasing coal production levels depends of course on productivity and competitiveness of UK coal with other forms of energy. The proposed privatisation of the electricity sector will also have an influence on coal demand and supply in the UK.

399. The position on future Natural Gas supplies and the degree of dependence on imports has not yet been clarified. The UK Government's decision in 1985 to block the British Gas Corporation's intended purchase of gas from the Norwegian Sleipner Field has meant that additional supplies of gas required in the 1990's still have to be found elsewhere. Some additional supplies from the UKCS have already been contracted for. Further quantities of gas will still be required. Although there are sufficient amounts of gas available from potential suppliers (UKCS, Norway, etc) decisions on future supplies have to be taken soon.
400. An interconnection with the mainland European gas network would not only increase security of supply but in the long term would increase the range of supply options open to the UK and the continent. The construction of new storage facilities, for example the Rough gas field, together with the increased production flexibility provided by the Morecambe field mean that British Gas is in a reasonably secure position to cope with major supply disruptions, such as occurred in April 1986 when Norwegian supplies were temporarily interrupted by industrial action.

#### Energy and the environment

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401. Following preliminary results from research carried out by the Scandinavian Academies of Sciences the UK authorities accepted that SO<sub>2</sub> discharges from UK power plants contribute to the acidification of Norwegian lakes. In 1986 it was decided that newly authorised coal fired power stations were to be equipped with SO<sub>2</sub> control equipment and in an effort to reduce the existing level of SO<sub>2</sub> emissions it was decided to retrofit the most modern of the coal burning stations with flue gas desulphurisation facilities over the period 1988 to 1997. Almost 900 MECU will be committed to this retrofitting programme. In all some 6 GW of existing capacity, will be retrofitted with FGD and 4 GW of new capacity will have FGD equipment installed over the next ten years. Low NO<sub>x</sub> burners are also to be installed at the twelve largest coal fired stations (23 GW). It is hoped that by 1998 the UK will have 10 GW of generating capacity equipped with FGD and 27 GW with low NO<sub>x</sub> burners. The total capital cost involved will be about 1 700 m ECU.

#### Sectoral Developments and Outlook

##### Oil

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402. Oil consumption figures although distorted by the coal miners dispute, show a stable overall trend, between 1982 and 1986 but with increased growth in the transport sector. Overall oil consumption could fall up to 1990 but demand in the transport sector in particular will tend to push up demand again after 1990. The transport sector could account for some 52% of oil consumption in 1995 as against 48% in 1986.

403. Indigenous oil production peaked at 2.5 mbd in 1985. It has now fallen slightly and is expected to be at 2.4 in 1987. Estimates of recoverable oil reserves have recently been revised upwards to a possible maximum of 2050 mt. The fall in oil prices has affected offshore activity in the UKCS. In 1986 the number of offshore exploration and appraisal wells was down to 113 compared to 157 in 1985. The position in 1987 was better with the number of wells expected to have been drilled rising again. The changes in Petroleum Revenue Taxation introduced by the UK Government and the relative price stability in world oil markets have helped to support the level of activity in 1987.
404. The Tenth Licensing Round in 1986/87 saw a fall in the number of applications submitted from the record level of nearly 150 in the previous round to 75 in the current round. In the context of the volatile oil market at the time the results must nevertheless be considered as encouraging, particularly in view of the relatively high average number of wells per block to which operators committed themselves.
405. A major issue to be confronted in the coming period is the manner in which offshore installations are to be disposed of. At present there are around 160 offshore platforms, of which  $\pm$  110 are in shallow water and can fairly readily be completely removed. The cost of removing the platforms has been put by industry sources at around 9 bn ECU.

#### Natural gas

406. The privatisation of British Gas has not fundamentally altered the operations of the gas industry in the UK, although the monopolies which British Gas had enjoyed in supplying North Sea gas and in supplying customers have been terminated, at least in legal terms. The Office of Gas Supply (OFGAS) was established under legislation to watch over the activities of the privatised British Gas in order to protect the interests of gas consumers. The main areas of concern for OFGAS are authorisations to supply gas, gas pricing and common carriage, and protection of the interests of tariff gas consumers.
407. As referred to earlier, additional supplies of gas are being negotiated for the 1990's. But with the conclusion of the agreement between European gas undertakings and Norway, which will permit the development of the Troll and Sleipner Fields, coupled with the upgrading of gas reserves in the UKCS, there seem to be more than sufficient potential supplies, and delivery routes, available. Decisions will need to be taken soon on such questions, including the extent and timing of any new imports.

The rate of growth of natural gas consumption is expected to be higher than overall energy consumption up to 1995. The residential and to a lesser extent the industrial sectors will be the main growth areas. Natural gas should as a result at least maintain its present share 22% of UK gross energy consumption, and, that share could well increase.

Solid fuels

408. With the termination of the year long coal miners dispute in 1985 the UK coal industry has continued its major rationalization plans. Total coal production in 1986 was 13% below 1982 levels. During the same period the total workforce of British Coal has been reduced by around 40%, accompanied by an increase of over 30% in average output per manshift worked in deep mines. Despite this impressive improvement in productivity British Coal will continue to require Government support to meet an envisaged deficit of 130mECU in 1987/88 (420mECU in 1986/87). The UK Government have set British Coal a target to break-even financially by 1988/89. World coal prices and the \$/£ exchange rate are variables that will have a major influence on British Coals ability to meet these targets.
409. The outlook for coal consumption in the UK is tied up with the electricity sector. The forthcoming privatisation of the electricity industry in the UK, as well as the future pattern of ordering new electricity plants, will be the major influences on the future demand for coal generally and the outlook for British Coal. Power station demand accounts for nearly three quarters of coal consumption in the U.K. and (80)% of British Coal's output goes to this sector under an agreement with CEGB as well as to the electricity undertakings in Scotland and Northern Ireland. The CEGB have selected sites for the construction of two (1800mw) coal fired stations which are due to be brought on stream in the 1990's. One of these sites is inland near a coal field while the second is to be located close to a major port which would facilitate if necessary, the purchase of coal from overseas sources.
410. The Governments plans for the privatisation of the electricity sector have been recently announced. The main features of the Government's proposals are that the CEGB's existing monopoly in generation and control of the national grid will be broken. A new private generating company will be responsible for supplying 30% of electricity requirements. The remainder of the CEGB which will be privatised also will have responsibility for the remaining power stations including the nuclear stations. Distribution will be in the hands of twelve companies based on the existing Area Boards. Ownership of the national grid will pass to these distribution companies.

To enhance security of supply the Government intends to impose a statutory obligation on the distribution companies to contract for a minimum proportion of non-fossil fueled generating capacity. Subject to this the distribution companies will be able to contract for supplies from virtually any source they wish.

The implications for domestic coal production (and for nuclear energy) could be far reaching. For example will a fully privately owned industry buy all its coal requirements from British Coal? That will of course depend on price. The high level of dependence on each other of the national coal and electricity industries will certainly have a major influence. It is unlikely though that a privatised industry would suddenly import a large proportion of its coal requirements. Also, many of the power stations that burn coal are situated near mines and

therefore removed from port and rail facilities. Unless there were further sharp falls in world coal prices the extra cost of transporting coal to these power stations would probably erode any price advantage of imported coal.

411. There does not at present seem to be much scope for any significant increase in coal consumption outside the electricity sector. The UK Government in 1987 terminated its coal firing scheme which assisted the installation of coal burning facilities in industry. Up to the last month of the scheme the number of applicants in its final year of operation was only 4. Although there was an increase in applications in the final month (a further 38) this relative lack of interest by industry gives an indication of the major difficulties that confront policy makers in trying to increase solid fuel usage outside the electricity sector. Despite increased use for electricity generation it is expected that the overall share of coal in the UK energy balance will remain fairly constant up to 1995.
412. Apart from coal there are also some lignite and peat reserves in the U.K. A development plan has been worked out for the exploitation of an estimated 420m tons of lignite reserves in Northern Ireland. A decision from the UK Government is awaited on proposals by public and private interests for the construction of a lignite power station to exploit this reserve. Coupled with the conversion of the oil fired Kilroot power station these developments could lead to the reduction in or even elimination of present Government subsidies designed to keep electricity prices in Northern Ireland in line with the levels on the UK mainland.

#### Electricity

413. The rate of growth in electricity consumption was over 10% between 1982-1986 as against GDP growth of 12% in the same period. Electricity consumption is expected to rise more slowly in the period to 1995 (just under 1.5% p.a.) against the background of GDP growth averaging around 2.5% per year.
414. As a result of the Governments go-ahead for the construction of the first PWR type nuclear power station in the UK the Central Electricity Generating Board have applied for permission to build a second nuclear station at Hinkley Point to come on stream in the second half of the 1990's. The major issue now confronting the electricity industry are the plans for privatisation which are described in Paragraph 30 above. As already stated the effects of privatisation could have an important influence on the long term energy situation in the UK, particularly in relation to domestic coal production and the future role of nuclear power.
415. The future balance between coal and nuclear for new generating stations

competitive fuel for electricity generation, although gas might make some inroads. The UK Government though has indicated that in its proposals for the privatisation of the electricity industry there will be a legislative obligation on the distribution companies to contract for a specified minimum level of non-fossil fuelled generating capacity. In any event it is not anticipated that further orders for new plants to come on stream before 1995 will be necessary. In any case coal and nuclear, taken together, should provide over 90% of the inputs to electricity generation in 1995.

416. The decision by the UK Government to increase the rate of return (on current cost assets) of the Electricity Industry from 2.75% in 1987 to 3.75% in 88/89 and 4.75% in 89/90 means that electricity prices are likely to rise quite substantially in the coming period. This could affect demand. Privatisation could however inspire the overall efficiency of the industry by introducing greater efficiency.
417. The share of hydrocarbons in electricity production has continued to fall, except for the period of the coal miners' dispute in 1984/85, when the CEBG brought on stream a number of oil-fired stations which are no longer used for base load demand. These oil-fired stations represent 20% of electricity capacity in the UK. The share of oil and natural gas in electricity generation in the UK is nevertheless expected at present to decline from (10%) in 1986 to around 8% in 1995. There does however appear to be growing interest in the use of gas turbines in this sector.

#### New and Renewable Energies

418. New and renewable energies do not make any appreciable contribution to the UK's energy requirements. A Research and Development Programme for these fuels has been in existence since the mid 1970's and to date some (£165 m) has been spent by the Department of Energy on assistance towards R&D. The main aim of Government Policy is to encourage the maximum exploitation of renewable energy technologies where they are economically competitive and environmentally acceptable. The level of Government expenditure peaked at over £17 m in 1981/82. R&D on technologies such as geothermal hot rock, wind, passive solar and biomass energy were the most significant in expenditure terms. Current annual expenditure on the programme is £14m. In the second national programme launched in 1985 New and Renewable energy technologies were classified according to three categories identified in a review of the previous programme. These categories are:  
Economically attractive: passive solar designs for buildings, some aspects of biomass (especially municipal waste);  
Promising but uncertain: wind power, geothermal hot rock, tidal energy, small hydro, small scale, inshore wave;  
 The third category is "Long-shot".

The aim of the Government's programme is to concentrate expenditure on the first two categories with the aim of encouraging commercial uptake of the economically attractive technologies and improving the performance and costs of the promising technologies to the point where they become competitive or show that they cannot be made competitive.

419. It is not expected that New and Renewable Energies will significantly increase their contribution to the UK's energy requirements by 1995.



CONCLUSIONS

Being a net energy exporter the UK has contributed to the Community's security of supply.

Despite this relative abundance of most energy resources the policies pursued in the UK have been similar to those implemented in other Member States. Conservation and ensuring diversity in supply and demand, have been key elements in UK energy policy. Looking at likely future developments in the UK is though hampered by the lack of Government projections and the absence of an overall policy statement on energy.

Central Governments attention to the potential for energy efficiency improvements was not, until the mid-1980's, as active as in some other Member States. The creation of the Energy Efficiency Office in 1983 and the programmes it has since undertaken has undoubtedly heightened the awareness for further energy efficiency improvements. However with energy prices now lower the Government needs to look at the effectiveness of existing energy efficiency programmes. The transport sector which will account for a larger proportion of oil consumption in the period to 1995 merits particular attention.

The privatization of the electricity sector which is being undertaken inter alia so as encourage competition in this sector could have major consequences for fuel use in the electricity sector as well as for domestic coal production in the UK.

With plentiful natural gas available both in the UKCS and Norwegian offshore area British Gas have several options in regards to their supply requirements in the 1990's. Decisions will need to be taken soon on these supplies. The possibility of a link up with the European gas grid should not be overlooked since it would offer additional flexibility in respect of potential supplies as well as providing additional security back up.

The adoption of a more active role by the Government in the promotion of New and Renewable Energies would help to stimulate interest in these fields.

## SUMMARIZED ENERGY BALANCE - UNITED KINGDOM

FEBRUARY 1988

IN MILLION TOE	1973 A	1982 A	1985 A	1986 A	1990 B	1995 B
GROSS ENERGY CONSUMPTION	227.04	196.52	206.21	210.24	212.3	220.0
-BUNKERS	5.31	2.59	2.48	2.42	2.5	2.5
-INLAND CONSUMPTION	221.73	193.93	203.73	207.82	209.8	217.5
INLAND ENERGY CONSUMPTION	221.73	193.93	203.73	207.82	209.8	217.5
-SOLID FUELS	79.17	64.55	62.77	66.24	66.0	71.0
-OIL	108.24	76.28	77.52	76.95	73.8	75.0
-GAS	25.11	40.67	47.11	48.17	51.0	54.0
-PRIMARY ELECTRICITY ETC	9.21	12.43	16.33	16.46	19.0	17.5
INDIGENOUS PRODUCTION (1)	113.00	221.30	236.76	246.28	225.0	216.0
-HARD COAL	78.67	72.45	54.74	62.94	66.0	70.0
-LIGNITE & PEAT						
-OIL	0.68	104.65	129.97	129.69	100.0	85.5
-NATURAL GAS	24.44	31.77	35.72	37.56	40.0	43.0
-NUCLEAR ENERGY	8.88	12.04	15.98	15.69	18.5	17.0
-HYDRO & GEOTHERMAL (2)	0.33	0.39	0.35	0.40	0.5	0.5
-OTHERS & RENEWABLES						
NET IMPORTS (3)	112.88	- 22.12	- 31.92	- 34.81	- 12.7	4.0
-SOLID FUELS	- 0.85	- 2.56	6.58	4.92		1.0
-OIL	113.06	- 28.46	- 49.89	- 50.71	- 23.7	- 8.0
-NATURAL GAS	0.67	8.90	11.39	10.61	11.0	11.0
-ELECTRICITY (2)				0.37		
STOCK CHANGES (4)	- 1.16	2.66	- 1.37	1.23		
-SOLID FUELS	- 1.35	5.34	- 1.45	1.62		
-OIL	0.19	- 2.68	0.08	- 0.39		
-GAS						
ELECTR. GENERATION INPUT	72.66	65.87	71.33	71.33	73.0	77.5
-SOLID FUELS (5)	44.17	45.64	42.60	47.33	49.0	55.0
-OIL	18.34	7.42	11.65	7.43	4.0	4.0
-NATURAL GAS	0.94	0.38	0.75	0.48	1.0	1.0
-NUCLEAR ENERGY	8.88	12.04	15.98	15.69	18.5	17.0
-HYDRO & GEOTHERMAL (2)	0.33	0.39	0.35	0.40	0.5	0.5
-OTHERS & RENEWABLES						

## MAIN INDICATORS (RELATED TO LONG TERM OBJECTIVES)

	1973 - 1963	1982 - 1973	1986 - 1982	1990 - 1986	1995 - 1990	
INLAND ENERGY ANNUAL GROWTH RATE	1.7%	- 1.5%	1.7%	0.2%	0.7%	
GDP ANNUAL GROWTH RATE	3.2%	0.7%	3.0%	1.5%	1.5%	
IMPROVEMENT IN ENERGY INTENSITY		18.8%	5.3%	4%	3%	
	1973	1982	1985	1986	1990	1995
SHARE OF OIL IN GROSS ENERGY CONSUMPTION	50.0%	40.1%	38.8%	37.8%	35.9%	35.2%
SHARE OF HYDROCARBONS IN ELECTRICITY PRODUCTION	26.5%	11.8%	17.4%	11.1%	6.8%	6.5%
SUPPLY DEPENDANCE ON IMPORTS	49.7%	-11.3%	-15.5%	-16.6%	- 6.0%	1.8%

- A. STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES  
 B. SUBMISSIONS FROM MEMBER STATES AND BEST ESTIMATES FROM EXTERNAL SOURCES
- NOTES  
 1. PRODUCTION OF PRIMARY SOURCES INCLUDING RECOVERED PRODUCTS  
 2. THE CONVERSION OF ELECTRICITY, INCLUDING HYDRO AND GEOTHERMAL, IS BASED ON ITS ACTUAL ENERGY CONTENT : 3600 KJ/KWH OR 860 KCAL/KWH  
 3. THE (-) SIGN MEANS NET EXPORTS  
 4. THE (-) SIGN MEANS A STOCK DECREASE  
 5. INCLUDING COKE OVEN GAS AND BLAST FURNACE GAS (DERIVED FROM COAL)
- GENERAL NOTES :  
 FIGURES SUBMITTED BY MEMBER STATES HAVE BEEN ADAPTED WHERE NECESSARY TO ENSURE CONSISTENCY WITH SOEC STATISTICAL DEFINITIONS OR CONVERSION FACTORS